

# Arm's Length Outsourcing

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## Abstract

We analyze the economic consequences of strategic delegation of the right to decide between public or private provision of governmental service and/or the responsibility of negotiating with the chosen service provider after a contract has been signed. Our model is broad enough to encompass both bureaucratic delegation from a government to a privatization agency and electoral delegation from voters to a government. We show that it is a powerful instrument for the principal to achieve better allocation of resources and to obtain a lower price from private service providers. When inhouse production is preferred delegation can indirectly offset weak incentives in the public sector. When outsourcing is preferred, optimal delegation is to an agent, who is at the brink of choosing inhouse provision. Such an agent is a strong negotiator with the firm and offsets market power.

**Keywords:** Outsourcing, Strategic Delegation, Incomplete Contracting, Market Power, Representative Democracy.

**JEL:** D72, L33, L97

## 1 Introduction

Governments strive at providing high quality services for the citizens and at the same time charge low taxes. In house provision of public services often lead to excessive costs, and outsourcing can be an instrument that reduces costs and boosts the budget of both local and central governments (see e.g. surveys by Shleifer 1998, World Bank 1995 and Megginson and Netter 2001). There is less consensus about how outsourcing affects the quality of public services. In areas like electricity provision or garbage collection, where quality is easy to contract upon ex ante and monitor ex post, outsourcing and/or privatization can imply cheaper service provision at a higher level of quality. In areas like health care, elderly care, police enforcement or military

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combat service, where it is difficult to describe, monitor and contract upon quality, the choice of service provision can involve a tradeoff between cost and quality.

We consider the provision of public services where quality is difficult to measure and contracting therefore necessarily incomplete. We show that delegation of the authority to decide upon provision mode - outsourcing or inhouse provision - and of the authority to contract with service providers - public or private - have important economic consequences. The analysis yields that delegation can be an important instrument for a political principal (a government or an electorate) to give service providers - public and private - better incentives and counter private market power.

Hart, Shleifer and Vishny (1997) analyze the cost-quality tradeoff of public service provision in an incomplete contracting framework. A private service provider is residual claimant and has strong incentives to cut costs, which has an adverse effect on the quality. Incentives to improve service are weaker, whether, since the contractor's payment for quality improvement comes through renegotiation with the government after the task has been performed. When production is inhouse the risk of being replaced weakens the manager's bargaining position relative to a private firm's implying that a public manager has less incentives to cut cost and improve quality. Compared with first best, outsourcing leads too much cost cutting, hurting quality, and too little effort spent on developing the service. Public provision leads to less investment in both cost cutting and quality improvement. Which provision mode that delivers highest quality and most welfare depends crucially on how much cost cutting hurts the quality of the service provision.

We extend the Hart, Shleifer and Vishny framework in two directions: We close the model by endogenizing the outsourcing price under various degrees of private market power, which allows us to analyze the government's incentives to outsourcing public service. In addition we introduce delegation of the authority to choose a service provider and the authority to negotiate with the chosen service provider both before and after a contract has been signed. We show that delegation is a powerful policy instrument under both types of service provision.<sup>1</sup>

Our model is broad enough to cover both the case of a national or local government that delegates the authority to decide on outsourcing and contract with service providers to a bureaucratic agency (or a resort minister) and the case of representative democracy where voters elect a politician to be in charge of the service provision. Since our model has several interpreta-

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<sup>1</sup>On a more technical note we also deviate from the Hart, Shleifer and Vishny framework by assuming that the contracting parties rationally foresee the outcome of the post contractual renegotiation implying that agents that foresee high future rent from post contractual renegotiation are willing to accept a lower fix remuneration in the initial contract, whether it be managerial salary in the inhouse case or service price in the outsourcing case.

tions, we use the terms *principal* and *agency*, where the principal delegates decision and contracting rights to the agency. An agency has preferences for cost and quality but they may differ from the principal's.

We compare incentives to outsource and the resulting economic consequences, i.e. the cost and quality of the public service, as well as welfare consequences for four different cases: *No delegation*, where the principal neither can delegate the outsourcing decision nor the contracting right, serves as the base line; *mandatory inhouse provision*, where service has to be provided inhouse and contracting powers are delegated to an agency; *arm's length delegation*, where both the outsourcing decision and the contracting authority are delegated; and, finally, *partial delegation*, where the principal chooses the service provider and negotiates the initial contract but delegates the powers to conduct the renegotiation. The different modes have different virtues but they also represent different institutions. For instance, inhouse provision is mandatory for elderly care in several Scandinavian countries. The many local or regional elections of mayors where outsourcing are salient issues corresponds to arm's length delegation and so does the case, where decisions are delegated to a resort minister with full powers.

The principal dual objective is to have high quality service at a low cost. We identify two effects which makes delegation a powerful means to achieve these goals: *the incentive effect* pertaining to the renegotiation and *the bargaining effect* pertaining to the initial contracting. Two examples illustrate the effects: First assume that the principal finds that inhouse provision leads to excessive costs, since the public manager has insufficient incentives to perform cost reducing effort. Then the principal can hire an agency who cares less about the adverse impact on quality and thus is more in favor of cost reduction than the principal is. This agency will be willing to pay the public manager more for implementing cost reductions in the renegotiation. The public manager's incentives to spend efforts on cost reductions are increased this way, but so is his renegotiated pay. However, foreseeing the outcome of the renegotiation the principal will make savings on the manager's base wage. *The incentive effect* implies, therefore, that delegation effectively shifts part of the fixed salary towards incentive based pay. Hence delegation substitutes an explicit incentive contract.

The *bargaining effect* reflects that delegation may counter private market power. Assume that the principal prefers outsourcing because he focuses more on cost cutting than on quality. Then inhouse provision is not a real threat in the negotiation and if the firm has market power it will capture part of the surplus associated with outsourcing: the price will be relatively high. The principal can improve upon the bargaining situation by delegating to an agency that cares more about quality. Such an agency is more reluctant to outsource and facing a high price from the private firm, it will not outsource. This forces the firm to lower the price. *The bargaining effect* implies, therefore, that delegation is an effective tool for achieving lower

prices from private service providers.

We first consider the important basic case where cost reductions constitute the overwhelming motive and the important tradeoff related to outsourcing is that costs are lowered but so is quality. The *bargaining effect* makes arm's length delegation optimal for the principal, when he prefers outsourcing. When the principal cares more about quality and prefers in-house provision, arm's length delegation may involve the problem that the preferred type of agency prefers outsourcing. Partial delegation is therefore better in some cases. When the preferred agency prefers inhouse provision itself, partial and arm's length delegation (and mandatory inhouse provision) are equally good for the principal. The principal does not completely internalize the effort cost of the service provider and if he were to choose the mode of provision it would not necessarily be second best. From an efficiency perspective, we show that delegation dominates non-delegation and partial delegation is weakly better than any other mode of provision.

When quality is the overwhelmingly important objective, the stronger incentives in the private sector makes outsourcing optimal for any type of principal and again delegation improves the principal's situation. The general case is a mixture of the two simple cases and the general results will depend on which objective is dominant. We consider the case where cost-reductions are not a minor concern and the outsourcing decision still involves the cost-quality trade off even though both kinds of effort are important. The basic results of the cost-reduction case bears over to this more general case.

More generally, our results shed light upon the scope of delegation as a remedy to mitigate incentive problems due to incomplete contracting. There are two essential requirements: First, there must exist variation in preferences such that delegation have effect. This is a natural assumption in the area of public service provision, where groups of individuals receive different net benefits from a given public service and may have different political preferences. However, this is not necessary the case in other areas where incomplete contracting has proven to be important. For instance delegation is less efficient in reducing inefficiencies in financial contracting, since there is less heterogeneity in individuals' valuation of monetary outcomes. Second, optimal delegation may require an agent with so extreme preferences that it cannot be found in the population. Our analysis, therefore, shows that delegation is a powerful instrument when distortions in public service provision are due to incomplete contracting; however, it would be naive to presume that it more generally can solve any allocation inefficiency created by contractual incompleteness.

The main distinction between *privatization* and *outsourcing* is that the former involves transfer of asset ownership from the government to the private sector, whereas the latter focuses on the transfer - through contracts - of rights to deliver a service for a limited amount of time. The theoretical

literature has focused on welfare consequences of privatization and outsourcing focusing on asymmetric information (Laffont and Tirole (1991), Schmidt (1996) and Shapiro and Willig (1993)) political failures (Shleifer and Vishny (1994) and Bennesen (1999)) and incomplete contracting (Hart, Shleifer and Vishny 1997). All these studies focus on the normative consequences of public and private ownership; however, they do not provide strong explanations of why a self interested government would accept to outsource public service or privatize government assets. We endogenize a self interested government's decision to outsource public service. In this aspect, our study complements Debande and Friebe (2004)'s analysis of why governments engage in mass privatization and Börner (2004)'s study of why government's implement political reforms.<sup>2</sup> Empirical studies of privatization has to a large extend focused on how increased competition has affected the cost of maintaining facilities and providing public and private services (see e.g. Vickers and Yarrow (1988), World Bank (1995) and (1997), La Porta et.al. (1997) and the survey by Megginson and Netter (1999)).

Our model focuses on the trade off between cost and quality of service provision. We believe that this trade off is essential in many kind of governmental services. The *quality shading* hypothesis argues that quality may deteriorate when service production is transferred to the private sector (Jensen and Stonecash 2005). There are no systematic evidence for a general *quality shading*; however, there are some indications that it is a concern in areas where it is difficult to make rigorous and enforceable contracts upon service quality. Hartley (2004) and Fredland (2004) analyse provision of combat and support functions to sovereign governments by private companies. The studies conclude that there are substantial potential cost saving from outsourcing military activities but their economic role will be limited due to contractual hazards. There are a number of studies that link ownership structures of hospitals to the quality of the delivered health care (a.o. Sloan et al. 1998, Devereaux et.al. 2002 and Deber 2002) where the ultimate measure of quality is likelihood of death. Similarly, Crampton and Starfield (2004) discusses the quality effects of private provision of primary health service. Some studies have investigated the quality effects of outsourcing garbage collection (a.o. McDavid (2002)) an area where outsourcing generally reduces cost and frequently increase quality.

The structure of the paper is as follows: In Section 2 we focus on non contractible investment in cost saving that have an adverse impact on quality. We set up the basic model and analyze as a benchmark incentives to outsource given delegation is not possible. Then we compare resource allocation and incentives to outsource under three types of delegation: mandatory

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<sup>2</sup>Interestingly, our paper is also related to the large literature on central bank indepen-  
 dency following Rogoff (1985). The focus in central bank delegation is on ability to  
 commit to a certain future policy. In our setting delegation improves the government's  
 position in the post contractual bargaining situation.

inhouse provision, arm's length and partial delegation. Section 3 focuses on non contractible investment in quality improvement. Section 4 combines the two previous sections and analyzes the power of delegation under the existence non contractible investment in both cost reduction and quality improvement. Section 5 concludes.

## 2 One task: Cost reduction

We will first consider the case, where the crucial task faced in service production is a reduction of cost. We assume that cost reductions involves a classic trade off: When the total cost of producing the service is reduced it also reduces the quality of the final service. We begin this section with setting up the basic framework of inhouse provision and outsourcing of a public service when investment or effort spent in cost reduction is non contractible. This part consists of a simplified version of the model developed in Hart, Shleifer and Vishny (1997). We extend their model by analysing a principal's incentives to outsource under different market structures when delegation is not possible. We use this as a building block for our analysis of how optimal delegation affects resource allocation. Finally, we investigate the welfare consequences of delegation.

We start out by setting up our basic model. The principal (e.g. a local government) provides a service, which can be produced inhouse or outsourced. In both cases, the service provider - the public manager or the firm - may perform effort  $e_c$  aimed at reducing cost. The effort results in plans, which may or may not be implemented. Effort is observable by both parties but non-contractible<sup>3</sup>. The total costs of producing the service consists of remuneration of the manager plus other costs. If the cost reduction plans are implemented, the non-managerial cost of producing the service is lowered from  $C_0 > 0$  to

$$C(e_c) = C_0 - e_c. \quad (1)$$

If the principal produces inhouse, it bears the total costs consisting of  $C(e_c)$  plus remuneration of the manager. In case of outsourcing, the firm bears the cost. We assume that the firm is owned by its manager so there is no managerial wage cost for the firm.

If the plans are implemented the quality of the service will be reduced to

$$Q(e_c) = Q_0 - \theta e_c. \quad (2)$$

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<sup>3</sup>To be specific, we assume that the service provider's investment in cost reduction is observable but not verifiable to third parties, i.e. it cannot be written into contracts that are enforceable ex post. This is a standard assumption in the incomplete contracting literature (Hart 1995). For a discussion of this assumption we refer to (Maskin and Tirole (1999) and Hart and Moore (1999)).

The deterioration of quality is the side effect of implementing the cost reduction plans. Depending of the type of service and technical issues, this effect may be more or less severe, which is determined by the parameter  $\theta$ . The principal is interested in high quality but dislikes paying for the service. When quality is  $Q$  and expenditures on the service are  $Y$ , the principal's utility is

$$V(Q, Y) = \phi_p Q - Y \quad (3)$$

where  $\phi_p$  is the weight the principal puts on quality.

The gross gain from investing in cost reduction is

$$s(e_c, \phi_p, \theta) = (1 - \theta\phi_p) e_c. \quad (4)$$

As is clear from this expression, cost reducing effort only gives a positive gross surplus if  $\phi_p < \frac{1}{\theta}$ .

The effort is costly to the service provider, whether it is the public manager or the firm the effort cost is equal to  $\frac{1}{2}e_c^2$ .

## 2.1 No delegation

We first consider the base line case, where neither the authority to decide on outsourcing and perform the initial contracting nor the renegotiation authority can be delegated by the principal.

### 2.1.1 Inhouse provision

Under inhouse provision the principal hires a manager at the competitive market for managers and pays him a wage  $w$ . With total income  $I$ , his utility is

$$u^m = I - \frac{1}{2}e_c^2. \quad (5)$$

When hired, the manager spends effort,  $e_c$ , resulting in plans. Since effort is non-contractible, the manager has no direct incentive to perform it. However, after effort is performed (and the associated utility cost is sunk for the manager), the parties can renegotiate his contract and decide whether to implement the plans or not. At that point in time, the plans are tangible and it is possible to write a contract specifying that they should be implemented. If negotiations break down, the principal can replace the manager, but only half of the gross gains can be realized, since the new manager does not have the detailed knowledge and human capital of the old manager.<sup>4</sup>

As the principal can recoup half of the gross surplus if the manager is fired, the gains from renegotiation consist of the other half:  $\frac{1}{2}s(e_c, \phi_p, \theta)$ , which is split evenly so the manager's income is  $w + \frac{1}{4}s(e_c, \phi_p, \theta)$ . When

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<sup>4</sup>That exactly half of the gross gains can be recouped is inessential for the qualitative results, but it simplifies formulas nicely.

choosing effort, the manager foresees the renegotiation, so his optimizing choice is

$$e_c^{in}(\phi_p, \theta) = \frac{1 - \theta\phi_p}{4} \quad (6)$$

if  $\phi_p < 1/\theta$  and zero otherwise.

The wage  $w$  makes the manager indifferent between taking the job and going for his outside option, which we normalize to 0. We deviate from the wage setting in Hart, Shleifer and Vishny by assuming that the parties have rational expectations and foresee the upcoming renegotiation.<sup>5</sup> Therefore the manager's wage fulfills

$$w = 0 - \frac{1}{4}s(e_c^{in}(\phi_p), \phi_p, \theta) + \frac{1}{2}e_c^{in}(\phi_p, \theta).$$

When  $\phi_p < 1/\theta$ , so effort is positive, the total expenditure for the principal is

$$\begin{aligned} Y^{in}(\phi_p) &= C_0 - e_c^{in}(\phi_p) + w + \frac{1}{4}s(e_c^{in}(\phi_p), \phi_p, \theta) \\ &= C_0 - \frac{1 - \theta\phi_p}{4} + \frac{1}{2}\left(\frac{1 - \theta\phi_p}{4}\right)^2 \end{aligned} \quad (7)$$

and the principal's utility from in-house provision is

$$u^{in} = \phi_p \left( Q_0 - \theta \frac{1 - \theta\phi_p}{4} \right) - \left( C_0 - \frac{1 - \theta\phi_p}{4} + \frac{1}{2} \left( \frac{1 - \theta\phi_p}{4} \right)^2 \right). \quad (8)$$

When  $\phi_p \geq 1/\theta$ , i.e. effort is zero, the total expenditure is just  $C_0$  and the principal's utility is  $\phi_p Q_0 - C_0$ .

For later comparison we find the first best level of effort, i.e. the effort level that maximises the net surplus between the manager and the principal,

$$N(e_c, \phi_p, \theta) = s(e_c, \phi_p, \theta) - \frac{1}{2}e_c^2 = (1 - \phi_p\theta) e_c - \frac{1}{2}e_c^2 \quad (9)$$

For  $\phi_p < 1/\theta$  it is

$$e_c^*(\theta) = 1 - \theta\phi_p \quad (10)$$

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<sup>5</sup>Hart, Shleifer and Vishny 1997 assume that the public manager receives a fix wage weakly larger than their outside utility. Hence, the government does not foresee that renegotiation will lead to that the manager ends up with a total compensation strictly larger than his outside utility. We believe that a rational government recognizes that he can lower the fix part of the manager's remuneration below the relevant reservation wage, because both manager and principal know that additional payment will follow in the renegotiation process.

Hart, Shleifer and Vishny briefly discuss the possibility that the manager offers the government some of his post contractual rent but categorize such actions as corruption. It is interesting to notice that rational wage contracting implies that any foreseen postcontractual rent can be transferred between the negotiating parties in the initial wage negotiation and therefore in the present setting has the same effect as post contractual bribes.

otherwise it is zero.

To sum up, the contractual incompleteness lead to inefficiency since the public manager's effort level is too low compared to first best. The reason is that the renegotiation provides the manager with too weak incentives, since he only internalizes a quarter of the total value created by his action.

### 2.1.2 Outsourcing

When the service provision is outsourced, the principal and a private firm concludes a contract stipulating that the firm produces the service for the price  $p_0$  and bears the associated costs. The contract can be renegotiated, but it cannot be terminated prematurely. Then the private firm exerts effort,  $e_c$ , which again is non-contractible. When the private firm has made the effort and come up with plans for cost reduction, the parties may renegotiate the contract. If negotiations break down, the firm owns the plans and decides whether cost reductions will be implemented. This is the crucial difference to inhouse provision. Since the firm bears costs and is paid  $p_0$  regardless of whether the plans are implemented or not, it will wish to implement the cost reductions.

One may wonder, whether the principal would be interested in paying the firm for not implementing the cost reduction. If  $\theta\phi_p < 1$ , then although the principal is hurt, he is not willing to pay the firm the potential cost savings for not implementing the cost reduction. In this case, the renegotiation will have no effect and the firm will just implement the cost reduction. For  $\theta\phi_p \leq 1$ , therefore, the total expenditure for the principal under outsourcing is  $Y^o = p_0$ . The firm's optimal choice is

$$e_c^o = 1. \quad (11)$$

If, on the other hand,  $1 < \theta\phi_p$ , then the quality reduction hurts the principal so much that he is willing to pay more than the potential cost reduction in order to avoid it. Assuming - as above - that the parties split the bargaining surplus 50:50, then such a payment would imply that the firm in fact gets even larger benefit from effort directed at cost reductions, since now the marginal payoff is  $1 + \frac{\phi_p\theta-1}{2}$ . The optimal choice of cost reducing effort would be  $e_c = 1 + \frac{\phi_p\theta-1}{2}$ , and this would make outsourcing unattractive for the principal. Below we show that outsourcing is only chosen when  $\theta\phi_p \leq \frac{3}{7}$  and we will therefore not pursue the case where  $\theta\phi_p > 1$  further.

The utilities to the firm and the principal from outsourcing are

$$u^f = p_0 - C_0 + \frac{1}{2} \text{ and } u^o = \phi_p Q_0 - \theta\phi_p - p_0. \quad (12)$$

Comparing (6), (10) and (11), we have that

$$e_c^{in}(\phi_p, \theta) \leq e_c^*(\phi_p, \theta) < e_c^o. \quad (13)$$

Cost reducing effort is larger under outsourcing than under inhouse provision. While the public manager has no direct interest in cost reductions and takes into account that they hurt the principal, the firm has a strong motive to reduce cost, since it pays the cost. Outsourcing therefore involves a tradeoff, the cost of producing the service falls but it is at the expense of quality.

### 2.1.3 Incentives to outsource

We endogenize the price of the private service provider in order to analyze the government's incentive to outsource.<sup>6</sup> We envision outsourcing through a bidding process, where the lowest bidder wins the contract. The winning price depends on the competitive environment. If the principal is a large actor in the market and the market is competitive, it is reasonable to assume that the price will equal the competitive price, where the firm earns no excess profit and the principal reaps the whole surplus from outsourcing.<sup>7</sup> However if competition is weak and the firms are able to collude the outcome will not be competitive. If, for instance, there are many local principals facing one large monopolistic firm, the firm has significant bargaining power. If the principal invites tenders, the private firm will only need to submit a bid, which exactly makes the principal indifferent between outsourcing and producing in-house. In this case the private monopoly will reap the surplus from outsourcing.

The joint surplus of the principal and the firm from outsourcing is

$$\Omega(\phi_p, \theta) = u^o + u^f - (u^{in} + 0)$$

where the zero is the value of the firm's outside option. Inserting gives

$$\Omega(\phi_p, \theta) = \begin{cases} \frac{1}{32} (3 - 7\theta\phi_p) (3 + \theta\phi_p) & \text{if } \phi_p \leq \frac{1}{\theta} \\ \frac{1}{2} (1 - 2\theta\phi_p) & \text{if } \phi_p > \frac{1}{\theta} \end{cases} \quad (14)$$

We will assume that the parties split the surplus, so that the firm's share is  $\gamma$  (and the principal's share is  $(1 - \gamma)$ ). Thus  $\gamma$  parameterizes the degree of market power: If  $\gamma = 1$ , the firm reaps all surplus - the monopoly case - if  $\gamma = 0$  the principal reaps all surplus - the perfectly competitive case.

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<sup>6</sup>Similar to the wage formation discussed above, this implies that the firm's future rent from the renegotiation process will be included in the initial price negotiation. This is a crucial assumption for the effectiveness of delegation and follows naturally from rational contracting.

In endogenizing the outsourcing price, we deviate from Hart, Shleifer and Vishny (1997). They briefly discuss the possibility that the firm bribes the government during the renegotiation phase. Again it is noteworthy that our assumption about rational price negotiation implies that foreseen post contractual rent can be transferred between the parties during the initial price negotiations.

<sup>7</sup>This will in principle also be the consequence if the principal holds some standard auction, for instance an English auction, and there are at least two bidders.

The principal's utility from outsourcing is therefore

$$u^o = (1 - \gamma)\Omega + u^{in} \quad (15)$$

from which it is clear that the principal only outsources when the joint surplus is positive. This leads to

**Proposition 1** *Under no delegation, a principal of type  $\phi_p$  outsources if and only if*

$$\phi_p \leq G(\theta) \equiv \frac{3}{7\theta}. \quad (16)$$

The Proposition provides a number of interesting empirically relevant insights into governments' outsourcing behaviour:

First, *outsourcing is a two-edged sword*. The private firm will spend more effort making cost reductions possible but this is at the cost of lower quality. This trade off leads principals who care less for the quality of the service, to outsource, while principals who put large weight on the service, tend to choose inhouse production. The higher is  $\theta$ , the more severe is the trade-off and the smaller is the cut-off value of  $\phi_p$ . Hence, outsourcing takes place, *ceterius paribus*, when the principal does not value the benefits of the service so much and when cost reductions do not hurt quality so much.

Second, Proposition 1 yields that *the outsourcing decision is independent of the competitiveness of the market* -  $\gamma$  does not enter in condition (16). While perhaps surprising at first sight, the reason is straightforward: Outsourcing takes place when the surplus from outsourcing is positive, this is independent of how the surplus is split. Market power does not affect the existence of the surplus, it only affects how it is split.

Third, the principal's preferences for quality has a *price effect*. Under outsourcing the price,  $p_0$ , is determined such that firm receives the fraction  $\gamma$  of the outsourcing surplus,  $\Omega$ . The surplus, and therefore also the price, depend on the principal's preference for quality. Using (8), (14) and (15), we find the principal's utility from outsourcing:

$$u^o(\phi_p, \theta) = \phi_p Q_0 - \theta \phi_p - C_0 + \frac{1}{2} - \frac{\gamma}{32} (3 - 7\theta \phi_p) (\theta \phi_p + 3). \quad (17)$$

Using (12) we find the price equals

$$p_0 = Y^o(\phi_p, \theta) = C_0 - \frac{1}{2} + \frac{\gamma}{32} (3 - 7\theta \phi_p) (\theta \phi_p + 3), \quad (18)$$

which decreases in  $\phi_p$  for  $\phi_p \leq \frac{3}{7\theta}$ . A principal, who values quality more, is more hurt by the quality reductions following the private firm's cost reductions. This lowers the price the firm receives.

Notice, that when the principal is of type  $\phi_p = G(\theta) = \frac{3}{7\theta}$ , the outsourcing surplus,  $\Omega(\phi_p, \theta)$  is zero. Such a principal finds that the large cost

reductions implemented by the firm hurts quality so much, that he is of the brink of preferring inhouse production. Facing a principal of type  $G(\theta)$ , the firm is therefore only able to get a contract if its payoff  $\gamma\Omega(\phi_p, \theta)$  is zero - indendently of the market structure,  $\gamma$ . This is true even when the private firm is a monopolist.

## 2.2 Delegation

The benchmark analysis of the previous section showed how incomplete contracting distorts ressource allocation because of inefficient incentives. The public mangager's effort choice depends on the principal's preferences, since his incentives are indirectly provided through renegotiaion. The private firm, who is residual claimant had too strong incentives to make cost reductions and this hurt principal's with a strong preference for quality the most. The price the private firm receives therefore depends on the principal's preferences. Hence, if a principal could "misrepresent" his preferences, he may be able to obtain less distortion in ressource allocation and/or a better price of the service. A way to acheive this outcome is to delegate the authority to outsource and contract with the service provider to an agency.

Since there are several decisions involved, the degree of delegation may vary. We consider three different cases: Under *arms' lenght delegation*, the principal delegates both the outsourcing decision, the initial contracting authority as well as the authority to renegotiate the contract. Under *mandatory inhouse provision*, outsourcing is not an option, and the principal delegates the initial contracting with the public service provider as well as the renegotiation decision. Finally, under *partial delegation*, the principal takes the outsourcing decision himself, and makes the initial contracting with the service provider, but he delegates the renegotiation authority.

This section analyzes how such delegation affects incentives to outsource and the cost and quality levels of the delivered service both when the service provider is private and public.

The principal can choose among agencies, who also care about the quality and the cost of the delivered service. As before principal  $\phi_p$  values quality with the parameter  $\phi_p$ . The agency is chosen from a group of potential agencies, whose preferences for the quality, characterized by  $\phi_a$ , differ. We will assume that the population is sufficiently heterogeneous that for any positive  $\phi_a$  it is possible to find an agency with  $\phi_a$ . We exclude the possibility of negative  $\phi_a$ , so we exclude the existence of malevolent agencies who benefit from public service beeing of low quality. It would in fact make the analysis simpler, if we did not impose this - reasonable - restriction.

As mentioned in the Introduction, the framework is general enough to have several interpretations. In *bureaucratic delegation* the principal is the government and the agency is an independent service provision agency that negotiate with private and public service providers and choose for each type

of service between inhouse provision or outsourcing. Alternatively, one could conceive the agency as a *resort minister* with independent powers.

The second interpretation is one of *representative democracy*. In this setting it is assumed that outsourcing is a decisive issue in elections. This is most likely to be the case in elections to local governments or municipalities where outsourcing of the core services of the welfare state like elderly services or health services are topical issues. The group of voters in the election are principals and the median voter (characterized by  $\phi_p$ ) is the decisive principal. We assume that a politician cannot commit to a policy before the election so political promises prior to an election are cheap talk. The elected politician is going to maximize her utility and voters realize this. The election therefore becomes a game of delegation for the median voter.<sup>8</sup> The median voter then elects a government with preferences characterized by  $\phi_a$ .

### 2.2.1 Delegation under mandatory inhouse provision

First we consider the case where outsourcing is not an option, but the principal may delegate the responsibility for the service provision to an agency. The agency has authority to hire the public manager and renegotiate the contract. The service could be e.g. elderly care in a country where the law prescribes that municipalities must provide inhouse provision of retirement homes.<sup>9</sup> Principal  $\phi_p$ 's utility when agency  $\phi_a$  chooses inhouse provision is

$$v^{in}(\phi_a|\phi_p, \theta) = \phi_p(Q_0 - \theta e_c^m(\phi_a, \theta)) - Y^{in}(\phi_a, \theta),$$

which gives

$$v^{in}(\phi_a|\phi_p, \theta) = \phi_p \left( Q_0 - \theta \frac{1 - \theta \phi_a}{4} \right) - \left( C_0 - \frac{1 - \theta \phi_a}{4} + \frac{1}{2} \left( \frac{1 - \theta \phi_a}{4} \right)^2 \right), \quad (19)$$

for  $\phi_a < 1/\theta$  and  $\phi_p Q_0 - C_0$  otherwise. The principal's preferred agency maximizes  $v^{in}(\phi_a|\phi_p, \theta)$  among all agencies  $\phi_a \geq 0$ .<sup>10</sup> This gives

**Proposition 2** *Under mandatory inhouse provision, the principal's preferred agency,  $\phi_a^{mi}(\phi_p, \theta)$ , values quality less than the principal and is given by*

$$\phi_a^{mi}(\phi_p, \theta) = \begin{cases} 0 & \text{if } 0 \leq \phi_p \leq \frac{3}{4}\frac{1}{\theta}, \\ 4\phi_p - \frac{3}{\theta} & \text{if } \frac{3}{4}\frac{1}{\theta} \leq \phi_p \leq \frac{1}{\theta}, \\ \text{any } \phi_a > \frac{1}{\theta} & \text{if } \frac{1}{\theta} < \phi_p. \end{cases} \quad (20)$$

<sup>8</sup>As is seen below, the median voter is well-defined.

<sup>9</sup>This is indeed the case in the Scandinavian countries.

<sup>10</sup>Here and in the sequel, it is straightforward to check that the second order condition for maximum is fulfilled.

The Proposition reflects that the principal takes advantage of the *incentive effect* of delegation. When the principal chooses agency, he bears in mind that too little effort is spent by the public manager on cost reductions, since the manager only internalizes a quarter of the gross surplus, cf. (6) and (10). The principal counters this problem by choosing an agency who cares less than the principal about quality, as it is easily checked that

$$\phi_a^{mi}(\phi_p, \theta) < \phi_p \text{ for } \phi_p \leq \frac{1}{\theta}.$$

When the public manager renegotiates with the agency, the surplus from cost reductions are higher than if renegotiations were with the principal, since the agency values quality less and is more favorable to cost reductions. The manager, who receives part of the surplus, therefore gets a higher marginal pay from putting more effort into cost reductions and respond by making more effort. While the principal likes the higher effort, he dislikes the increased pay to the manager. However, this is partly offset in the initial contracting. Recall that the public manager is hired at the competitive market for managers, so his total pay will cover his effort cost plus his outside option. When signing the initial contract with the agency, he rationally foresees the income from the renegotiation and is willing to accept a lower base wage. Hence, the principal in effect only ends up covering the manager's extra effort cost. The *incentive effect* implies that a larger fraction of the manager's pay is related to incentives. Delegation, therefore, substitutes for a formal incentive contract.

The incentive effect improves efficiency. In fact, we have that

$$e_c^m \left( 4\phi_p - \frac{3}{\theta}, \theta \right) = \frac{1 - \theta \left( 4\phi_p - \frac{3}{\theta} \right)}{4} = 1 - \theta\phi_p = e_c^*(\phi_p, \theta),$$

for  $3/(4\theta) \leq \phi_p \leq 1/\theta$ , so in these cases delegation can offset all distortions following from contractual incompleteness under mandatory inhouse provision. Principals with lower  $\phi_p$  find that the boundary condition,  $0 \leq \phi_a$  binds. Optimal delegation would require that the principal delegates to so extreme types, that they cannot be found in the population. Hence, although delegation improves the situation for the principal in this case, it does not solve all allocation problems. Principals with  $\phi_p > 1/\theta$ , prefer no cost reduction at all, and this can be achieved by choosing any type of agency fulfilling  $\phi_a > 1/\theta$ .

Delegation is a powerful instrument; however, the analysis also highlights why delegation does not solve all problems related to postcontractual renegotiations. First, as we saw it might be the case that sufficiently extreme agents do not exist. Secondly, the premise for delegation is that agents are heterogeneous and have different preferences on the trade off between cost and quality. We believe this is a natural assumption in the context of public

service provision such as, for instance, a local bus route or an elderly home. However, in many incomplete contracting frameworks, for instance in the financial contracting models described in Hart 1995, such variation is not necessarily present and delegation may not be an efficient tool to circumvent resource allocation inefficiencies created by incomplete contracting.

### 2.2.2 Arm's Length Delegation

In this section we consider the case where the principal delegates to an agency who both decides on the mode of service provision and it is in charge of the initial negotiations with public and private service providers as well as the renegotiation. As discussed above this is for instance the case in representative democracies, where voters delegate to a politician or under bureaucratic delegation. While it may be an institutional choice, arm's length delegation may also be the only feasible institutional arrangement. Due to time constraints a political leadership necessarily have to delegate many tasks to subordinates, including the authority to decide on some service provision tasks. It might be difficult or impossible for the principal to write detailed delegation contracts with an agent. In addition, even if it is possible to contract on the provision mode between the principal and the agency, doing so may create other incentive problems. E.g. managers and workers in public service provision may shirk if they know that outsourcing/privatization is never an option.

Under arm's length delegation, the principal is aware that agencies with  $0 \leq \phi_a \leq G(\theta)$  will outsource, while those with  $G(\theta) \leq \phi_a$  will choose inhouse provision.<sup>11</sup>

Principal  $\phi'_p$ 's utility when agency  $\phi_a$  outsources is

$$v^{out}(\phi_a|\phi_p, \theta) = \phi_p(Q_0 - \theta) - \left( C_0 - \frac{1}{2} + \frac{\gamma}{32}(3 - 7\theta\phi_a)(\theta\phi_a + 3) \right) \quad (21)$$

and the most preferred agency maximizes this among those who outsource. The most preferred among those who prefer inhouse provision maximizes  $v^{in}(\phi_a|\phi_p, \theta)$  (as given in (19)). Straightforward maximization and comparison of the indirect utilities under inhouse provision and outsourcing respectively gives:

**Proposition 3** *Under arm's length delegation, the outsourcing decision is the same as under no delegation. Principal  $\phi'_p$ 's preferred agency,  $\phi_a^{al}(\phi_p, \theta)$ ,*

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<sup>11</sup>An agency with  $\phi_a = G(\theta)$  is indifferent between inhouse provision and outsourcing. We assume that in this case the agency chooses the principals most preferred option. Otherwise, the principal could delegate to a type  $G(\theta) - \varepsilon$  if she preferred outsourcing and type  $G(\theta) + \varepsilon$  if she preferred inhouse provision, where  $\varepsilon$  is small.

and the outsourcing decision is given by:

$$\phi_a^{al}(\phi_p, \theta) = \begin{cases} G(\theta) & \text{if } 0 \leq \phi_p \leq G(\theta) & \text{outsourcing,} \\ G(\theta) & \text{if } G(\theta) \leq \phi_p \leq 2G(\theta) & \text{inhouse,} \\ 4\phi_p - \frac{3}{\theta} & \text{if } 2G(\theta) \leq \phi_p \leq 1/\theta & \text{inhouse,} \\ \text{any } \phi_a > \frac{1}{\theta} & \text{if } \frac{1}{\theta} < \phi_p & \text{inhouse.} \end{cases}$$

Principals with low preference for quality who prefer outsourcing take advantage of the *bargaining effect* and delegate to an agency of type  $\phi_a = G(\theta)$ . This agency cares more about quality than the principal and is at the brink of preferring inhouse provision. When contracting with the private firm this agency is a tough negotiator, since it finds the firm's expected cost savings problematic for quality. The outsourcing surplus between this agency and the firm is negligible (zero actually) and the outsourcing price is therefore as low as possible. The *incentive effect* plays no role here, since the firm will just implement the cost savings without further renegotiation. Principals, who prefer inhouse provision, take advantage of the *incentive effect*, just as they did under mandatory inhouse provision, and delegates to agents, who care less about quality than the principal. However, principals with intermediate valuations of quality, where  $G(\theta) \leq \phi_p \leq 2G(\theta)$  run into the problem that the preferred agency under mandatory inhouse provision now wishes to outsource. Hence, the principal has to modify the choice of agency to a type who just chooses inhouse provision. This still gives an incentive effect, but not so much as the principal would have wished for. Principals with even higher preference for quality do not encounter this problem, they can freely choose the most preferred agency under inhouse provision and stay confident that this agency also prefers inhouse provision.

Arm's length delegation does not change the outsourcing decision: Principals delegate to an agency, who makes the same decision on outsourcing as the principal would himself. The reason is that the *bargaining effect* and the *incentive effect* go in different directions. Consider a principal of type  $G(\theta) + \varepsilon$ , where  $\varepsilon$  is very small. Even though he could get (almost) as good a bargain with the private firm as agency  $G(\theta)$  he prefers inhouse provision under no delegation. When he delegates, he will not be interested in delegating to agency  $G(\theta)$  who outsources. Similarly, principal  $G(\theta) - \varepsilon$  prefers outsourcing under no delegation even though he himself would induce (almost) the same incentives for the public manager as the lowest type agency, who chooses inhouse production, type  $G(\theta)$ . Type  $G(\theta) - \varepsilon$  will therefore not be interested in delegating to an agency, who chooses inhouse provision. The result is that the outsourcing decision is not changed by arm's length delegation.

Since the *bargaining effect* and the *incentive effect* go in different directions, principals prefer agencies, which are closer to being indifferent between outsourcing and inhouse provision than the principal is. In the context of

representative democracy, where the provision of public goods is the salient issue, this implies that voters vote for politicians who are more moderate than themselves.

The principal's optimal agency has preferences different from the principal for almost all principals (if  $\phi_p < 1/\theta$ ). In the context of democracy Proposition 3 has the important implication that representative democracy is better for the median principal than direct democracy. We also note that a principal's preferred agency is weakly increasing in  $\phi_p$ . If one imagines that different voters in the electorate has different  $\phi_p$ , this implies that the preferred agency of the voter with the median value of  $\phi_p$  is a Condorcet winner.

### 2.2.3 Partial delegation

Arm's length delegation provides the principal with the strategic benefits of delegation. However, as we saw the principal may encounter the problem that the preferred agency under - say - inhouse provision prefers to outsource. This limits the principal's options and the principal has to choose a second best agency of type  $\phi_a = G(\theta)$ . The principal can avoid this problem by taking the outsourcing decision himself. We have already considered the case of mandatory inhouse provision above, now we focus on the case where the principal first decides on the mode of provision and then delegates the authority to renegotiate with the service provider to an agency. We call this *partial delegation*.

When the private market is characterized by some market power it is not an option for the principal to specify that the agency shall outsource and leave the price negotiations to the agency - at least this is a very bad option. If the agency is forced to outsource, the outsourcing surplus is infinite and the price undetermined as the model is specified. This reflects that in reality the agency would fall prey to the monopoly power of the firm(s). We therefore consider the case where the principal himself conducts negotiations with the firm if outsourcing is chosen. Both parties understand that the alternative for the principal is to choose inhouse provision. When the mode of provision is chosen - and if outsourcing occurs the firm's price is set - the principal chooses the best agency to conduct the renegotiation. The best agency then depends on the chosen mode of provision.<sup>12</sup> In the price negotiations with the private firm, both parties realize this.

From equation Proposition 2 we know that if the principal chooses inhouse provision and  $\phi_p \leq \frac{3}{4}\frac{1}{\theta}$  then  $\phi_a = 0$  and  $e_c = 1$ . The utility to the principal in this case is

$$v^{in}(0|\phi_p, \theta) = \phi_p \left( Q_0 - \frac{1}{4}\theta \right) - C_0 + \frac{7}{32}.$$

---

<sup>12</sup>In fact, any agency is optimal when outsourcing is chosen, since there will be no renegotiation in this case, as discussed above.

If, on the other hand, outsourcing is chosen, then  $e_c = 1$ , and the utility to the principal and the firm respectively is given by  $u^o$  and  $u^f$  as given in (12). Hence, the outsourcing surplus is

$$\hat{\Omega}(\phi_p, \theta) = u^o + u^f - (v^{in}(0|\phi_p, \theta) + 0) = \frac{3}{32}(3 - 8\theta\phi_p). \quad (22)$$

This is positive if  $\phi_p \leq \frac{3}{8}\frac{1}{\theta}$ . For  $\phi_p \geq \frac{3}{4}\frac{1}{\theta}$  the optimal agency under inhouse provision is not  $\phi_a = 0$ , but it is straightforward to check that the outsourcing surplus is also negative in this case. This gives

**Proposition 4** *Under partial delegation, the principal chooses outsourcing if and only if*

$$\phi_p \leq H(\theta) \equiv \frac{3}{8}\frac{1}{\theta}. \quad (23)$$

*If outsourcing is chosen, any agency is optimal for the principal. If inhouse provision is chosen, the principal prefers an agency of type  $\phi_a^{mi}(\phi_p, \theta)$  as given in (20).*

Under partial delegation outsourcing is less likely than under no delegation and arm's length delegation, since  $H(\theta) < G(\theta)$ . The reason is that partial delegation enables principals of types close to  $G(\theta)$  to specify inhouse provision and choose an agency who gives an optimal incentive effect. This agency would prefer to outsource if it had the opportunity, and this choice is therefore an option for the principal under arm's length delegation. When the principal specifies inhouse provision, the situation is as under mandatory inhouse provision. Hence, the principal can take full advantage of the incentive effect under partial delegation. The bargaining position effect, on the other hand, vanishes under partial delegation since the initial contracting with the firm is done by the principal himself. Still the improved prospects under inhouse provision makes the principal himself a better negotiator with the firm although not as good as the agency, who is at the brink of choosing inhouse provision. All in all outsourcing is a less attractive option for principals with  $\phi_p$  in the vicinity of  $G(\theta)$ . Principals with low preference for quality still prefer outsourcing, for them the strong cost reductions made by the firm are still attractive.

#### 2.2.4 Efficiency

The principal does not directly internalize the effort cost of the service provider, so the outcome is not necessarily welfare maximizing. In this section, we consider welfare, by which we understand the sum of utility of the principal and the service provider, the net surplus as given in (9), which we restate for convenience

$$N(e_c, \phi_p, \theta) = s(e_c, \phi_p, \theta) - \frac{1}{2}e_c^2 = (1 - \phi_p\theta)e_c - \frac{1}{2}e_c^2.$$

The first best level of effort maximizes the net surplus and is  $e_c^* = 1 - \theta\phi_p$ , for  $\phi_p \leq 1/\theta$  cf (10).

We are interested in understanding which institution for allocation of authority creates most surplus from the provision of the service. Proposition 5 ranks the four different institutions considered according to the net surplus generated. The proof of the Proposition is straightforward: For each institution, we can find the induced effort level (using  $e_c = 1$  whenever there is outsourcing and equation (6) when there is inhouse provision together with the  $\phi_a$  of the chosen agency). This effort level is then inserted into  $N(e_c, \phi_p, \theta)$ . Remembering that  $H(\theta) \equiv \frac{3}{8\theta} < \frac{3}{7\theta} \equiv G(\theta)$ , we have:

**Proposition 5** *Efficiency of institutions for allocation of authority:*

a) *Delegation improves service provision: For any  $\phi_p \leq \frac{1}{\theta}$ , Arm's Length and Partial Delegation give at least as high surplus as No Delegation. For  $G(\theta) < \phi_p < \frac{1}{\theta}$  all types of delegation give strictly higher surplus than No Delegation.*

b) *For  $\phi_p \leq H(\theta)$  all institutions (except Mandatory Inhouse Provision) lead to outsourcing and are equally good. For  $H(\theta) < \phi_p \leq G(\theta)$  only Arm's Length Delegation and No Delegation lead to outsourcing.*

c) *Partial Delegation gives at least as high surplus than any other institution and if  $H(\theta) < \phi_p \leq 2G(\theta)$  it gives strictly higher surplus than No Delegation and Arm's Length Delegation.*

d) *First best can be achieved if and only if  $2H(\theta) \leq \phi_p$ . If  $\frac{1}{\theta} \leq \phi_p$  all institutions lead to first best. If  $2G(\theta) \leq \phi_p$  then any type of delegation leads to first best. If  $2H(\theta) \leq \phi_p < 2G(\theta)$ , then partial delegation and mandatory inhouse provision lead to first best.*

Figure 1 depicts the net surplus as a function of  $\phi_p$  and thus illustrates what is behind Proposition 5 for the parameter values:  $\theta = 1, Q_0 = 4, C_0 = 1$  and  $\gamma = 0.5$ . First best is the solid grey curve; no delegation is the solid black line which has a kink at  $\phi_p = G(\theta)$ ; arm's length outsourcing is given by the combination of the solid black line for  $\phi_p \leq G(\theta)$  and the dashed black line for  $\phi_p \geq G(\theta)$ ; mandatory inhouse provision is the dashed grey line; and, finally, partial delegation is the dots that combine the solid black line for  $\phi_p \leq H(\theta)$  with the dashed grey line for  $\phi_p \geq H(\theta)$ .

The Figure shows that both *arm's length* and *partial delegation* (weakly) dominates no delegation, and are strictly better when the service is produced inhouse cf a) of Proposition 5. When the service is outsourced, the effort level is chosen by the firm without regard to any renegotiation and therefore the effort level and surplus is the same whether there is delegation or not (cf b)). When the service is produced inhouse the delegation to an agency, which cares less about quality, gives stronger incentives for the public manager to perform cost reducing effort and this raises the surplus. (as long as  $\phi_p < 1/\theta$ ).

The Figure also demonstrates that *partial delegation* is the most efficient mode, cf *c*). It has the advantage over mandatory inhouse provision that the benefits from outsourcing are reaped for low  $\phi_p$  and it has the advantage over arm's length outsourcing that the principal needs not worry that the preferred agency under inhouse provision cares so little about quality that it prefers to outsource. Under arm's length outsourcing, the principal modifies the choice of agency when  $\phi_p$  is close to  $G(\theta)$  in order to keep the agency choosing inhouse provision. Finally, the Figure illustrates *d*), full efficiency can only be achieved for high  $\phi_p$ . These types of principal have the option to delegate to an agency who cares sufficiently less about quality that the public manager can be induced to choose the first best level of effort. Again *partial delegation* allows this to be the case for a larger range of  $\phi_p$  than *arm's length* since the principal needs not worry about that the agency may choose outsourcing.

### 2.2.5 The principal's ranking

The different institutions for allocating authority give the principal different options. Suppose the principal could chose the institution, which one would he choose? It is straightforward that any type of delegation is (weakly) better for the principal than non-delegation. Under delegation it is an option for the principal to choose a type equal to himself, thus mimicking non-delegation. Whenever he does something different, it is because it gives him higher utility.

Similarly, *partial delegation* is (weakly) better for the principal than *mandatory inhouse provision*. Again the principal can mimick *mandatory inhouse provision* under *partial delegation*. When he does not, it is because it gives him higher utility.

The comparison between *partial delegation* and *arm's length delegation* is more delicate. *Partial delegation* has the advantage that the principal needs not worry that the agency may outsource, when the principal is not interested in this, and so the principal can choose from a wider array of agencies and take full advantage of the incentive effect, when he prefers inhouse provision. *Arm's length delegation*, on the other hand, has the advantage, that when the principal prefers outsourcing, he can take advantage of the bargaining position effect and reap the whole surplus from outsourcing. From Proposition 4 it is clear that outsourcing only is better for the principal than inhouse provision with the optimal agency when  $\phi_p \leq H(\theta)$ . From Proposition 2 and Proposition 3), we know that the choice of agency is the same under *arm's length delegation* and *partial delegation* when  $2G(\theta) \leq \phi_p$  and that the all modes lead to the same utility for the principal if  $\frac{1}{\theta} \leq \phi_p$ . Summarizing the discussion we therefore have

**Proposition 6** *The principal's most preferred institution for allocation of authority is as follows:*

*If  $0 \leq \phi_p \leq H(\theta)$  or  $2G(\theta) \leq \phi_p$  arm's length delegation is optimal for the principal*

*If  $H(\theta) \leq \phi_p$  partial delegation or mandatory inhouse provision are optimal for the principal*

*If  $\frac{1}{\theta} \leq \phi_p$  all modes are optimal for the principal*

Figure 2 depicts the principal's pay off as a function of  $\phi_p$  and thus illustrates Proposition 6 for the parameter values:  $\theta = 1$ ;  $Q_0 = 4$ ;  $C_0 = 1$  and  $\gamma = 0.5$ . The figure highlights the shift in the principal's preferred mode of delegation around  $H(\theta) = \phi_p$ .

### 3 One task: Improvement

In this section we briefly look at the case where the important task is improvement and development of the service rather than cost reductions. An example would be military procurement. In the development of a stealth fighter, cost reductions have not been in the forefront, the quality of the fighter appears much more important. The section provides part of the intuition for the results we obtain when there are two important tasks, cost reductions and improvements.

Effort is now directed at improving the service, we call such effort  $e_q$ . The effort materializes in plans for improvement, when they are implemented the resulting quality of the service is

$$Q(e_c) = Q_0 + e_q. \quad (24)$$

The effort cost for the service provider is  $(1/2)e_q^2$ . Retracing the steps of the analysis above the optimizing effort choice for the public manager is  $e_q = \phi_p/4$  and the principal's utility from inhouse provision, when he delegates to agency  $\phi_a$ , becomes

$$u_q^{in} = \phi_p \left( Q_0 + \frac{\phi_a}{4} \right) - \left( C_0 + \frac{1}{2} \left( \frac{\phi_a}{4} \right)^2 \right).$$

The first best choice of effort is  $e_q^* = \phi_p$  and the optimal delegation under inhouse provision is to an agency with  $\phi_a = 4\phi_p$ . When the principal out-sources, there will now be renegotiation with the firm, who owns the plans for improvement of the service.<sup>13</sup> The surplus is split and the optimizing

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<sup>13</sup>We assume that the firm will only implement the quality improvement if it gets its share of the surplus. Strictly speaking, the firm is indifferent between implementing the quality improvement or not. However, in reality this will most likely increase cost. At the cost of extra notation, this could have been introduced explicitly. For notational simplicity, we just assume that the firm, when indifferent, chooses not to implement the quality improvement.

effort choice for the firm is  $e_q = \phi_p/2$ . The outsourcing surplus is  $(5/32)\phi_p^2$ . Notice that this surplus is *increasing* in the principal's type, the reason is that the firm has stronger incentives to provide effort than the public manager and the extra effort is more valuable the more the principal cares about the quality. The utility for the principal when he delegates to agency  $\phi_a$ , who outsources is

$$u_q^o(\phi_p, \theta) = \phi_p \left( Q_0 + \frac{\phi_a}{2} \right) - \left( C_0 + \frac{1}{8}\phi_a^2 + \frac{\gamma}{32}5\phi_a^2 \right) \quad (25)$$

The outsourcing surplus is positive for all types of principals. The optimal agency maximizes (25) which gives

$$\phi_a = \frac{8}{4 + 5\gamma}\phi_p. \quad (26)$$

The optimal agency puts more weight on quality than the principal. The reason is the *incentive effect*, which now also enters in relation to the firm. When effort is directed at improving the service, there is renegotiation with the firm - just as with the public manager. The mechanism is similar to the one present with the public manager, by delegating to an agency with higher preference for quality, the principal gives the firm stronger incentives to effort, since the agency is more willing to pay for improvements in the renegotiation. This increased pay to the firm is again partly offset in the initial contracting, here the firm receives a price which covers the outside option, the effort cost - and unlike the public manager - also part of the surplus, depending on the degree of market power. Market power therefore mitigates the incentive effect. If there is no market power, the optimal agency puts double as much weight on quality as the principal, reflecting that the firm's incentive is only half of what it ideally should be. The more market power the firm has, the larger is the fraction it keeps of the outsourcing surplus. The principal responds by delegating to a more moderate agency.

## 4 Two tasks: Cost reduction and improvement

We now consider the case where the service provider has two tasks and directs effort on cost reductions,  $e_c$ , as well as development and improvement of the service,  $e_q$ . In this case, the quality of the service becomes

$$Q(e_c, e_q) = Q_0 + e_q - \theta e_c$$

For simplicity, we assume that the effort cost is separable in the tasks, equal to  $(1/2)e_c^2$  and  $(1/2)e_q^2$  respectively.

The general case represents a mixture of the two cases discussed above.

Retracing the steps above one finds<sup>14</sup> that the principal's utility from inhouse provision, when delegating to agency  $\phi_a$ , is

$$\begin{aligned} & \tilde{v}^{in}(\phi_a|\phi_p, \theta) \tag{27} \\ = & \begin{cases} \phi_p \left( Q_0 + \frac{\phi_a}{4} - \frac{1-\theta\phi_a}{4} \right) - \left( C_0 - \frac{1-\theta\phi_a}{4} + \frac{1}{2} \left( \frac{\phi_a}{4} \right)^2 + \frac{1}{2} \left( \frac{1-\theta\phi_a}{4} \right)^2 \right) & \text{if } \phi_a \leq \frac{1}{\theta}, \\ \phi_p \left( Q_0 + \frac{\phi_a}{4} \right) - \left( C_0 + \frac{1}{2} \left( \frac{\phi_a}{4} \right)^2 \right) & \text{if } \phi_a > \frac{1}{\theta}. \end{cases} \end{aligned}$$

The outsourcing surplus (between the principal and the firm) is

$$\tilde{\Omega}(\phi_p) = \begin{cases} \frac{1}{32} (5\phi_p^2 + (3 - 7\theta\phi_p)(\theta\phi_p + 3)) & \text{if } \phi_p \leq \frac{1}{\theta}, \\ \frac{5}{32}\phi_p^2 + \frac{1}{2}(1 - 2\theta\phi_p) & \text{if } \phi_p > \frac{1}{\theta}. \end{cases} \tag{28}$$

From the previous sections we know that when cost reductions are crucial, principals, who value quality less, outsource. When improvements are crucial, all types outsource, and the outsourcing surplus is higher the more the principal values quality. The two tasks, therefore, give different incentives and the results in the two-task case depend on how serious the quality deteriorating effects of cost reductions are as reflected in the parameter  $\theta$ , and how much the principal values quality as given by  $\phi_p$ . This is clearly reflected in (28). Furthermore, the expressions also show that if  $\phi_p$  is sufficiently high, then the outsourcing surplus is positive. In this case, there will be no cost reducing effort and the extra effort the private firm puts into improvements determines the result - essentially this is equivalent to the case where the only task is improvements.

We will here focus on the case, where the cost - quality trade off matters for agents who care much about quality, so that outsourcing is not always preferred. From (28) we have that this will be the case if  $\theta \geq \sqrt{5/7} \approx .85$  and  $\phi_p \leq (16\theta + 4\sqrt{16\theta^2 - 5})/5$ . The comparative statics of  $\theta$  are clear from the previous sections, so in order to simplify the expressions, we let  $\theta = 1$  in the sequel and restrict  $\phi_p$  such that  $\phi_p \leq (16 + 4\sqrt{16 - 5})/5 \approx 5$ .  
9. The outsourcing surplus  $\tilde{\Omega}$  is then positive for principals

$$\phi_p \leq \tilde{G} = \frac{3\sqrt{11} - 9}{2} \approx 0.4749,$$

and principal  $\phi_p$ 's utility, when agency  $\phi_a$  outsources, is

$$\begin{aligned} & \tilde{v}^{out}(\phi_a|\phi_p) \tag{29} \\ = & \phi_p \left( Q_0 + \frac{\phi_a}{2} - 1 \right) - \left( C_0 - \frac{1}{2} + \frac{1}{8}\phi_a^2 + \frac{\gamma}{32} (5\phi_a^2 + (\phi_a + 3)(3 - 7\phi_a)) \right). \end{aligned}$$

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<sup>14</sup>The calculations are by now straightforward, they are available on request from the authors. Since the effort cost is separable, the expressions in the general case are just the sum of the expressions of the single task cases and are thus easily obtained.

## 4.1 Mandatory inhouse provision

Under *mandatory inhouse provision* the principal chooses an agency which maximizes  $\tilde{v}^{in}(\phi_a|\phi, 1)$ . This directly gives

**Proposition 7** *Under mandatory inhouse provision, principal  $\phi_p$ 's preferred agency is given by*

$$\tilde{\phi}_a^{mi}(\phi_p) = \begin{cases} 0 & \text{if } \phi_p \leq \frac{3}{8}, \\ 4\phi_p - \frac{3}{2} & \text{if } \frac{3}{8} \leq \phi_p \leq 1, \\ 4\phi_p & \text{if } 1 < \phi_p. \end{cases} \quad (30)$$

The choice of agency under mandatory inhouse provision is governed by the *incentive effect* and takes into account incentives to perform both effort tasks. For  $\phi_p < 1/2$ , we have that  $\phi_a = 4\phi_p - 3/2 < \phi_p$ , so the preferred agency puts less weight on quality than the principal, while the opposite is true for  $\phi_p \geq 1/2$ . In both cases, it reflects *the incentive effect*: When  $\phi_p$  is low, the most important issue for the principal is cost reductions, and strong incentives for cost reductions are provided by choosing an agency with low  $\phi_a$ , just as is the case when cost reductions is the only task. When  $\phi_p > 1/2$ , on the other hand, the most important task is improvements and therefore an agency with high  $\phi_a$  is chosen, just as is the case when improvements is the only task. For high  $\phi_p$  ( $>1$ ) no effort will be spent on cost reductions and the optimal agency completely alleviates the incentive problem related to effort directed at improving the service.

Since the principal has to balance the incentives for both tasks, the optimal agency does not lead to first best effort levels. The first best choice of efforts are  $e_q = \phi_p$  and  $e_c = 1 - \phi_p$ , while for  $\phi_p \leq \frac{3}{8}$  the preferred agency's choice is  $e_q = \frac{0}{4} = 0$  and  $e_c = \frac{1-0}{4} = \frac{1}{4}$  and for  $\frac{3}{8} \leq \phi_p \leq 1$ , they are  $e_q = \frac{\phi_a}{4} = \frac{4\phi_p - \frac{3}{2}}{4} = \phi_p - \frac{3}{8}$  and  $e_c = \frac{1 - (4\phi_p - \frac{3}{2})}{4} = \frac{5}{8} - \phi_p$ .

### 4.1.1 Arm's length delgation

Under Arm's length delegation, we get the following Proposition by using (27) and (29)

**Proposition 8** *Principal  $\phi_p$ 's preferred agency  $\phi_a$  under arm's length delegation and the outsourcing decision is given by:*

$$\tilde{\phi}_a^{al}(\phi_p) = \begin{cases} \frac{8\phi_p + 9\gamma}{4 - 2\gamma} & \text{if } 0 \leq \phi_p \leq \frac{1}{2}\tilde{G} - \frac{3\sqrt{11}}{8}\gamma & \text{outsourcing,} \\ \tilde{G} & \text{if } \frac{1}{2}\tilde{G} - \frac{3\sqrt{11}}{8}\gamma \leq \phi_p \leq \tilde{G} & \text{outsourcing,} \\ \tilde{G} & \text{if } \tilde{G} \leq \phi_p \leq \frac{1}{4}\tilde{G} + \frac{3}{8} & \text{inhouse,} \\ 4\phi_p - \frac{3}{2} & \text{if } \frac{1}{4}\tilde{G} + \frac{3}{8} \leq \phi_p \leq \frac{5}{2} & \text{inhouse,} \\ 4\phi_p & \text{if } \frac{5}{2} \leq \phi_p \leq \frac{16 + 4\sqrt{16-5}}{5} & \text{inhouse.} \end{cases}$$

As when cost reductions is the only task, principals who care less about quality prefer outsourcing, while principals who care much about quality prefers inhouse provision. Since the provider will also spend effort at improvements, principals, who care very little about quality, do not prefer agencies, who are at the brink at choosing inhouse provision. Although such agencies are optimal with respect to the *bargaining effect*, they will, through the *incentive effect*, induce the firm to perform too much quality enhancing effort and the principal will have to pay for this through the price. The principal is not interested in that. A low  $\phi_p$  principal therefore realizes that the *bargaining* and the *incentive effects* work in different directions, and he modifies the choice of agent, to reduce the effort spent on quality. The flip side of the coin is that this leaves some surplus to the firm. The higher is market power,  $\gamma$ , the more important is *the bargaining effect*, and the higher  $\phi_a$  he therefore chooses. When  $\phi_p$  is close to but still smaller than  $\tilde{G}$ , the principal's choice of agent is governed by the interest in reaping all surplus and the preferred agent has  $\phi_a = \tilde{G}$ .

For larger  $\phi_p \geq \tilde{G}$ , the principal prefers inhouse provision. As we have seen above, when  $\phi_p$  is close to  $\tilde{G}$ , the principal is constrained in his choice of  $\phi_a$  by the consideration that the agent should not prefer outsourcing, therefore the optimal choice is  $\phi_a = \tilde{G}$ . For larger  $\phi_p$ , this is not so and the results are as under mandatory inhouse provision.

As previously, the outsourcing decision is not affected by *arm's length delegation*. Whether the principal decides himself or delegates the outsourcing decision to the agency, outsourcing results if and only if  $\phi_p < \tilde{G}(\theta)$ .

The preferred agency is increasing in the principal's type. Hence, if we interpret principals as voters, the median voter's preferred agency is a Condorcet winner.

## 4.2 Partial delegation

Recall that under *partial delegation* the principal first decides on outsourcing and then chooses an agency. If he chooses to outsource, he concludes the contract with the private firm before leaving the renegotiation to the agency ( $\phi_a$ ). In this case the firm's effort choice is  $e_c = 1$  and  $e_q = \phi_a/2$ . The surplus between the agency and the firm from implementing the quality improvement is  $\phi_a\phi_a/2$ , which they split. The utilities to the firm,  $\tilde{u}^f$ , and the principal,  $\tilde{u}^o$ , are therefore

$$\tilde{u}^f = p_0 + \frac{1}{8}\phi_a^2 - C_0 + \frac{1}{2} \text{ and } \tilde{u}^o = \phi_p \left( Q_0 + \frac{1}{2}\phi_a - 1 \right) - \frac{1}{4}\phi_a^2 - p_0.$$

When the principal chooses agency, the outsourcing price  $p_0$  is given and the optimal choice of agent maximizes  $\tilde{u}^o$  for given  $p_0$ . This gives

$$\phi_a = \phi_p.$$

Notice that the principal wishes to delegate to a type, who has the same preferences as himself. We could also interpret this as he prefers not to delegate the decision. Unlike under arm's length outsourcing, the price,  $p_0$ , is given at the time of the delegation. The principal can therefore not factor in that a higher renegotiation surplus to the firm is offset through a lower initial price, as it is under arm's length delegation. Hence the *incentive effect* is not present and the optimal agency has the same preferences as the principal.

From equation (20) we know that if the principal chooses inhouse provision and  $\phi_p \leq 3/8$  then  $\phi_a = 0$  and the effort levels are  $e_q = 0$  and  $e_c = 1$ . The utility to the principal in this case is

$$v^{in}(0|\phi_p, \theta) = \phi_p \left( Q_0 - \frac{1}{4} \right) - C_0 + \frac{7}{32}.$$

The outsourcing surplus is therefore

$$\tilde{\Omega}(\phi_p, \theta) = (\tilde{u}^o + \tilde{u}^f) - (v^{in}(0|\phi_p, \theta) + 0) = \frac{3}{32} (2\phi_p - 1) (2\phi_p - 3),$$

which is positive for all  $\phi_p \leq 1/2$ . Hence all types  $\phi_p \leq 3/8$  outsource. If  $3/8 \leq \phi_p \leq 1$ , equation (20) gives that the optimal agency under inhouse provision is  $\phi_a = 4\phi_p - 3/2$ .

Hence, the outsourcing surplus is

$$\tilde{\Omega}(\phi_p, \theta) = (\tilde{u}^o + \tilde{u}^f) - \left( v^{in} \left( \left( 4\phi_p - \frac{3}{2} \right) |\phi_p, \theta \right) + 0 \right) = \frac{1}{64} (9 - 40\phi_p^2).$$

This yields:<sup>15</sup>

**Proposition 9** *Under partial delegation, the principal chooses outsourcing if and only if*

$$\phi_p \leq \tilde{H} = \frac{3}{2\sqrt{10}} \approx 0.4743.$$

*If outsourcing is chosen, the principal prefers an agency of his own type. If inhouse provision is chosen, the principal prefers an agency of type  $\tilde{\phi}_a^{mi}(\phi_p)$  as given in (30).*

### 4.3 Effort, efficiency and incentives in the dual task case.

We are now ready to provide some intuitive comparison of the various provision modes for the dual task case. Figure 3 through 5 shows effort levels, net surplus and the principal's pay off for each of the different modes. The figures are drawn for parameter values:  $\theta = 1$ ,  $Q_0 = 4$ ,  $C_0 = 1$  and  $\gamma = 0.5$ . We

<sup>15</sup>It is straightforward to check that inhouse provision is also preferred for  $\phi_p > 1$ .

notice that we have marginally more outsourcing under partial delegation than under arm's length or no delegation ( $\tilde{H} \approx 0.4743 < 0.4749 \approx \tilde{G}$ ). However, the difference is almost non-existent. Thus, to improve the readability of the figures we have oppressed the ticks for the  $\tilde{H}$  condition, which is overlapping with the  $\tilde{G}$  condition.

Part A in Figure 3 shows how investment in quality differs across the different modes of service provision. First best effort,  $e_q^* = \phi_p$ , is given by the solid grey line. The solid black line yields the no delegation outcome. Notice it increase with half the pace than first best until  $\phi_p = \tilde{G}$ . At this point the principal decides to produce the service inhouse, which implies a drop in quality investment and that for higher  $\phi_p$  the quality investment only increases with 1/4 of the pace that first best quality investment does. This reflects that outsourcing provides better incentives for investment in quality than inhouse provision; however, both modes provides too few incentives compared to first best. *Arm's length delegation* is pictured by the dashed black line in the figure. Notice that by delegating to a higher type under both outsourcing and inhouse provision, the private firm and the public manager will have significant higher incentives for investment in quality. Under inhouse provision there is lower quality investment but it does increase with the same pace as the first best quality investment. When the service is outsourced we notice that there will be an inefficient high level of quality investment relative to first best. This may seem odd from a first perspective, because it does not affect the investment in cost reduction. However, the principal prefers this because it gets a tougher negotiator with the private firm implying that the service is delivered at a lower price from the private company. The cost of this is a distortion in quality investment. Finally, *partial delegation* is the dotted line that combines no delegation under outsourcing where the principal - due to the absence of the bargaining effect - prefers not to delegate and arm's length delegation under inhouse provision where the presence of the incentive effect provides incentives to delegate.

Part B of Figure 3 provides the reverse picture with respect to investment in cost reduction. Again the downward sloping grey line is the first best investment in cost reduction, i.e.  $e_c^* = (1 - \phi_p)$ . Remember that any private firm will choose  $e_c^* = 1$ , thus we see that there is too much cost reduction under private service production. All alternative provisions modes provide too few incentives for cost reduction under inhouse provision. Notice, however, that when delegation is possible, the principal chooses to lower incentives to cost reduction even further because this raises incentives to quality improvement.

Figure 4 pictures the net surplus derived from the service provision. Again the first best net surplus is the grey curve at the top of the figure. No delegation (black line) approaches first best for principal who does not care about quality. However, the more the principal cares about quality the larger is the reduction in net surplus due to few incentives for quality investment

and too large incentives for cost reduction under private provision. When the service is produced inhouse, the inefficiency of no delegation increases mainly due to too few incentives for quality improvement. A similar picture is shown when the principal delegates with two noteworthy exceptions: First, the tradeoff between a cheaper price for the service and a distortion in quality investment under outsourcing implies that *arm's length delegation* generates lower net surplus than partial delegation or no delegation for very low  $\phi_p$ 's. The reason is that the price discount generated by the principal's choice does not show up in the net surplus, since this is a redistribution from the private firm to the public sector. Second, *arm's length* and *partial delegation* generate significantly more net surplus than no delegation when quality is crucial, i.e. for high  $\phi_p$ 's. The figure, therefore, suggests the empirical implication, that delegation provides a strong welfare improvement for public services that are clearly best provided inhouse.

Figure 5 illustrates the government's pay off from the service provision given the optimal delegation policy in Propositions 8 and 9. Relative to no delegation, it is not surprising that the principal can do better for any  $\phi_p \neq \tilde{G}$  by either *arm's length* or *partial delegation*. It is more interesting to notice that the principal is strictly better off for small values of  $\phi_p$ . In this area we saw in Figure 4 that net surplus generated through delegation were lower than net surplus generated through no delegation. Again this confirms the intuition provided above. The government distorts incentives for quality investment to obtain a lower price for the service when it is outsourced.

## 5 Conclusion

Most public service provision is done in environments where it is difficult to contract upon on all future contingences. This paper has identified two core effects - the *incentives* and the *bargaining* effects - that makes delegation of decision authority a powerful policy instrument in managing public service provision: First by delegating the right to renegotiate to an agent that cares less about quality to increase the public manager *incentives* to be more focused on reducing cost. Second, by delegating the right to outsource to an agency that is indifferent between provision modes, the *bargaining* power of the private firm is lowered implying that delegation can reduce the price of private provision of public service.

The analysis generated a number of empirical relevant implications: First, the decision to outsource does not depend on the degree of competition among private service providers. If there is a joint surplus from outsourcing the outsourcing price shall be adjusted such that outsourcing takes place. Second, we identified two ways of delegating the outsourcing decision - *arm's length* and *partial* delegation. Both types of delegation create more efficient resource allocation than no delegation. Third, *partial*

delegation is better at creating efficiency when service is produced inhouse.

Delegation is an efficient tool in providing better public service; however, our analysis also highlights the limitation of delegation in mitigating more generally allocation distortions due to contractual incompleteness. There are two necessary conditions for delegation to work: First, delegation will increase the incentive part of a public or private manager's remuneration and, therefore, leave him or her with a larger stake in the post contractual renegotiation process. The government must be able to foresee this and make a proportional reduction in the base remuneration, whether it be the public manager's wage or the service price under private provision. Second, the premise for delegation is that there exist sufficiently heterogenous preferences in the population over issues which are non contractible. We believe this is a natural assumption in the context of the quality of public service provision such as primary health care, military operation or public transportation. the. However, we acknowledge that this is not the case in other areas, such as financial contracting, where contractual incompletenesses have shown to be important.

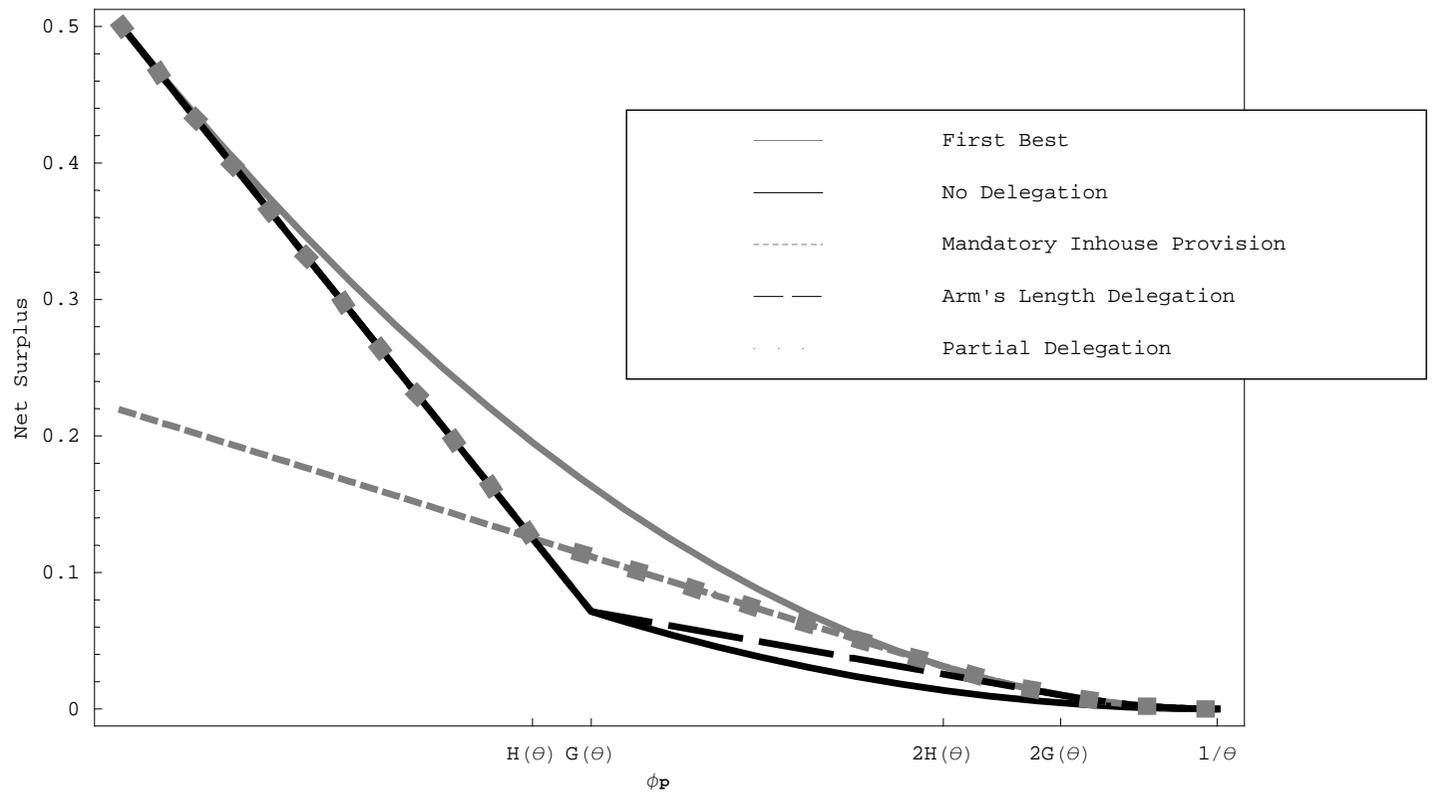
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**Figure 1: Efficiency (One Task: Cost Reduction).**



**Figure 2: Incentives (One Task: Cost Reduction).**

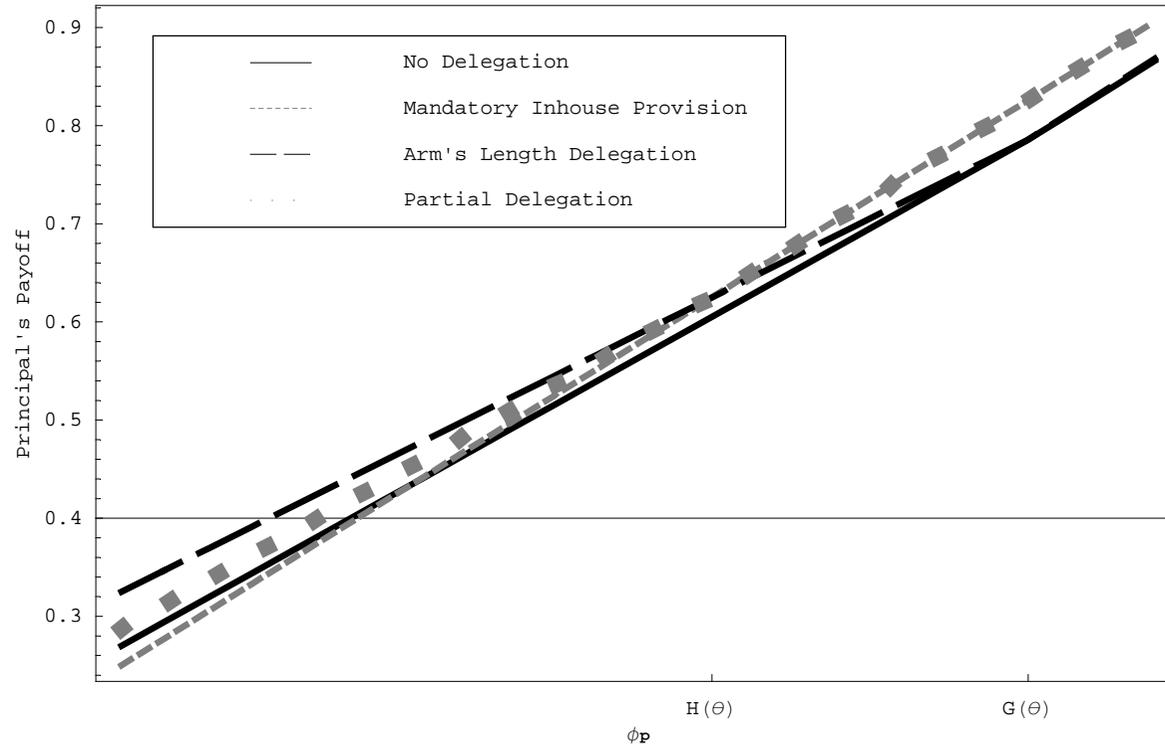


Figure 3a: Quality Improving Effort.

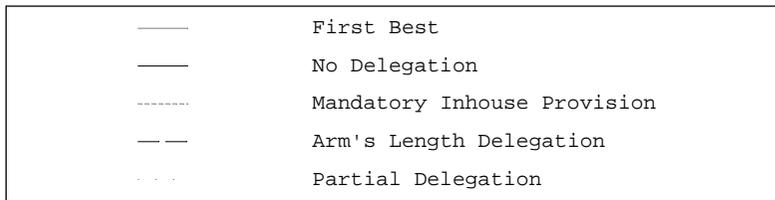
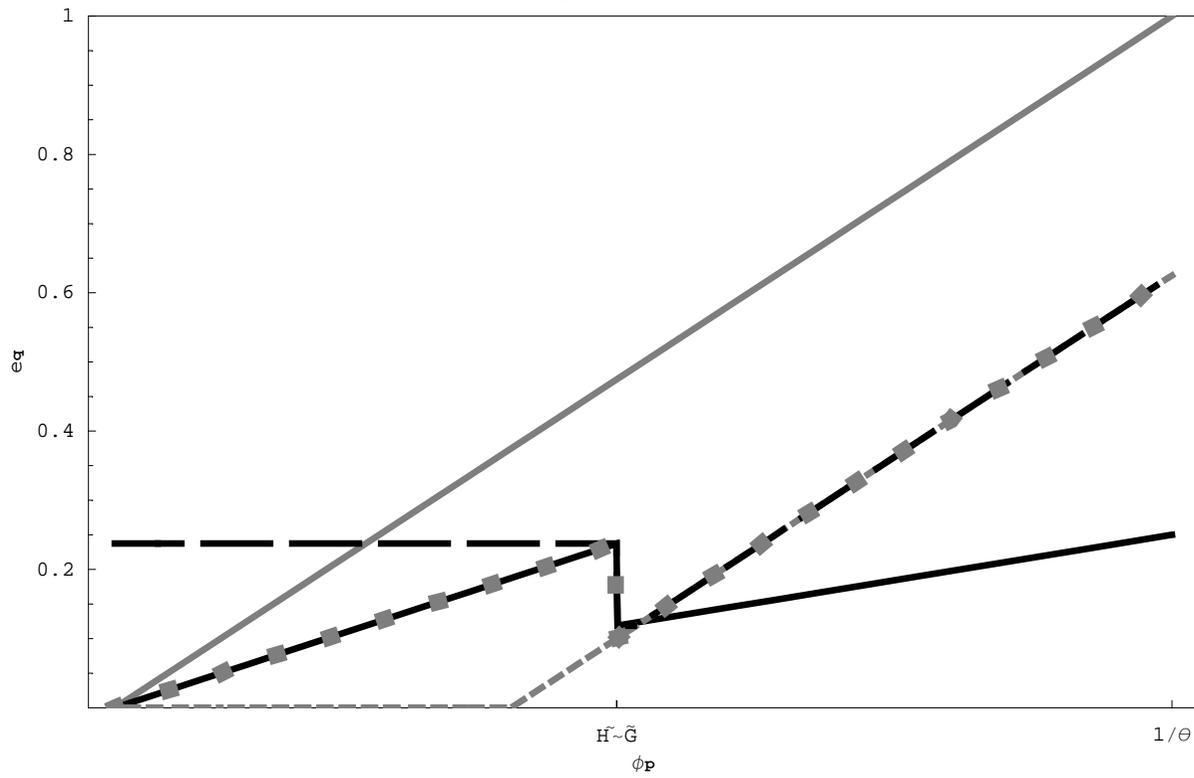
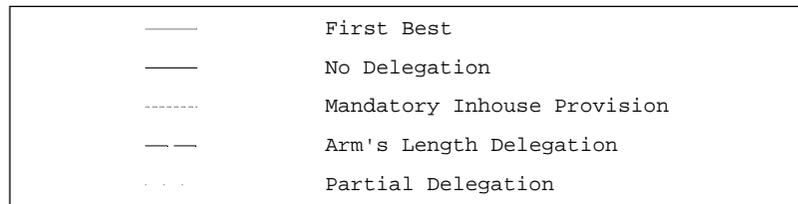
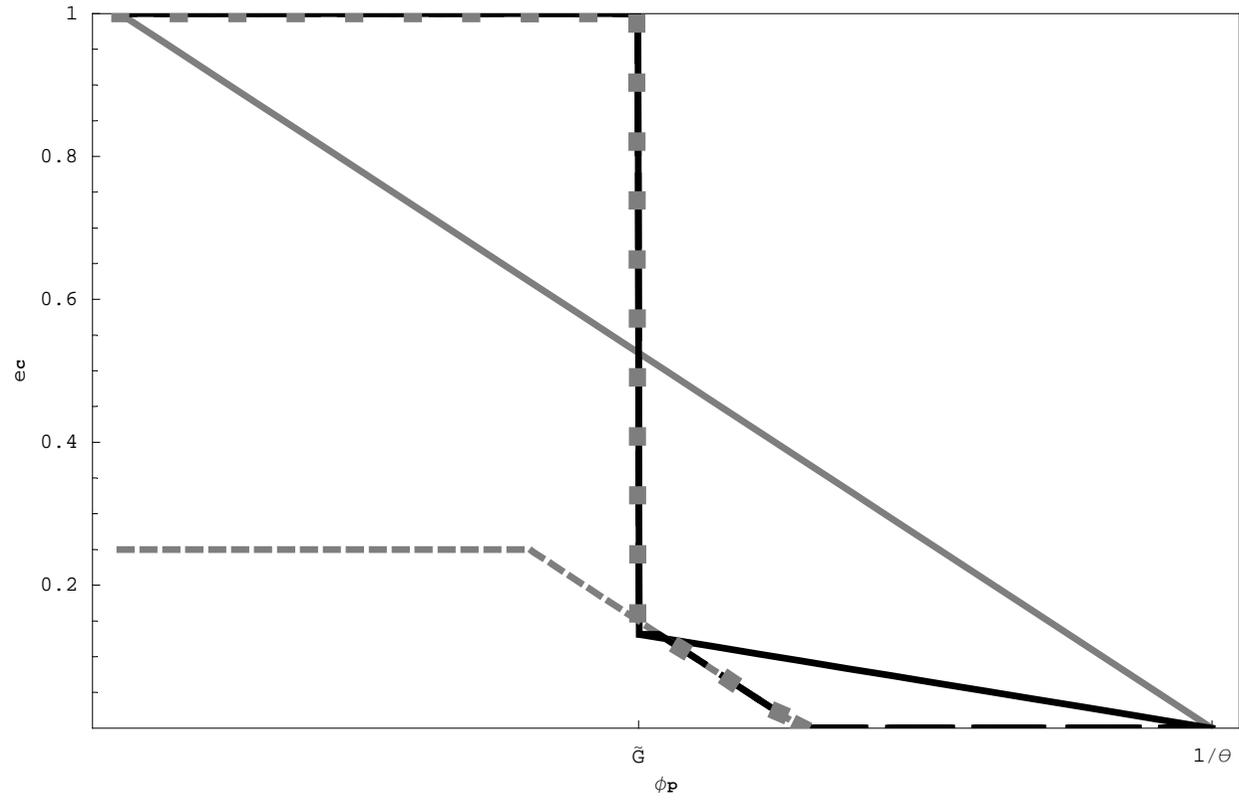
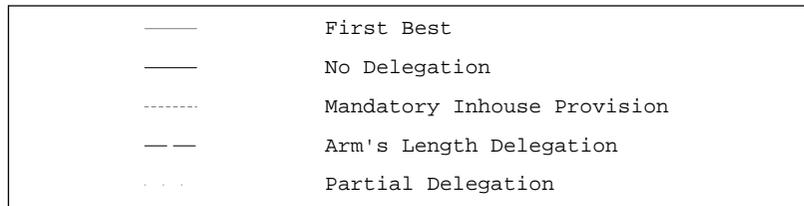
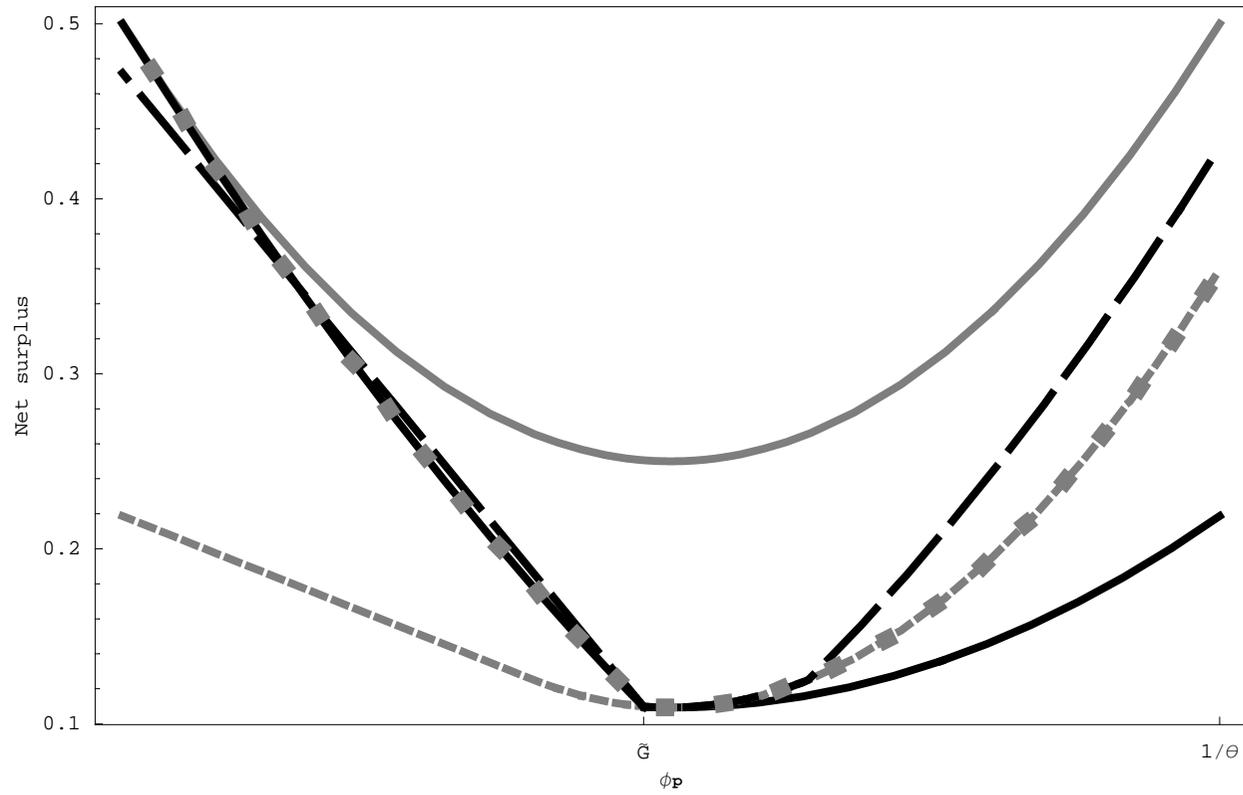


Figure 3b: Cost Reducing Effort.



**Figure 4: Efficiency (Two Tasks: Quality Improvement and Cost Reduction).**



**Figure 5: Incentives (Two Tasks: Quality Improvement and Cost Reduction).**

