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We analyze the economic consequences of strategic delegation of the right to decide between public or private provision of governmental service and/or the authority to negotiate and renegotiate with the chosen service provider. Our model encompass both bureaucratic delegation from a government to a privatization agency and electoral delegation from voters to a government. We identify two powerfull effects of delegation when contracts are incomplete: The *incentive effect* increases the incentive part of service providers' remuneration and we show that strategic delegation may substitute formal incentive contracts. The *bargaining effect* improves the bargaining position vis a vis a private firm with market power and leads to a lower price for the service.

Keywords: Outsourcing, Strategic Delegation, Incentives, Incomplete Contracting, Market Power, Representative Democracy.
JEL: D72, L33, L97

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1 Introduction

Governments should provide high quality services and charge low taxes. In the last decades outsourcing has been widely used as an instrument to reduce costs and boost the budget of both local and central governments (see surveys by World Bank 1995, Shleifer 1998, and Megginson and Netter 2001). Most public service provision is done in environments where it is difficult to contract upon all contingencies. In this paper we focus on how ressource allocation can be improved by delegating the outsourcing decision to politically motivated agencies.

While outsourcing often reduces costs, it is less obvious how it 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 combat service, where it is difficult to describe, monitor and contract upon quality, the choice of service provision often involves a trade off between cost and quality.

In the present paper, we consider the case where there is a non-trivial trade-off between cost and quality and investigate the economic implications of delegating the authority to take the make-or-buy decision and/or to contract and negotiate with public and private service providers. We consider a simple framework where a *principal* delegates the decision and contracting rights to a politically motivated *agency*. Our model is broad enough to cover both the case of a national or local government that delegates to a bureaucratic agency, a department minister, or a politically motivated NGO, and the case of representative democracy where voters elect a politician to decide on the service provision. We show that delegation is a powerful instrument to provide public and private service providers with better incentives and to counter private market power. Ultimately our model sheeds new light on fundamental issues like optimal provision of public service, distortion in ressource allocation under incomplete contracting and the advantages of representative democracy.

We build on the incomplete contracting framework of Hart, Shleifer and Vishny (1997) where a government faces a cost-quality trade off when it chooses between contracting with a public or a private service provider. In both cases contracts are incomplete and the service provider's

incentives are indirect and come through renegotiation of the contract. The incentives are therefore in general not optimal and typically stronger (for good and bad) in the private sector. We extend this framework by endogenizing the outsourcing price; including market power; and, rational market determined managerial wage formation. However, the main premise of our analysis - and therefore the main departure from the HSV97 setting - is that we assume that agents are heterogenous and value the quality of the public service differently.

The principal's dual objective is to have high quality service at a low cost. We identify two effects, which make delegation a powerful tool to achieve these goals. The first effect is *the incentive effect* pertaining to renegotiation of the contract with the service provider. Assume that the principal finds that inhouse provision leads to excessive costs, since the public manager has insufficient incentives to put effort into reducing cost. Then the principal can delegate the contract renegotiation to an agency who cares less about the adverse impact on quality. The agency will be willing to pay the public manager more for implementing cost reductions. The public manager's incentive to spend effort on cost reductions is increased in this way, and so is the payment, he receives in the renegotiation. However, when his base wage is negotiated initially, the outcome of the renegotiation is foreseen and the principal will make savings on the manager's base wage since the manager's total pay reflects the outside option the maket for managers offers. *The incentive effect* of delegation, therefore, effectively shifts part of the fixed salary towards incentive based pay. Hence, *delegation essentially substitutes for an explicit incentive contract.*[1] Notice, that the effect depends both on the agency's higher willingness to pay and the fact that the total pay of the manager reflects the outside options the market offers

[1] The following numeric example illustrates the incentive effect: Assume a principal, P, hires a manager, M, to provide an inhouse service at a fix wage 8. M can invest (non-contractible) at a private cost of 3. P's value of the service is 14 with the investment and 10 without. With an equal split of the renegotiation surplus, M receives only 2 after investing. Thus, M does not invest.

Imagine P delegates the decision to negotiate with M to an agency, A, that cares more about the investment. Assume A's value is 20 with the investment and 10 without. Post-renegotiation now provides M a compensation of 5 implying that M invests.

With a fixed base salary of 8, P - who pays all the costs - will not delegate since the total cost of 13 (i.e. $8+5$) leaves her with a surplus of 1. Without delegation there is no investment and P ends up with a surplus of 2. However, rational parties foresee the renegotiation process and A will under delegation offer M a lower base salary of 6 equal to the original base salary (8) plus cost of investment (3) minus expected outcome of renegotiation (5). Hence, given rational wage setting and delegation, P ends up with a surplus of $14-6-5=3$ which exceeds the surplus of 2 from not delegating. The incentive effect of delegation effectively induces stronger incentives through increasing the incentive part of a public manager's compensation.

him.

The second effect is the *bargaining effect* reflecting that delegation may counter private market power. Assume that the principal prefers outsourcing because she focuses more on cost cutting than on quality. Then inhouse provision is not a real threat in the negotiation with a private firm, 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.[2]

We trace the implications of these two effects in four different cases of delegation and compare it to our benchmark case of *no delegation*, where the principal keeps all decision power. The delegation cases are: *mandatory inhouse provision*, where service has to be provided inhouse by a governmental service provider and contracting powers are delegated to an agency; *arm's length delegation*, where both the outsourcing decision and the contracting authority are delegated; *partial delegation*, where the principal chooses the type of service provider but delegates the contract and negotiation powers; and, finally, *double delegation,* where each decision is delegated to different independent agencies. The different modes have different virtues but they also represent different institutions. For instance, inhouse provision is mandatory for police services in most countries. Local or regional elections of mayors where outsourcing is a salient issue correspond to arm's length delegation and so does the case where decisions are delegated to a department minister with full powers or an NGO.

We first focus on the important basic case where cost reductions constitute the overwhelming motive and the important trade off related to outsourcing is that costs are lowered but so is

[2] The following numerical example illustrates the bargaining effect: A given service is worth 15 to P and can be provided at cost 10 by a public service provider or at cost 4 by a private. The public manager delivers service at a higher quality and let $\Delta q > 0$ be the difference. Assume P does not care about the quality. Then P will choose the private firm and pay 7 for the service, if prices are determined through an equal split of bargaining surplus. However, assume that P delegates the outsourcing decision to an agency A that values Δq slightly less than 6. A prefers inhouse if the private service provider demands a price (slightly) higher than 4 and the private firm thus offers the service at this price. Hence, the bargaining effect of delegation secures that P gets her prefered mode of service provision at a lower price.

quality. This highlights the power of the *incentive* and *bargaining effects* in an illustrative way, since there is no incentive effect under private service provision in this case. The *bargaining effect* makes arm's length delegation better than partial delegation for the principal, when she prefers outsourcing. When the principal cares more about quality and prefers inhouse provision, arm's length delegation is still better than no delegation, but may involve the problem that the preferred type of agency for dealing with the public manager prefers outsourcing. Partial delegation is therefore better in some cases. When the preferred agency prefers inhouse provision itself, partial and arm's length delegation are equally good for the principal as they both induce the *incentive effect*.

In the political interpretation of *arm's length delegation* where the principal is the median voter of the electorate and the agency the elected politician, these results imply that representative democracy is better for the median voter than direct democracy. However, we wil show conditions for when limiting the politicians' powers (i.e. *partial delegation*) generates even more welfare.

The principal does not completely internalize the effort cost of the service provider and if she were to choose the mode of provision it would not necessarily be the socially best. From an efficiency perspective, we show that delegation dominates non-delegation and partial delegation is weakly better than any other mode of provision except double delegation.[3]

When quality is the overwhelmingly important objective, the stronger incentives in the private sector make outsourcing optimal for any type of principal. In this case the *incentive effect* is present under both public and private service provision. 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 delegation from the cost-reduction case bear over to this more general case.

[3] *Double delegation* can mimick *arm's length delegation* (by delegating both decisions to the same type) and *partial delegation* (by delegating the outsourcing decision to a type identical to the principal). Thus, double delegation is always weakly better for the principal than the other two delegation modes. We are not aware of any practical examples of double delegation; hence, we include this case as a theoretical exercise that can be used as an upper benchmark for the other types of delegation.

More generally, our results shed light upon the scope of delegation as a remedy to mitigate incentive problems due to incomplete contracting. The analysis is based on two essential premises: First, delegation requires the existence of heterogenous preferences. 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 necessarily the case in other areas where incomplete contracting has proven to be important.[4] Second, optimal delegation may require a talented agent with so extreme preferences that it can be hard to find. Hence, whereas our analysis indicates that strategic delegation is powerful in public service provision, we do not claim that it can solve all allocation inefficiencies 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 Bennedsen (1999)) and incomplete contracting (Hart, Shleifer and Vishny, 1997). Besley and Ghatak (2001) studies optimal ownership structures among two parties that both care about and invest in public projects. They show that ownership shall be allocated to the part that cares most about the project and apply this insight to the studies of NGO ownership of public goods.[5]

All these studies focus on the normative consequences of public and private ownership; however, they do not provide strong positive 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 a number of recent theoretical contributions: Debande and Friebel (2004) analyze why govern-

[4]For instance, we conjecture that delegation is less efficient in improving resource allocation in financial contracting, since there is less heterogeneity in individuals' valuation of monetary outcomes.

[5]In Besley and Ghatak's analysis a government under inhouse provision always chooses the right investment level seen from the government's perspektive but ignore the external effect on the NGO's utility. In our model - as in HSV97 - there is no payoff externality; however, the government cannot - without delegation - implement the optimal investment levels due to that public managers have too weak incentives.

ments engage in mass privatization; Börner (2006) studies why governments implement political reforms; and, Ellman (2006) focusses on when a government's loss of control reduces its responsiveness to public opinion which can reduce the public's political involvement. We depart from all these studies by analyzing how strategic delegation improves the government's position in pre and post contractual bargaining situations.[6]

Empirical studies of privatization has to a large extent 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), and the survey by Megginson and Netter (1999)). A growing number of studies address explicitly the determinants of local government's make-or-buy decision. Lopez de Silanaes et.al. (1997) documents the existence of important political motives that affect the make-or-buy decision at the county level in US. Brown and Potoski (2003) and Levin and Tadelis (2005) show the importance of transaction costs in contracting when local governments decide on outsourcing or inhouse provision of public services. The latter study explicitly develops a measure contracting difficulty and shows that it is strongly correlated with keeping service provision inhouse in US municipalities.

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) analyzes 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)

[6] Our paper is also related to the large literature on central bank independency following Rogoff (1985). The focus in central bank delegation is on the ability to commit to a certain future policy.

discusses the quality effects of private provision of primary health service.[7]

The structure of the paper is as follows: In Section 2 we focus on non contractible investment in cost saving having 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 four types of delegation: mandatory inhouse provision, arm's length, partial and double 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 involve a classic trade off: When the total cost of producing the service is reduced so is 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 endogenizing managerial wage formation and 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 ressource allocation. Finally, we investigate the welfare consequences of delegation.

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 - performs cost reducing effort, e_c, at a private cost of $\frac{1}{2}e_c^2$. The effort results in plans, which may or may not be implemented. Effort is observable by both parties but non-contractible[8]. The total costs

[7] 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.

[8] 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).

of producing the service consists of renumeration 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

$$C(e_c) = C_0 - e_c. \tag{1}$$

If the principal produces inhouse, she bears the total costs consisting of $C(e_c)$ plus renumeration 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

$$Q(e_c) = Q_0 - \theta e_c. \tag{2}$$

The deterioation 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 $\theta \geq 0$. 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

$$V(Q, Y) = \phi_p Q - Y \tag{3}$$

where $\phi_p \geq 0$ is the weight the principal puts on quality.

The gross gain from investing in cost reduction is

$$s(e_c, \phi_p, \theta) = \left(1 - \theta\phi_p\right) e_c. \tag{4}$$

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

2.1 No delegation

We first consider the base line case, where neither authority to decide on outsourcing and perform the initial contracting nor the authority to renegotiate 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. When hired, the manager spends effort, e_c, resulting in plans. With

total income I, and effort level, e_c, his utility is

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

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.[9]

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

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

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.[10] Therefore the manager's wage fulfills

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

[9] That exactly half of the gross gains can be recouped is inessential for the qualitative results, but it simplifies formulas nicely.

[10] Hart, Shleifer and Vishny 1997 assume that the public manager receives a fixed wage weakly larger than his outside option. Hence, the government does not foresee the renegotiation implying that the manager ends up with a total compensation strictly larger than his outside option. We believe that a rational government recognizes that it can lower the fixed part of the manager's remuneration below the relevant reservation wage, because both manager and government 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 catagorize such actions as corruption.

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

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

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

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

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,

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

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

$$e_c^*\left(\phi_p, \theta\right) = 1 - \theta\phi_p \tag{10}$$

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 conclude 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 non-contracteble effort, e_c which results in plans for cost reduction. At this point, 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 $\phi_p\theta < 1$, then although the principal is hurt, she 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

$$e_c^o = 1. \tag{11}$$

If, on the other hand, $1 < \phi_p\theta$, then the quality reduction hurts the principal so much that she 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

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

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

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

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 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.[11] 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

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

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

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

We will assume that the parties split the surplus, so that the firm's share is γ (and the principal's share is $(1-\gamma)$). Thus γ 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.

The principal's utility from outsourcing is therefore

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

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

[11] 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 who do not coordinate their bids.

Proposition 1 *Under no delegation, a principal of type ϕ_p outsources if and only if*

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

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 quality, to outsource, while principals who care more for quality, tend to choose inhouse production. The higher is θ, the more severe is the trade-off and the smaller is the cut-off value of ϕ_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* - γ 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.

The outsourcing price, p_0, is determined such that the firm receives the fraction γ of the outsourcing surplus, Ω. The surplus, and therefore also the price, depends on the principal's preference for quality. Using (8), (14) and (15), we find the principal's utility from outsourcing:

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

Using (12) we find that the price equals

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

which decreases in ϕ_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. The principal's preferences for quality has a *price effect*.

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

quality so much, that she 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 $\gamma\Omega\left(\phi_p, \theta\right)$ is zero - indendently of the market structure, γ. This is true even when the private firm is a monopolist.

2.2 Delegation

The benchmark analysis above showed that when incentives and bargaining outcomes are determined through renegotiation, the public manager's effort choice and the outsourcing price do depend on the principal's preferences. Hence, if a principal could "misrepresent" her preferences, she may be able to obtain less distortion in ressource allocation and/or a better price of the service. One effective way to acheive such strategic misrepresentation is to delegate the authority to outsource and the responsibility of contract negotiation to an independent agency.

There are multiple decisions involved in contracting and negotiating with private and public service providers; thus, in theory there are multiple decisions that can be delegated independently of each other and to independent agencies. To structure the following analysis we divide all decisions into two categories: First, the *outsourcing-decision* covers the decision to choose between a private or a public service provider, and, second, the *contract and negotiation* decision covers responsibility to hire, contract and negotiate with the service provider after the form of provision has been decided. Each of these decisions can be decided by the principal or delegated to an agency.

We categorize the four possible cases as follows: Under *Mandatory inhouse provision* outsourcing is not an option and the principal delegates the contract and negotiation decision to an independent agency. Under *Arms' length delegation* the principal delegates both the outsourcing and the contract and negotiation decisions to *one* independent agency. Under *Partial delegation* the principal delegates the contract and negotiation decision to an independent agency but does not delegate the outsourcing decision. Finally, *double delegation,* is the most advanced form of delegation where the two decisions are delegated to *two* independent agencies.

In the following, we investigate how each of these delegation modes affects incentives to outsource and the cost and quality levels of the delivered service. The principal can choose among agencies, who also are politically motivated and care about the quality and the cost of

the delivered service. As before principal ϕ_p values quality with the parameter ϕ_p. The agency is chosen from a group of potential agencies, whose preferences for the quality, characterized by ϕ_a, differ. We will assume that the population is sufficiently heterogeneous that for any positive ϕ_a it is possible to find an agency with ϕ_a. We exclude the possibility of negative ϕ_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 *department minister* with independent powers or a politically motivated NGO.

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 or health services are topical issues. The group of voters in the election are principals and the median voter (characterized by ϕ_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.[12] The median voter then elects a government with preferences characterized by ϕ_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. primary school provision, hospital service or elderly care in a country where the law prescribes that municipalities must provide inhouse provision of such service. Principal $\phi_p's$ utility when agency ϕ_a chooses inhouse

[12] As is seen below, the median voter is well-defined.

provision is

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

which gives

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

for $\phi_a<1/\theta$ and $\phi_pQ_0-C_0$ otherwise. The principal's preferred agency maximizes $v^{in}\left(\phi_a|\phi_p,\theta\right)$ among all agencies $\phi_a\geq 0$.[13] This gives

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

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

The Proposition reflects that the principal takes advantage of the *incentive effect* of delegation. When the principal chooses agency, she 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

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

When the public manager renegotiates with the agency, the surplus from cost reductions is 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, she 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

[13] Here and in the sequel, it is straightforward to check that the second order condition for maximum is fulfilled.

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.[14]

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

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

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 ϕ_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 powerfull instrument; however, as discussed in the introduction 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 capable of negotiating with the service provider 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. This is a natural assumption in the context a local bus route, an elderly home or other kind of public service. However, incomplete contracting has also proved to be an important modelling tool in areas where such variation is not present (see Hart 1995), which limits the ability of delegation to circumvent ressource allocation inefficiencies.

[14] Notice, it is crucial for delegation to work that the renegotiation outcome is foreseen at the time of the initial contracting with the service provider. As noticed above this is the main difference between our approach and the HSV97 analysis. In their framework, delegation would not improve ressource allocation because the service providers renumeration does not include the expected pay from renegotiation. Whereas delegation could improve incentives in their analysis it would be too costly for the principal and she will choose not to delegate as illustrated in the example in footnote (1).

2.2.2 Arm's Length Delegation

As discussed in the Introduction, delegation can be an institutional choice as in the case of representative democracy, where voters delegate to an elected politician. However, it can also be the only feasible arrangement, since political leaderships necessarily have to delegate many tasks to subordinates, including the authority to decide on some service provision tasks. To cover these settings, we begin with the case where the principal delegates to an agency, who both decides on the mode of service provision and is responsible for hiring and negotiating with the service provider.

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.[15]

Principal $\phi_p's$ utility when agency ϕ_a outsources is

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

and the most preferred agency maximizes this among those who outsource. The most preferred among those who prefer inhouse provision maximizes $v^{in}\left(\phi_a|\phi_p,\theta\right)$ (as given in (19)). Straightforward maxization 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, $\phi_a^{al}\left(\phi_p,\theta\right)$, and the outsourcing decision is given by:*

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

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

[15] An agency with $\phi_a = G(\theta)$ is indifferent between inhouse provision and outsourcing. We assume that in this case the agency chooses the principal's 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 ε is vanishingly small.

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 negligble (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 delegate 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 lenght delegation does not change the outsourcing decision: Principals delegate to an agency, who makes the same decision on outsourcing as the principal would herself. The reason is that the *bargaining effect* and the *incentive effect* partly offset each other: The bargaining effect induces the principal to choose an agency who values quality more than herself, the incentive effect induces her to choose an agency who values quality less. Consider a principal of type $G(\theta) + \varepsilon$, where ε is very small. Even though she could get (almost) as good a bargain with the private firm as agency $G(\theta)$, she prefers inhouse provision under no delegation. When she delegates, she will, therefore, not be interested in delegating to agency $G(\theta)$ who outsources. Similarly, principal $G(\theta) - \varepsilon$ prefers outsourcing under no delegation even though she herself 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 opposite directions, principals prefer agencies, who are closer to being indifferent between outsourcing and inhouse provision than the

principal herself 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 ϕ_p. If one imagines that different voters in the electorate has different ϕ_p, this implies that the preferred agency of the voter with the median value of ϕ_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 herself. 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, contracts with the service provider 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 herself 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.[16] In the price negotiations with the private firm both parties realize this.

From 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

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

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

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

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*

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

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

Under partial delegation outsourcing is less likely than under no delegation and arm's length delegation, since $H\left(\theta\right) < G\left(\theta\right)$. The reason is that partial delegation enables principals of types close to $G\left(\theta\right)$ 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 not 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 effect, on the other hand, vanishes under partial delegation since the initial contracting with the

[16] In fact, any agency is optimal when outsourcing is chosen, since there will be no renegotiation in this case, as discussed above.

firm is done by the principal herself. Still the improved prospects under inhouse provision makes the principal herself a better negotiator with the firm allthough 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 ϕ_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 Double-delegation

Our final delegation mode is *double-delegation*, where the principal delegates the outsourcing decision to agency a_1 and the authority to hire and conduct the post-contractual renegotiation to another agency, a_2.

For agency a_1, the principal's choice of agency a_2 is then given, and if he chooses inhouse provision his utility is $v^{in}\left(\phi_{a_2}|\phi_{a_1},\theta\right)$ (as given in (19)), while the utility if he chooses outsourcing is $v^{out}\left(\phi_{a_2}|\phi_{a_1},\theta\right)$ (from (21)). Inserting, we find that inhouse provision is chosen by a_1 if

$$\phi_{a_1} \geq \frac{3}{8\theta}(1-\gamma) + \frac{(1+7\gamma)}{8}\phi_{a_2} \tag{24}$$

If a_1 and a_2 are chosen such that (24) is fulfilled with equality, the outsourcing surplus between the firm and a_1 is zero, and the outsourcing price therefore equals zero. If the principal wishes to outsource, she should take advantage of this. The principal's utility from outsourcing will then be (again using 21)

$$\tilde{v}^{out}\left(\phi_p,\theta\right) = \phi_p(Q_0-\theta) - \left(C_0 - \frac{1}{2}\right)$$

If inhouse provision is chosen, the optimal choice of agency a_2 maximizes $v^{in}\left(\phi_{a_2}|\phi_p,\theta\right)$. The solution is $\phi_a^{mi}\left(\phi_p,\theta\right)$ as given in Proposition 2. Inserting into the principal's utility function and comparing with $\tilde{v}^{out}\left(\phi_p,\theta\right)$ leads to

Proposition 5 *Under double delegation, the principal chooses outsourcing if and only if*

$$\phi_p \leq H(\theta) \equiv \frac{3}{8}\frac{1}{\theta} \tag{25}$$

In this case, the principal chooses a_1 and a_2 fulfilling (24) and reaps the outsourcing surplus. Otherwise the principal chooses inhouse provision and she prefers an agency a_2 of type $\phi_a^{mi}\left(\phi_p,\theta\right)$ as given in (20).

Hence, the outsourcing decision and the delegation under inhouse provision are the same under *double-delegation* and *partial delegation.* However, when outsourcing is preferred by the principal, she can take advantage of the possibility of delegating the outsourcing decision to a type who is just at the brink of choosing inhouse provision and reap all of the outsourcing surplus. It is intuitive that the outsourcing decision is the same under the two institutions: Under *partial delegation* the outsourcing surplus is zero for principal $\phi_p = H(\theta)$. She is therefore indifferent between outsourcing or not, and the firm's total payment equals zero. Clearly, she can not improve upon this situation by delegating this decision to an agent.

2.2.5 Efficiency

The principal does not directly internalize the effort cost of the service provider, so the outcome is not necessarily maximizing joint surplus. In this section, we consider efficiency, 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[17]

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

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. Figure 1 depicts the net surplus as a function of ϕ_p for the case where the quality reduction parameter, θ, equals one, and the market power parameter, γ, euqals a half. *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* and *double delegation* are the dotted line that combine the solid black line for $\phi_p \leq H(\theta)$ with the dashed grey line for $\phi_p \geq H(\theta)$.

Figure 1 shows that *arm's length*, *partial* and *double delegation* (weakly) dominate *no delegation*, and are strictly better when the service is produced inhouse. When the service is

[17] We hesitate in defining the principal's and the service provider's joint surplus as welfare, since this is only true when the principal internalises all interest in the society but the service provider's.

outsourced, the effort level is chosen by the firm without regard to any renegotioation. Thus, the effort level and joint surplus are the same whether there is delegation or not. Under inhouse production there is delegation to an agency, which cares less about quality. This yields stronger incentives for the public manager to perform cost reducing effort and this increases the joint surplus.

The Figure also demonstrates that *partial* and *double delegation* are the most efficient modes. They have the advantage over mandatory inhouse provision that the benefits from outsourcing are reaped for low ϕ_p and they have 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 ϕ_p is close to $G(\theta)$ in order to ensure that the agency chooses inhouse provision.

Finally, the Figure illustrates that full efficiency can only be acheived for high ϕ_p. These types of principals 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. P*artial* and *double delegation* allow this for a larger range of ϕ_p than *arm's lenght.*

In the following proposition we rank the different institutions according to the net surplus generated and we show that the intuition provided by Figure 1 carries over to the more general case of $.\theta, \geq 0$ and $\gamma \in [0,1]$. 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 ϕ_a of the chosen agency). This effort level is then inserted into $N\left(e_c, \phi_p, \theta\right)$. Remembering that $H(\theta) \equiv \frac{3}{8\theta} < \frac{3}{7\theta} \equiv G(\theta)$, we have:

Proposition 6 *Efficiency of institutions for allocation of authority:*

a) Delegation improves service provision: For any $\phi_p \leq \frac{1}{\theta}$, Arm's Length, Partial and Double 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, Double and No Delegation lead

to outsourcing.

c) Partial and Double Delegation yield at least as high surplus as any other institution and if $H(\theta) < \phi_p \leq 2G(\theta)$ *they yield 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, Double and Mandatory inhouse provision lead to first best.*

2.2.6 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 she choose? It it 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 herself, thus mimicking non-delegation. Whenever she does something different, it is because it gives her higher utility. By similar replication arguments, we notice that *double delegation* must be weakly prefered to other kinds of delegation and that *partial delegation* is (weakly) better for the principal than *mandatory inhouse provision.*[18]

The comparison between the two more realistic cases of *partial delegation* and *arm's length delegation* is more involved. *Partial delegation* has the advantage that the pricipal 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 she prefers inhouse provision. *Arm's length delegation,* on the other hand, has the advantage, that when the principal prefers outsourcing, she can use the *bargaining 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

[18] Remember from footnote 3 that *Double delegation* can mimick both *arm's length delegation* and *partial delegation. Partial delegation* mimicks *mandatory inhouse* provision whenever the principal decides not to outsource.

same utility for the principal if $\frac{1}{\theta} \leq \phi_p$. Summarizing the discussion, we therefore have

Proposition 7 *The principal's most preferred institution for allocation of autority is as follows:*

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

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

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

3 One task: Quality 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 quality 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

$$Q(e_c) = Q_0 + e_q. \tag{26}$$

The effort cost for the service provider is $(1/2)e_q^2$.

Inhouse provision: As above, the public manger recevives a quarter of the surplus, so his optimizing effort choice is $e_q = \phi_a/4$ and the principal's utility from inhouse provision, when she delegates to agency ϕ_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 $\phi_a = 4\phi_p$. It follows that delegation through mandatory inhouse provision secures first best ressource allocation as does inhouse provision under partial (and, thus, double) delegation.

When the principal outsources, there will now be renegotiation with the firm, who owns the plans for improvement of the service.[19] The surplus is split and the optimizing effort choice for the firm is $e_q = \phi_p/2$. The outsourcing surplus between the firm and the principal 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 valueable the more the principal cares about the quality. The utility for the principal under arm's length delegation, when he delegates to agency ϕ_a, who outsources, is

$$u_q^o\left(\phi_p,\theta\right) = \phi_p\left(Q_0 + \frac{\phi_a}{2}\right) - \left(C_0 + \frac{1}{8}\phi_a^2 + \frac{\gamma}{32}5\phi_a^2\right) \tag{27}$$

The outsourcing surplus is positive whenever $\phi_a = \phi_p$ implying that no delegation and arm's length delegation induces outsourcing. The optimal agency maximizes (27), which gives

$$\phi_a = \frac{8}{4+5\gamma}\phi_p. \tag{28}$$

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, since the agency is more willing to pay for improvements. 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.

[19] 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.

Under *double delegation,* the principal can gain by delegating the outsourcing decision to an agency, who is more reluctant to outsource. Given agency a_2 conducts the renegotiation, the outsourcing surplus for agency a_1 is

$$\begin{aligned}\Omega_{a_1|a_2} &= \phi_{a_1}\left(Q_0+\frac{\phi_{a_2}}{2}\right)-\left(C_0+\frac{1}{8}\phi_{a_2}^2\right)\\ &\quad-\left(\phi_{a_1}\left(Q_0+\frac{\phi_{a_2}}{4}\right)-\left(C_0+\frac{1}{2}\left(\frac{\phi_{a_2}}{4}\right)^2\right)\right)\\ &= \left(\frac{1}{4}\phi_{a_1}-\frac{3}{32}\phi_{a_2}\right)\phi_{a_2}.\end{aligned}$$

Hence, by choosing a_1 and a_2 such that $\phi_{a_1}=\frac{3}{8}\phi_{a_2}$, and $\phi_{a_2}=2\phi_p$, the principal can attain first best and obtain an outsourcing price that leaves no surplus to the private service provider.

To sum up, delegation is very powerful in the case where the only task is quality improvement and there is no trade-off as in the cost reduction case. First best can be achieved through delegation under both public and private service provision.

4 Two tasks: Cost reduction and quality improvement

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

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

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. From the previous sections we know that when cost reductions are crucial and the cost - quality trade off is in focus, principals, who value quality less, outsource. When quality improvements are crucial and cost reductions are not possible, 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 deterioating effects of cost reductions are as reflected in the parameter θ, and how much the principal values quality as given by ϕ_p. We will focus on the case, where cost reductions, although not irrelevant, involves

a non-trivial trade off in relation to quality. This is the case when $\theta > 0$, so cost reductions hurt quality, and $1 - \theta\phi \geq 0$, so that there will be cost reducing effort. Since the comparative statics wrt θ is clear from the previous sections and in order to simplify the exposition, we will let $\theta = 1$ in the following and accordingly restrict ϕ_p, ϕ_a, ϕ_{a1} and ϕ_{a2} to the interval [0,1][20].

4.1 No delegation

Under no delegation, the pricipal takes all decisions herself. The public manager internalizes 1/4 of the surplus, so as above the effort choices, under no delegation, are $e_q = \phi_p/4$ and $e_c = \left(1 - \theta\phi_p\right)/4$. The principal's utility of inhouse service provision is

$$\tilde{v}^{in} = \phi_p \left(Q_0 + \frac{\phi_p}{4} - \frac{1-\phi_p}{4} \right) - \left(C_0 - \frac{1-\phi_p}{4} + \frac{1}{2}\left(\frac{\phi_p}{4}\right)^2 + \frac{1}{2}\left(\frac{1-\phi_p}{4}\right)^2 \right). \tag{29}$$

When the principal outsources, the firm internalizes half of the surplus from quality improvement and receives all cost reductions, it therefore chooses $e_q = \phi_p/2$ and $e_c = 1$.

The principal pays the outsourcing price p_0 and pays half of the gross surplus in the renegotiation, her utility therefore is

$$\tilde{v}^{out} = \phi_p \left(Q_0 + \frac{\phi_p}{2} - 1 \right) - p_0 - \frac{1}{4}\phi_p^2. \tag{30}$$

In the Appendix we show that the outsourcing surplus equals[21]

$$\tilde{\Omega}\left(\phi_p\right) = \left\{ \frac{1}{32}\left(5\phi_p^2 + \left(3 - 7\phi_p\right)\left(\phi_p + 3\right)\right). \right. \tag{31}$$

which is simply the sum of the surplusses in the two individual cases considered above. The principal outsources when the surplus is positive, which directly yields

Proposition 8 *Under no delegation, the principal outsources in the two task case iff*

$$\phi_p \leq \tilde{G} = \frac{3\sqrt{11} - 9}{2} \approx 0.475$$

[20] It may appear a bit "crude" that we restrict the parameter space for the $\phi's$ to [0,1]. By doing it we avoid comparison with many cumbersome and unreasonable cases, where the optimal solution involves no effort on cost reduction. When $\phi_a > 1$, there is no effort on cost and ϕ_a can freely be increased by the principal in order to induce more effort on quality. Hence the cost-quality trade-off disappears. This feature appears in our setting, since the utility from quality is linear, which has the advantage that we can get closed form solutions to the principal's delegation problem. Had we instead assumed that utility from quality was suffiently convex, the optimal solution would always involve some cost reducing effort and the cost quality trade-off would always remain. In our simple linear model, we obtain this feature by restricting the parameter space.

[21] The proofs of the two-task case left out in the text can be found in the Appendix.

4.2 Delegation with two tasks

We now consider the various delegation regimes.

4.2.1 Mandatory inhouse provision

Under *mandatory inhouse provision,* the principal's utility, when she chooses agency ϕ_a is

$$\tilde{v}^{in} = \phi_p \left(Q_0 + \frac{\phi_a}{4} - \frac{1-\phi_a}{4} \right) - \left(C_0 - \frac{1-\phi_a}{4} + \frac{1}{2}\left(\frac{\phi_a}{4}\right)^2 + \frac{1}{2}\left(\frac{1-\phi_a}{4}\right)^2 \right) \tag{32}$$

and the preferred agency maximizes this among ϕ_a fulfilling $0 \leq \phi_a \leq 1$. This directly gives

Proposition 9 *Under mandatory inhouse provision, principal ϕ_p's preferred agency is in the two task case given by*

$$\tilde{\phi}_a^{mi}\left(\phi_p\right) = \begin{cases} 0 & \text{if} \quad \phi_p \leq \frac{3}{8}, \\ 4\phi_p - \frac{3}{2} & \text{if} \quad \frac{3}{8} \leq \phi_p \leq \frac{5}{8}, \\ 1 & \text{if} \quad \frac{5}{8} \leq 1. \end{cases} \tag{33}$$

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 $\phi_p > 1/2$. In both cases, it reflects *the incentive effect:* When ϕ_p is low, the principal does not care so much about the quality of the service and the most important issue is cost reductions. Strong incentives for cost reductions are provided by choosing an agency with low ϕ_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 ϕ_a is chosen, just as is the case when improvements is the only task.

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 $\phi_p \leq 3/8$ the effort choices are $e_q = 0$ and $e_c = \frac{1}{4}$. For $3/8 \leq \phi_p \leq 5/8$, they are $e_q = \left(4\phi_p - \frac{3}{2}\right)/4 = \phi_p - 3/8$ and $e_c = \left(1 - \left(4\phi_p - \frac{3}{2}\right)\right)/4 = 5/8 - \phi_p$. For $\phi_p \geq 5/8$, the choices are $e_q = 1/4$ and $e_c = 0$.

4.2.2 Arm's length delgation

Under *arm's length delegation*, the principal chooses an agency, which takes care of both the outsourcing decision and the renegotiation. This agency is in the same position as the principal is under no delegation, hence outsourcing surplus between the agency and the firm is given by (31) with ϕ_a substituted for ϕ_p.We can therefore directly infer that the agency outsources if and only if

$$\phi_a \leq \tilde{G} \tag{34}$$

The principal's utility if the agency outsources is therefore (compare with (30))

$$\tilde{v}^{out} = \phi_p \left(Q_0 + \frac{\phi_a}{2} - 1 \right) - p_0 - \frac{1}{4} (\phi_a)^2 \tag{35}$$

Since the firm's share of the outsourcing surplus $\gamma\tilde{\Omega}(\phi_a)$ equals the outsourcing price, p_0, less net costs, $C_0 - 1/2$, plus net earnings from quality improving effort $(1/2)\phi_a(\phi_a/2) - (1/2)(\phi_a/2)^2$, the outsourcing price p_0 equals

$$p_0 = \gamma\tilde{\Omega}(\phi_a) + C_0 - \frac{1}{2} - \frac{1}{8}\phi_a^2$$

The principal's utility if the agency chooses inhouse provision is as in (32). Maximizing over ϕ_a in (32) and in (35) (inserting for the price), and taking into account the outsourcing condition (34) then directly leads to

Proposition 10 *In the two task case, principal ϕ_p's preferred agency ϕ_a under arm's length delegation and the outsourcing decision is given by:*

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

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 (as was the case when only cost reductions mattered). 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 intererested in that. A low ϕ_p principal therefore realizes that the *bargaining* and the *incentive effects* work in opposite directions, and she modifies the choice of agency, 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, γ, the more important is *the bargaining effect*, and the higher ϕ_a is chosen. When ϕ_p is close to but still smaller than $\tilde{G}$, the principal's choice of agency is governed by the interest in reaping all surplus and the preferred agency has $\phi_a = \tilde{G}$.

For larger $\phi_p \geq \tilde{G}$, the principal prefers inhouse provision. As we have seen above, when ϕ_p is close to $\tilde{G}$, the principal is constrained in her choice of ϕ_a by the consideration that the agency should not prefer outsourcing, therefore the optimal choice is $\phi_a = \tilde{G}$. For larger ϕ_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 herself 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 consider a representative democracy, where principals are voters, the median voter's preferred agency is a Condorcet winner.

4.2.3 Partial delegation

Recall that under *partial delegation* the principal first decides on outsourcing and then chooses an agency. At the time when the agency is chosen, the *outsourcing price is therefore given.* The optimal choice of agency maximizes $\tilde{v}^{out}$ as given in (35) taking as given the outsourcing price p_0. This gives

$$\phi_a = \phi_p.$$

When she outsources, the principal wishes to delegate to a type, who has the same preferences as herself. We could also interpret this as she prefers not to delegate the decision. Unlike under arm's length outsourcing, the principal can not factor in that a higher renegotiation surplus to the firm is offset through a lower initial price, since the price is given when the agency is chosen. Hence the *incentive effect* is not present and the optimal agency has the same preferences as the principal.

If the principal chooses inhouse provision her utility is given by (32). In the Appendix we compare the relevant utilities from inhouse provision and outsourcing and show that

Proposition 11 *Under partial delegation, the principal chooses outsourcing in the two task case if and only if*

$$\phi_p \leq \hat{G} = \frac{3}{2\sqrt{10}} \approx 0.474.$$

If outsourcing is chosen, the principal prefers an agency of her own type. If inhouse provision is chosen, the principal prefers an agency of type $\tilde{\phi}_a^{mi}\left(\phi_p\right)$ *as given in Proposition 9.*

4.2.4 Double-delegation

Recall that under *double-delegation*, the principal delegates the outsourcing decision to agency a_1 and the authority to hire and conduct the post-contractual renegotiation to a different agency, a_2. In the Appendix, we show that the outsourcing surplus between agency a_1 and the firm in this case is

$$\Omega_{12} = \frac{1}{32}\left(-24\phi_{a_1} + 6\phi_{a2} - 2\phi_{a2}^2 + 9\right)$$

Agency a_1 therefore outsources iff

$$\phi_{a_1} \leq \frac{6\phi_{a2} - 2\phi_{a2}^2 + 9}{24} \tag{36}$$

The principal's utility from outsourcing is (compare with (35))

$$v^{out} = \phi_p\left(Q_0 + \frac{\phi_{a2}}{2} - 1\right) - p_0 - \frac{1}{4}\left(\phi_{a2}\right)^2$$

The optimal choice of ϕ_{a1} and ϕ_{a2} when the principal goes for outsourcing maximizes this subject to the restriction (36). In the Appendix we show that $\phi_{a2} = 2\phi_p$, so the choice of agency a_2

gives optimal incentives on the quality improving task. The choice of agency a_1 is made such that this agency is indifferent between outsourcing or not, so that the surplus is zero and the price therefore as low as possible.

If the principal prefers inhouse provision, the principal's utility is given by (32) (with ϕ_{a2} substituting for ϕ_a) and the choice of agency a_2 is exactly as under mandatory inhouse provision as in Proposition 9. By comparing the relevant utility expressions for the principal in the two cases, inhouse and outsoucing, we prove the rest of Proposition 12 in the Appendix

Proposition 12 *Under double delegation, the principal chooses outsourcing in the two task case if and only if*

$$\phi_p \leq \tilde{H} = \frac{3}{8}\sqrt{2} \approx 0.53.$$

If outsourcing is chosen, the principal prefers an outsourcing agency, ϕ_{a1}, such that equation (36) is satisfied with equality and a renegotiation agency of type $\phi_{a2} = \max[2\phi_p, 1]$.

If inhouse provision is chosen, the principal prefers any outsourcing agency, ϕ_{a1}, such that the relevant inequality in (41) in the Appendix is satisfied and a renegotiation agency of type $\phi_{a2} = \tilde{\phi}_a^{mi}(\phi_p)$ as given in Proposition 9.

Comparing the cases of *partial* and *double delegation* we notice that these two institutions provide very different outcomes under two tasks, which they did not do in the single task case. There will be more outsourcing under *double delegation* than under *partial delegation*. The intuition is the following. Under *partial delegation* we showed above that the *bargaining* effect is removed under outsourcing because the price is given at the time when the agency is chosen. Under *double delegation*, the principal chooses the renegotiation agency before the outsourcing agency has negotiated with the private firm. Hence, the private firm knows the preference of the renegotiation agency and is willing to accept a lower price if it can foresee that compensation will be higher in the renegotiation phase. Notice that if the principal promised to delegate to the ex ante optimal renegotiation agency before she negotiated the price with the private firm, the firm would recognize that such a promise would not be ex post optimal. When the price is fixed at any level the principal will prefer a renegotiation agency with similar preferences

as herself. Hence, the key in *double delegation* is the ability to commit to the renegotiation agency before the price negotiations with the private firm. Since this improves the outcome under outsourcing, it follows that we shall observe more outsourcing under *double delegation* than under *partial delegation*.

4.3 Effort and efficiency in the dual task case.

We are now ready to provide som intuitive comparison of the various provison modes for the dual task case. Figures 2 and 3 show efforts levels and net surplus for each of the different modes of service provision. [22]

Part A in Figure 2 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 increases with half the slope of first best until $\phi_p = \widetilde{G}$ reflecting that the private service provider internalises - through renegotiation - half of the additional surplus generated from investing in quality. When ϕ_p exceeds $\widetilde{G}$, the principal decides to switch from outsourcing to inhouse service provision, which implies a drop in quality investment and that for higher ϕ_p the quality investment only increases with 1/4 of the slope of first best quality investment. This reflects that the public manager internalises only a quarter of the additional surplus generated by his investment in quality.

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 slope as the first best quality investment until the restriction $\phi_a \leq 1$ is binding. When the service is outsourced we notice that there will be an inefficiently high level of quality investment relative to

[22] Remember that we have throughout the two task case for simplicity assumed that the quality deterioration parameter θ is one and we have restricted the preferences for quality parameters, $\phi_p, \phi_a, \phi_{a1}$ and ϕ_{a2} to be positive and less than or equal to one. To draw the following figures we have in addition assumed that the market power, γ, is a half, i.e. that the private firm and the principal (or the outsourcing agency) splits any outsourcing surplus equally. We notice from above that we have marginally more outsourcing under partial delegation than under arm's length or no delegation ($\hat{G} \approx 0.474 < 0.475 \approx \widetilde{G}$). However, the difference is small. Thus, to improve the readability of the figures we have oppressed the ticks for the $\hat{G}$ condition, which is overlapping with the $\widetilde{G}$ condition.

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 increases the *bargaining effect.* The principal delegates to an agency, who puts more weight on quality and is a tougher negotiator implying that the service is delivered at a lower price from the private company. The cost of this is a distortion in quality investment.[23]

Partial delegation is the dotted grey 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.

Finally, *Double delegation* - the dotted black line - provides the most powerful incentives to invest in quality. It leads to outourcing of service provision for a larger range of quality preferences than any other service provision modes. For the private provision case double delegation solves the challenges facing the two former delegation modes: By picking the two agencies simultanously it lowers the investment incentive relative to the *arm's length* without compromising on the bargaining effect and relative to the *partial delegation* it provides optimal incentives *and* exploits the bargaining effect by picking the two agencies simultanously.

Part B of Figure 2 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. Under public service provision, all alternative provisions modes provide too few incentives for cost reduction. However, when delegation is possible, the principal chooses to lower incentives to cost reduction even further because this raises incentives to quality improvement. Notice also, that in a small area to the right of $\tilde{G}$, *mandatory inhouse* and *partial delegation* provide slightly stronger incentives to cost cutting than arm's length and no delegation. The reason is that the former modes can pick a renegotiation agency that would like to outsource but who is not given the right to decide upon the mode of service provision.

[23] Notice, that the quality effort is constant under private provision due to that $\gamma = 1/2$ as is clear from Proposition 10 above.

Figure 3 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 a 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 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 due to the insufficient incentives for quality improvement.

Delegation generally generate significantly more net surplus than no delegation under in-house provision, i.e. when the principal cares about quality. The figure, therefore, suggests the empirical implication, that delegation provides efficiency improvement for public services that are clearly best provided inhouse. The benefit of delegation for extreme principals is restricted by our restriction of the preference space. We have assumed that the most extreme principal ($\phi_p = 1$) cannot delegate to an even more extreme agency. This is the reason that all delegation modes converges to the *no delegation* case for $\phi_p \to 1$.[24]

The trade-off 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 ϕ_p's. The reason is that the price discount generated by the principal's choice does not show up in the netsurplus, since this is a redistribution from the private firm to the public sector. This trade-off does not exist under *double delegation* implying that *double delegation* always deliver the most efficient service provision. However, it is evident from the Figure that even *double delegation* cannot solve all efficiency problems related to incomplete contraction when the principal cares about quality.

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 *incentive* and the *bargaining* effects - that makes delegation of decision authority a powerful policy instrument in managing

[24] If we allowed for even more extreme agencies, the efficiency gain of delegation would increase in ϕ_p under inhouse provision.

public service provision: First by strategically delegating the right to hire and negotiate with a public or private service provider, the principal can manipulate with the service provider's incentive to reduce cost and/or increase quality. Strategic delegation essentially becomes a substitute for explicit incentive contracts. Second, by delegating the right to outsource to an agency that is indifferent between provison 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 empirically 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 will be adjusted so that outsourcing takes place. Second, we identified two empirical relevant ways of delegating the outsourcing decision - *arm's length* and *partial* delegation. Both types of delegation create more efficient ressource allocation than no delegation. Third, *partial* delegation is better than *arm's length* delegation at creating efficiency when service is produced inhouse.

A growing empirical literature investigate determinants of the choice of service provider in public service provision (e.g. La Porta et al. (1997), Brown and Potoski (2003) and Levin and Tadelis (2005)). This literature documents that political preferences, degree of contractual incompleteness and complexity of service provisions are all important factors in deciding the type of service provision. Our analysis highlights that delegation is an powerfull instrument in such settings. However, we do not explicitly provide direct empirical support for our theoretical results. We believe there are at least two challenges in doing so: First, as discussed in the Introduction, the choice of delegation mode is only in limited amount directed by efficiency considerations. In an election setting, most delegation will be *arm's length* where the electorate chooses a politician to be responsible for both the outourcing decision and the negotiation with a private service provider. In the real world, *double delegation* is clearly not an option for the electorate. However, *partial delegation* may be seen as a case of direct referendum, where the electorate votes on outsourcing and delegates the implementation of the result to an elected politician. Second, it is hard to think about counterfactuals for our delegation results because almost all service provision imply some degree of delegation from the principal due to time and

capacity constraints.

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. As discussed above, there are two necessary conditions for delegation to work: First, delegation will increase the incentive part of a public manager's remuneration and, therefore, leave him or her with a larger stake in the post contractual renegotiation process. The contracting agency must be able to foresee this and make a proportional reduction in the public manager's base salary. Second, the premise for delegation is that there exist sufficiently heterogenous preferences in the population over issues which are non contractible.

6 Appendix

Proofs for the two-task case.

For ease of exposition we will first consider double delegation, where principal delegates the outsourcing decision to agent ϕ_{a1} and the renegotiation to agent ϕ_{a2}. The other cases can then be found by inserting in the relevant places for ϕ_{a1} and ϕ_{a2}.

Agent ϕ_{a1}'s utility from inhouse provision, when renegotiation is delegated to agent ϕ_{a2} is

$$\tilde{v}_{12}^{in} = \phi_{a1}\left(Q_0 + \frac{\phi_{a2}}{4} - \frac{1-\phi_{a2}}{4}\right) - \left(C_0 - \frac{1-\phi_{a2}}{4} + \frac{1}{2}\left(\frac{\phi_{a2}}{4}\right)^2 + \frac{1}{2}\left(\frac{1-\phi_{a2}}{4}\right)^2\right) \tag{37}$$

Under outsourcing the firm gets all benefits from cost reduction and half of the gross surplus between the firm and agent ϕ_{a2} from quality improving effort. The optimizing choices are therefore $e_c = 1$ and $e_q = \phi_{a2}/2$. The total expenditure for the principal is p_0 plus what is paid in the renegotiation, equal to half of the gross surplus, $\frac{1}{2}\phi_{a2}\left(\frac{1}{2}\phi_{a2}\right)$. Agent $\phi'_{a1}s$ utility from outsourcing when ϕ_{a2} renegotiates is therefore

$$\tilde{v}_{12}^{out} = \phi_{a1}\left(Q_0 + \frac{\phi_{a2}}{2} - 1\right) - p_0 - \frac{1}{4}\left(\phi_{a2}\right)^2 \tag{38}$$

The initial contract is between the firm and agent ϕ_{a1}. The parties foresee the subsequent renegotiation and the firm gets a fraction γ of the total outsourcing surplus between the firm and agent ϕ_{a1}. Call this surplus Ω_{12}. Then $u^f = \gamma\Omega_{12}$. The firm's part of the surplus consists partly of the initial outsourcing price p_0 less costs C_0, partly of net cost savings $1-\frac{1}{2}$, and partly of the renegotiation pay less effort costs $\phi_{a2}\frac{\phi_{a2}}{4} - \frac{1}{2}\left(\frac{\phi_{a2}}{2}\right)^2 = \frac{1}{8}\phi_{a2}^2$, so

$$u_{12}^f = \gamma\Omega_{12} = p_0 - C_0 + \frac{1}{2} + \frac{1}{8}\phi_{a2}^2$$

which gives

$$p_0 = \gamma\Omega_{12} - \frac{1}{8}\phi_{a2}^2 + C_0 - \frac{1}{2} \tag{39}$$

Recall that

$$\Omega_{12} = \tilde{v}_{12}^{out} + u_{12}^{f} - \left(\tilde{v}_{12}^{in} + 0\right)$$

which gives

$$\Omega_{12} = \frac{1}{32}\left(-24\phi_{a_1} + 6\phi_{a2} - 2\phi_{a2}^2 + 9\right) \tag{40}$$

No delegation

Under no delegation all $\phi's$ in the relevant formulas are ϕ_p. Hence (40) and a little manipulation gives that the outsourcing surplus between the principal and the firm is given by equation (31).

Partial Delegation

From Proposition 9 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

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

The outsourcing surplus, when the pricipal is expected to choose agent $\phi_a = \phi_p$ in case of outsoucing, is therefore

$$\begin{aligned}\tilde{\Omega} &= \left(\tilde{v}^{out} + \tilde{u}^{f}\right) - \left(v^{in} + 0\right) \\ &= \phi_p\left(Q_0 + \frac{\phi_p}{2} - 1\right) - p_0 - \frac{1}{4}\left(\phi_p\right)^2 + \left(p_0 - C_0 + \frac{1}{2} + \frac{1}{8}\phi_p^2\right) \\ &\quad - \left(\phi_p\left(Q_0 - \frac{1}{4}\right) - C_0 + \frac{7}{32}\right)\end{aligned}$$

which is positive for all $\phi_p \leq 3/8$. Hence all types $\phi_p \leq 3/8$ outsource.

If $3/8 \leq \phi_p \leq 5/8$, Proposition 9 gives that the optimal agency under inhouse provision is $\phi_a = 4\phi_p - 3/2$, so that

$$\begin{aligned}v^{in} &= \phi_p\left(Q_0 + \frac{4\phi_p - \frac{3}{2}}{4} - \frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4}\right) \\ &\quad - \left(C_0 - \frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4} + \frac{1}{2}\left(\frac{4\phi_p - \frac{3}{2}}{4}\right)^2 + \frac{1}{2}\left(\frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4}\right)^2\right)\end{aligned}$$

Inserting into $\tilde{\Omega} = \left(\tilde{v}^{out} + \tilde{u}^{f}\right) - \left(v^{in} + 0\right)$, then gives

$$\tilde{\Omega} = \frac{1}{64}\left(9 - 40\phi_p^2\right).$$

Which yields Proposition 11:[25]

Double delegation

Using (38), (40) and (39) (and substituting ϕ_p for ϕ_{a1} in (38)) the principal's utility from outsourcing can be written

$$v^{out} = \phi_p\left(Q_0 + \frac{\phi_{a2}}{2} - 1\right) - \left(\gamma\Omega_{12} - \frac{1}{8}\phi_{a2}^2 + C_0 - \frac{1}{2}\right) - \frac{1}{4}\left(\phi_{a2}\right)^2$$

[25] It is straightforward to check that inhouse provision is also preferred for $\phi_p > 5/8$.

The optimal choice of ϕ_{a1} and ϕ_{a2} maximizes this subject to the restriction (36). This gives

$$\begin{aligned}\phi_{a2} &= \max[2\phi_p, 1] \\ \phi_{a1} &= \frac{12\phi_p - 2\left(\max[2\phi_p,1]\right)^2 + 9}{24} = \begin{cases} \frac{1}{2}\phi_p - \frac{1}{3}\phi_p^2 + \frac{3}{8} & \text{if} \quad \phi_p \leq \frac{1}{2} \\ \frac{1}{2}\phi_p + \frac{7}{24} & \text{if} \quad \phi_p > \frac{1}{2} \end{cases}\end{aligned}$$

The choice of agent a_2 gives optimal incentives on the quality improving task. The choice of agent a_1 is made such that this agent is indifferent between outsourcing or not, so that the surplus is zero and the price therefore as low as possible.

If the principal prefers inhouse provision, the choice of agent a_2 is exactly as under mandatory inhouse provision as in Proposition 9. Then the outsourcing surplus for agent a_1 becomes

$$\Omega_{12} = \begin{cases} \frac{1}{32}\left(-24\phi_{a_1} + 9\right) & \text{if} \quad \phi_p \leq \frac{3}{8} \\ \frac{1}{32}\left(-24\phi_{a_1} + 6\left(4\phi_p - \frac{3}{2}\right) - 2\left(4\phi_p - \frac{3}{2}\right)^2 + 9\right) & \text{if} \quad \frac{3}{8} \leq \phi_p \leq \frac{5}{8} \\ \frac{1}{32}\left(-24\phi_{a_1} + 6 - 2 + 9\right) & \text{if} \quad \frac{5}{8} \leq 1 \end{cases}$$

and with choices af a_2 as in Proposition 9 agent a_1 will chose inhouse provision if ϕ_{a1} fulfills

$$\begin{array}{lll} \frac{9}{24} \leq \phi_{a1} \leq 1 & \text{if} & \phi_p \leq \frac{3}{8} \\ \frac{-64\phi_p^2 + 96\phi_p - 9}{48} \leq \phi_{a1} \leq 1 & \text{if} & \frac{3}{8} \leq \phi_p \leq \frac{5}{8} \\ \frac{13}{24} \leq \phi_{a1} \leq 1 & \text{if} & \frac{5}{8} \leq 1 \end{array} \tag{41}$$

If $\phi_p \leq 3/8$, the optimal choice of ϕ_{a2} is $\phi_{a2} = 2\phi_p$ under outsourcing and $\phi_{a2} = 0$ under inhouse provision. The principal's utilities then are:

$$v^{out} = \phi_p\left(Q_0 + \frac{2\phi_p}{2} - 1\right) - \left(-\frac{1}{8}\left(2\phi_p\right)^2 + C_0 - \frac{1}{2}\right) - \frac{1}{4}\left(2\phi_p\right)^2$$

and

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

Hence $v^{out} > v^{in}$ for $\phi_p \leq 3/8$.

If $3/8 \leq \phi_p \leq \frac{1}{2}$, the optimal choice of ϕ_{a2} is $\phi_{a2} = 2\phi_p$ under outsourcing and $\phi_{a2} = \left(4\phi_p - \frac{3}{2}\right)$under inhouse provision. The principal's utilities then are:

$$v^{out} = \phi_p\left(Q_0 + \frac{2\phi_p}{2} - 1\right) - \left(-\frac{1}{8}\left(2\phi_p\right)^2 + C_0 - \frac{1}{2}\right) - \frac{1}{4}\left(2\phi_p\right)^2$$

$$\begin{aligned} v^{in} &= \phi_p\left(Q_0 + \frac{4\phi_p - \frac{3}{2}}{4} - \frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4}\right) \\ &\quad - \left(C_0 - \frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4} + \frac{1}{2}\left(\frac{4\phi_p - \frac{3}{2}}{4}\right)^2 + \frac{1}{2}\left(\frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4}\right)^2\right) \end{aligned}$$

Hence $v^{out} - v^{in} \geq 0$ iff $\frac{9}{64} - \frac{1}{2}\phi_p^2 \geq 0$ or

$$\phi_p \leq \frac{3}{8}\sqrt{2} \approx 0.530\,33$$

So $v^{out} > v^{in}$ for$3/8 \leq \phi_p \leq 1/2$.

If $1/2 \leq \phi_p \leq 5/8$, then the optimal choice of ϕ_{a2} is $\phi_{a2} = 1$ under outsourcing and ϕ_{a2} $= \left(4\phi_p - \frac{3}{2}\right)$ under inhouse provision. The principal's utilities then are:

$$v^{out} = \phi_p \left(Q_0 + \frac{1}{2} - 1\right) - \left(-\frac{1}{8} + C_0 - \frac{1}{2}\right) - \frac{1}{4}$$

$$\begin{aligned} v^{in} &= \phi_p \left(Q_0 + \frac{4\phi_p - \frac{3}{2}}{4} - \frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4}\right) \\ &\quad - \left(C_0 - \frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4} + \frac{1}{2}\left(\frac{4\phi_p - \frac{3}{2}}{4}\right)^2 + \frac{1}{2}\left(\frac{1 - \left(4\phi_p - \frac{3}{2}\right)}{4}\right)^2\right) \end{aligned}$$

and $v^{out} - v^{in} \geq 0$ iff $\phi_p \leq \frac{1}{8}\sqrt{5} + \frac{1}{4} = 0.529\,51$

Finally, if $5/8 \leq \phi_p$, then the optimal choice of ϕ_{a2} is $\phi_{a2} = 1$ under outsourcing and ϕ_{a2} $= 1$ under inhouse provision. The principal's utilities are

$$v^{out} = \phi_p \left(Q_0 + \frac{1}{2} - 1\right) - \left(-\frac{1}{8} + C_0 - \frac{1}{2}\right) - \frac{1}{4}$$

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

and $v^{in} > v^{out}$ iff $\frac{13}{32}\frac{4}{3} < \phi_p$. As $\frac{5}{8} > \frac{13}{32}\frac{4}{3}$, $v^{in} > v^{out}$ for all $\phi_p \geq 5/8$. This completes the Proof of Proposition 12.

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

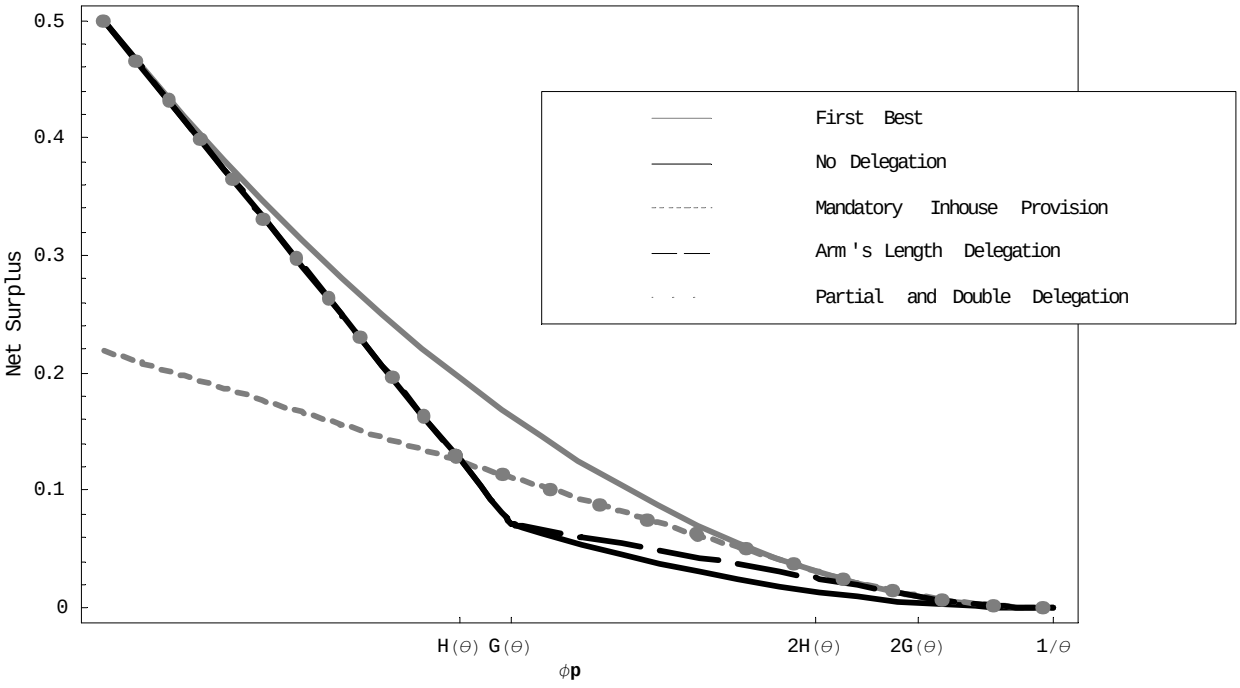


Figure 2a: Quality Improving Effort.

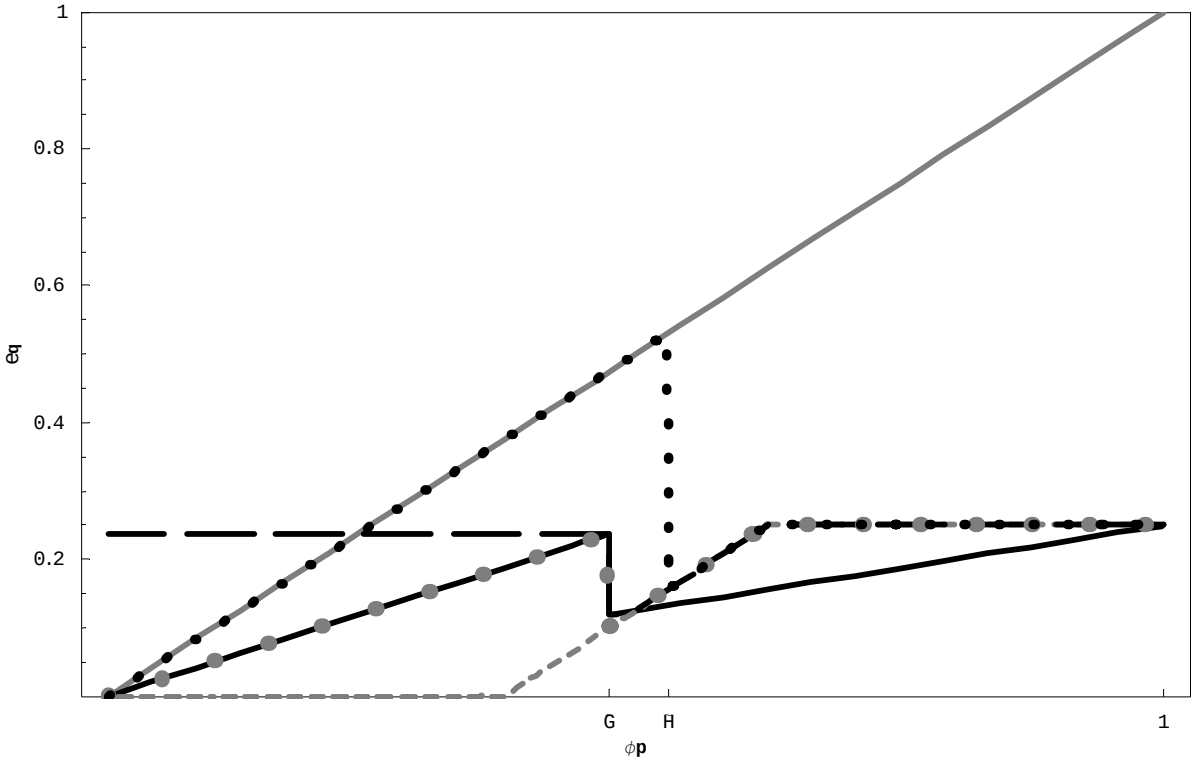
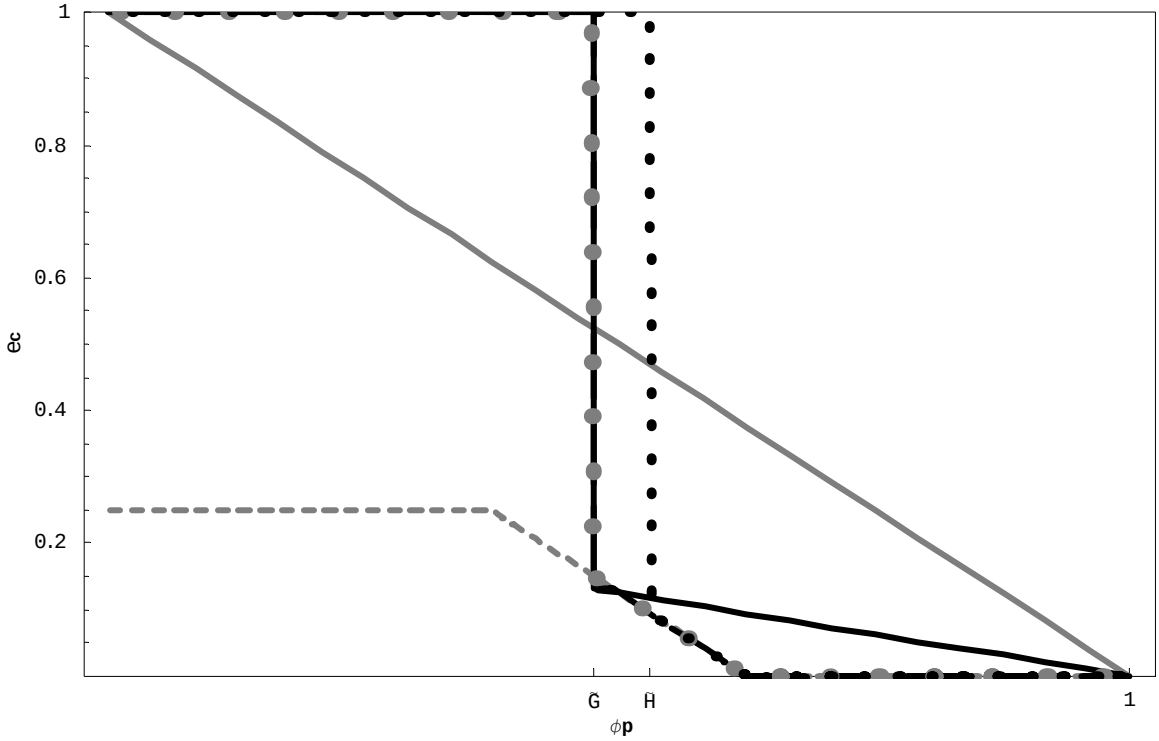


Figure 2b: Cost Reducing Effort.



First Best
No Delegation
Mandatory Inhouse Provision
Arm 's Length Delegation
Partial Delegation
Double Delegation

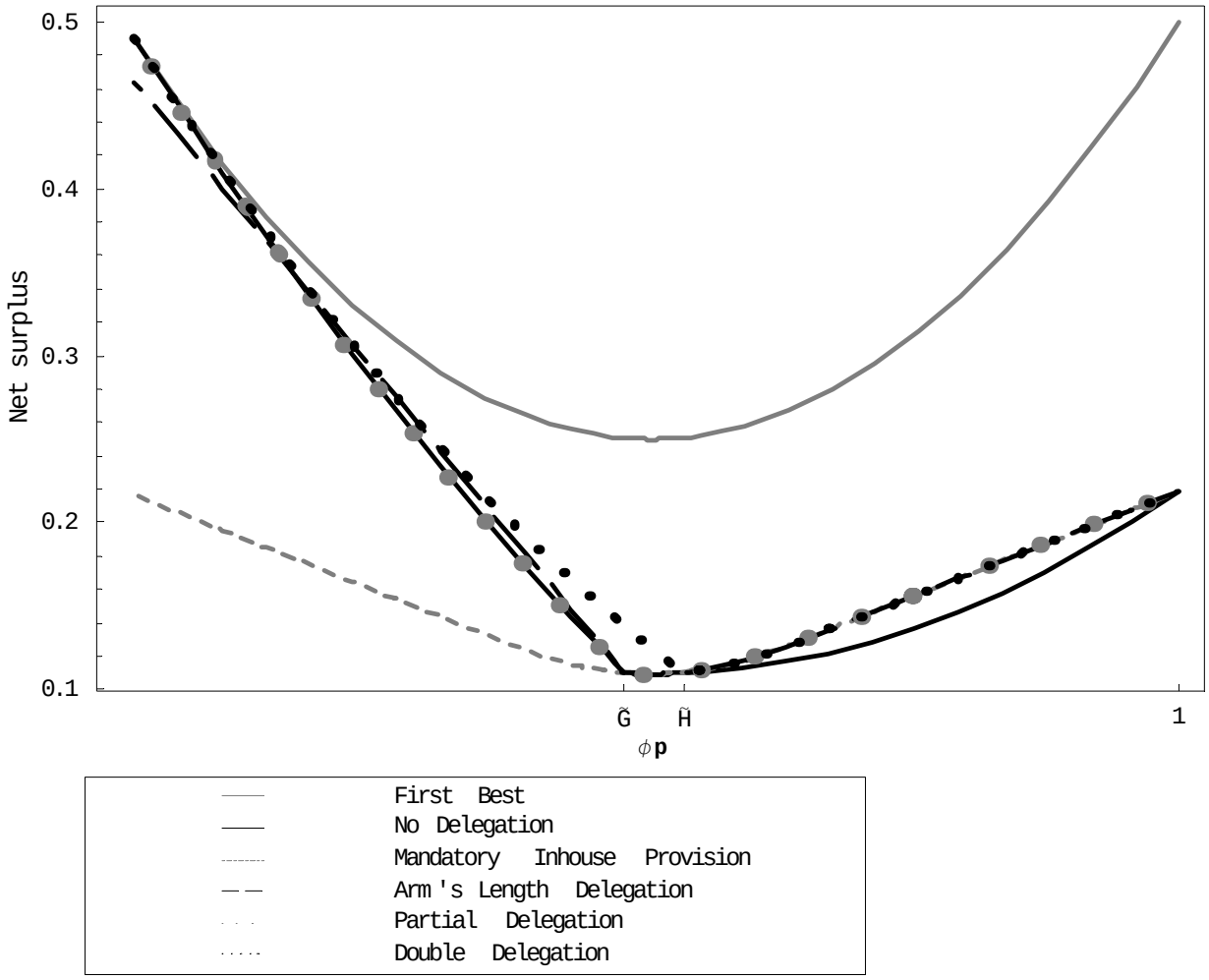



Figure 3: Efficiency (Two Tasks: Quality Improvement and Cost Reduction).