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TIIVISTELMÄ

Tämä tutkimus on teoreettinen ja tarkastelee sitä, olisiko julkisen tilaajan edun mukaista tuottaa itse rahoittamiansa palveluita tai vaihtoehtoisesti kilpailuttaa palvelutuotanto yksityisten tuottajien kesken. Usein on luonteenomaista, että kilpailutuksen kohteena on kokonainen palvelukokonaisuus, joka koostuu useista pienemmistä toimenpiteistä. Yksittäisten toimenpiteiden kilpailuttaminen erikseen on useita syistä tehotonta:

- toimenpide on vähäinen suhteessa sopimuksentekokustannuksiin
- oikean toimenpiteen spesifiointi voi olla tärkein osa itse toimenpidettä
- tarve, joka toimenpiteellä tyydytetään, realisoituu niin nopeasti, ettei kilpailuttamiseen ole enää aikaa.

Tämä tutkimus tarkasteleekin palvelukokonaisuuksien kuten terveyskeskuksen, sairaalan, vanhustentalon, päiväkodin, koulun tai jonkin politiikkalohkon kilpailuttamista. Tuolloin sopimus koskee useiden palvelutoimenpiteiden suorittamista. Itse palvelutarpeet, jotka määräävät tarvittavien toimenpiteiden luonteen, realisoituvat tyypillisesti vasta sen jälkeen, kun sopimus on tehty yksityisen palvelun tuottajan kanssa. Toiminnan luonteesta riippuen se, millä tavoin yksittäiset palvelutarpeet realisoituvat, on enemmän tai vähemmän satunnaista.

Tutkimuksessa tehdään oletus, jonka mukaan vain palvelun tuottaja havaitsee realisoituvat palvelutarpeet, joihin reagoiminen määrää palvelun vaikuttavuuden. Ole-

tuksen mukaan palvelutarvetta ei voida jälkikäteen todentaa. Yksityisen tuotannon ongelmana on se, että voiton maksimointi ei ohjaa tuottajaa reagoimaan palvelutarpeisiin tilaajan kannalta optimaalisesti. Yksityinen tuottaja pyrkii asettamaan tuotannon skaalan systemaattisesti liian pieneksi. Tämän estääkseen tilaaja edellyttää sopimuksessa, että todennettavissa olevat palvelutoimenpiteet, siis palvelusuoritteet, asetetaan ennalta määrätylle keskimääräiselle tasolle. Keskimääräistäminen aikaansaa kuitenkin tappiota tilaajalle palveluiden huonon kohdentumisen muodossa.

Kun tuotanto tilataan yksityiseltä tuottajalta, julkinen tilaaja kilpailuttaa potentiaalisia palvelun tuottajia erityisellä tarjontahuutokaupalla. Tämä mekanismi spesifioi huudettua määrää vastaavan hinnan (korvauksen) ennalta annetun määrähinta-asteikon mukaan. Huutokauppa seuloo voittajaksi kustannustehokkaimman tuottajan, toisin sanoen sen, jonka tuotannon marginaalikustannukset ovat alimmat. Tarkastelussa oletetaan, että potentiaalisten tuottajien marginaalikustannukset määräytyvät satunnaisesti samasta jakaumasta ennen huutokaupan pitoa.

Kun julkinen tilaaja tuottaa palvelut itse, se saa myös tilaisuuden havainnoida palvelutarpeiden realisoitumista. Koska julkisella tuottajalla ei ole yhtä voimakasta intressiä olla reagoimatta optimaalisella tavalla palvelutarpeisiin, allokoituvat yksittäiset palvelusuoritteet julkisessa tuotannossa paremmin kuin yksityisessä tuotannossa vastaamaan syntyneitä palvelutarpeita. Julkisen tuottajan marginaalikustannusten oletetaan määräytyvän samasta jakaumasta kuin yksityisten tuottajien marginaalikustannukset. Koska julkisia tuottajia on vain yksi ja yksityisiä taas useampi, voidaan odottaa, että kilpailun kautta valikoituva yksityinen tuottaja on julkista tuottajaa kuitenkin tehokkaampi.

Julkisen ja toisaalta yksityisen tuotannon vaihtoehtoiset edut (trade-off) liittyvät kustannustehokkuuteen, joka on yksityisessä kilpailutetussa tuotannossa suhteellisen hyvä, ja allokatiiviseen tehokkuuteen (vaikuttavuuteen), joka taas julkisessa tuotannossa on suhteellisen hyvä. Tutkimus osoittaa, että palvelutarpeen ennakoimattomuuden (vaikuttavuusparametrin varianssin) kasvu lisää julkisen tuotannon suhteellista etua. Vastaavasti kilpailijoiden määrän kasvu, jonka myötä tuottajaksi valikoituu yhä tehokkaampi yritys, vähentää julkisen tuotannon suhteellista etua. Tämä tulos auttaa myös ymmärtämään, miksi sellaiset palvelutarpeet, joiden tyydyttämiseksi tarvittavia toimenpiteitä on vaikea määrätä ennalta, soveltuvat huonoimmin kilpailun ja yksityisen tuotannon piiriin.

Tutkimuksessa tarkastellaan myös tilannetta jossa julkinen tilaaja investoi palvelutarpeen havainnointiin yksityisen tuotannon oloissa. Onnistuneen monitoroinnin ansioista myös julkinen tilaaja tulee tietoiseksi todellisesta palvelutarpeesta. Kun sekä yksityinen tuottaja että julkinen tilaaja ovat tietoisia palvelutarpeesta, jota ei edelleenkään voida todistettavasti havaita, ne voivat yhdessä sopia, että palvelusuoritteet sovitetaan vastaamaan todellisia palvelutarpeita. Tämä palvelusuoritteiden korjaaminen sopimuksessa määrätystä tasosta aikaansaa lisäetua, joka jaetaan osapuolten neuvotteluvoiman mukaan. Tutkimuksessa osoitetaan, että julkisen tuottajan ei kuitenkaan kannata aina investoida monitorointiin ja että julkisen tilaajan neuvotteluvoiman vahvistuminen kasvattaa investointeja monitorointijärjestelmään.

Lopuksi tarkastellaan tilannetta, jossa tilaaja ei voi havaita yksityisen tuottajan palvelusuoritetta, minkä vuoksi se pyrkii määräämään tuotantopanokset jo palvelusopimuksessa. Palvelutason turvaaminen panosten kautta on tavanomaista Suomenkin kuntapalveluiden tuottamista koskevissa sopimuksissa. Tässä käytännössä huutokauppa kuitenkin menettää seulontakykynsä marginaalikustannusparametrin suhteen.

ABSTRACT

This study focuses on the production services which are purchased by the government. We consider whether the delivery of the service should be public or private. The social impact of the service is determined by the satisfaction of unforeseen individual needs. Assuming that the information about these needs is ex post observed only by the supplier of the service favours public production. Auctioning the right-to-produce contract, however, selects the most cost-efficient private supplier. Whether private production is optimal resolves from the trade-off between cost efficiency and a failure in meeting individual needs. We also analyse investments in monitoring.

Keywords: service production, public or private and auction

JEL Classifications: L24 and D44

1 Introduction

The extent to which the services - whose primary purchaser is government institutions - are publicly produced varies from one country to another. Welfare services, for example, are even nowadays provided in-house in many countries. Empirical studies (see Meggison and Netter, 2001) have found that privatisation leads to lower costs in various industries and it is widely suggested that competition and privatisation of public service production should be favoured in those countries in which public organisations still produce the bulk of these services. On the other hand, recent studies and reports on the effectiveness in schooling (Dronkers and Robert, 2003) or on health expenditures and on the overall performance of health care systems (see e.g. Anell and Willis, 2000; The World Health Report, 2000) do not support the idea that the expansion of pro-profit units, at least, would improve performance. Ohlsson (2003) has also noticed that the cost advantage of contraction out - discovered by many studies which analyse cross section data – can disappear when one controls the selectivity bias. These mixed findings raise the question: Are there any special features in the provision of publicly provided services which set limits to competition and to consequent privatisation? How does the production the services - which are typically publicly produced - differ from the production of other services and commodities?

This study is theoretical, and by defining the unique characteristics of the service, which have a potential for public production, we bring new insight into the decision whether or not to privatise. We take for granted the fact that the service under consideration is publicly financed and address the issue as to whether the delivery of the service should be public or private. Because it is widely considered that the most efficient way to privatise is the use of competitive public tender, in this study we explicitly model the auction mechanism which selects the most efficient private supplier. So, we actually compare public provision with private provision and competition. We also analyse the situation in which the public purchaser invests in monitoring the needs which the private provision should respond to.

Most of the previous literature which focuses on public versus private provision considers a model in which production is divided into two phases: first, an investment in a fixed asset and, after that, the asset is used to provide the service. In this framework it is not only the issue between public ownership and provision versus private ownership and provision (as in Schmidt (1996) and in Hart et al. (1997)) but one can also consider whether the government should own the asset and purchase the service from a private provider or whether the ownership should also be allocated to the private firm (as in Bentz et al., 2003). The latter situation in which the private firm owns the asset and the provides the service for the government (the so-called public-private partnership) can also be organised in two ways: in unbundling, the builder of the asset and the provider of the service are selected separately; in bundling, both the building and provision are allocated to the same firm (see Hart, 2002). In these frameworks the hold-up problem plays a central role owing to the sunk investments in the relation-specific asset, which is then later used in the delivery of the service. In Hart et al. (1997) and Hart (2002) the investments in a fixed asset, which are seen to improve quality and also reduce costs, precede the efforts to reduce costs at the expense of the service quality. In any case, these two types of actions raise a trade-off between cost savings and quality improvements. This dualism in the effort setting also characterises Sörensen's (2004) framework, in which the agent can promote either his/her private interests or alternatively exert effort which improves the quality of the service. Insofar as the outcomes are unverifiable, the split of benefits can only be based on incomplete contracting. In Hart et al.s' (1997) model the extent to which the government (the purchaser) "holds up" the producer in the bargain over the mutually observed surplus is contingent on the ownership of the non-human assets. Private ownership also creates stronger incentives to exert effort to save costs and deteriorate quality. At the best, the quality deterioration associated with private production remains minor. In Schmidt's (1996) adverse selection framework, private ownership makes it possible for the governmental purchaser to commit to hard budget constraints. In its strivings toward costs savings, the private firm then outperforms the public firm which faces soft budget constraint. But performance in private ownership is impaired by the allocative inefficiency owing to private information of cost parameters.

Rather few studies have considered the regulator's incentives to monitor the service quality and the implications of the monitoring institution on the outsourcing decision. Sörensen (2004) allows the regulator to invest in monitoring and shows in his pure moral hazard framework that an increase in monitoring can induce the worker to strive harder for service quality.

Our setting differs from the previous literature in several aspects. First of all, in our framework, the quality is conceptually separated from the effectiveness which is associated with the satisfaction of individual needs. In our approach we stress the unforeseeable nature of the individual needs whose satisfaction defines the social impact of the service. This phenomenon is recognised (see, for example, Sandmo, 2002) but its implications are not profoundly analysed. By stressing that the provider of the service should respond to the unforeseen and ex post unverifiable individual needs - which is represented by the effectiveness parameter - we introduce a new approach in the modelling of service provision. The information about the value of the effectiveness parameter is the producer's private information. The high variance of this parameter characterises the production of, for example, welfare services as distinction of the production of many technical services and commodities. The public provider either does not know in advance exactly what it wants to be done when one should take actions in the many fields governmental or municipal policy.

In our adverse selection framework the nature selects the cost efficiency of potential suppliers and unlike most other studies which evaluate outsourcing we in this study explicitly model the competitive tender. This allows us to focus on the trade-off between competition and effectiveness violations. Owing to incomplete information of effectiveness, the auction mechanism cannot, however, induce the private producer to choose socially efficient production level as in Sappington and Stiglitz (1987). In our model competition adds cost efficiency, but simultaneously the pro-profit firm's tendency to minimise the level of output violates the effectiveness of the service.

In extending our consideration to cover monitoring we assume that by monitoring, the public purchaser also becomes able to observe, with a certain probability, the effectiveness parameter in the private provision. Mutual observation of effectiveness leads to bargaining over the spilt of the additional benefit which accrues when output is adjusted according to the effectiveness parameter. The approach introduced to assess the public purchaser's incentives to invest in monitoring[1] is fairly new in the literature. We show that the public purchaser pursues social efficiency by investing in monitoring if his/her ex-post bargaining power is high enough. The impact of the public purchasers' bargaining power on the social efficiency is then a reversal of that impact which the bargaining power has in the situation in which the supplier's

[1]Previously, Williamson (1964), Mirrlees (1975) and Calvo and Wellisz (1978) have recognised that the public supervisors must be given sufficient incentives to exert supervisory effort.

incentives to exert innovative effort should be strengthened as in the framework of Hart et al. (1997).

In the basic framework considered the public purchaser loses control of effectiveness in the private production, which, on its part, leads to allocative inefficiency and to losses in social welfare. We think that both private and public producers have an equal opportunity and ability to observe the needs which arise, react to them and evaluate how a response to them affects social welfare. On the other hand, neither a public nor a private firm - which are run by a manager - is assumed to have any incentive to deviate from the will of the owner. From this it follows that the privately owned firm tends to minimise the level of output (or quality) and deviate from the effectiveness norm, whereas a public firm pursues social welfare. To encounter the unresponsiveness related to the effectiveness parameter the public purchaser can only tend to control outputs in private provision and in this way fight against the tendency towards underproduction. As concerns the response to exposed effectiveness, we have assumed above that a public firm is benevolent and acts in line with the interests of the public purchaser (which represents the clients).

When a private producer is selected by auctioning the right-to-produce contracts - as we suppose - it becomes evident that a private producer is probably more cost-efficient than an alternative public supplier, in particular, in a thick market with many potential producers. This result applies at least when the cost efficiency of a public producer is drawn randomly from the same distribution as the cost efficiency of each private producer which participates in the auction. For the government the most effective mode to produce then resolves from the derived trade-off between allocative efficiency and cost efficiency. It is not surprising that the benefits of private production increase in the number of producers, in the cost inefficiency of the public supplier, in the variance of the parameter which defines cost efficiency and, inversely, in the variance of the parameter which defines the effectiveness of individual outputs.

This study is organised as follows: In chapter 2 we introduce the model. After this in chapter 3 we discuss the competitive tender which leads to private provision. In chapter 3 we also analyse public provision, after which we are able to compare the implications of public provision and private provision from the public purchaser's viewpoint. In chapter 4 we consider monitoring investments, which leads to bargaining over the additional benefit which accrues when the output is adjusted according to the mutually observed effectiveness. In chapter 5 we discuss the situation in which output is not verifiable and in 6 we consider more closely the correspondence of real life and the introduced model. Finally in chapter 7 we present conclusions.

2 The model

In the model considered the purchaser of the service is always public. But the producer can be either a public body or a private firm.

In the real world the contract - which defines the provision of welfare services - covers a wide range of different outputs and needs which should be satisfied. Without the loss of generality we consider, however, the provision of a single output. The value of a service for the provider is assumed to be $\beta S(q)$ so that $S' > 0$, $S'' < 0$ and q is the individual output. The effectiveness parameter β denotes the value of q for the public purchaser (which is the social value). We assume that β is uniformly distributed on the range $[\underline{\beta}, \overline{\beta}]$. Let $G(\beta)$ be $\beta's$ distribution function and $G'(\beta)$ be its density function. The value of β resolves when the need concerning q arises.

In the basic model, the effectiveness parameter β is observed only by a producer, and so in private provision it is observed only by the winning supplier after the auction. Delegating the production to the private firm the public authority loses its ability to see the needs which arise randomly, and so the public purchaser does not observe β when it materialises under private production. While producing itself, the public body observes β and can react to it. In the basic model output q and input z are verifiably observed. According to this, the quality of the output is also verifiable. We also explore the implication of the situation in which z is still verifiable and q is observed only by the producer and is not verifiable.

The production costs are linear and of the form z when z is an input to produce q. The production function is also linear and of the form $z = \theta_k q$ when θ_k is a producer $k's$ efficiency parameter. The nature selects each producer's type randomly from a uniform distribution $F(\theta_k)$, which has a support $[\underline{\theta}, \overline{\theta}]$. The efficiency parameter θ_k is a producer $k's$ private information. The number of potential private producers is n. A parameter θ_g denotes a public body's efficiency parameter which is also drawn randomly from $F(\theta_k)$. Then $E(\theta_g) = \frac{\underline{\theta}+\overline{\theta}}{2}$. The expected value for the winning supplier's cost parameter in private production is below $E(\theta_g)$ when $n \geq 2$. Without loss of generality we assume from now that only product q is supplied.

In private production the public purchaser sells the right-to-produce contract in a sealed bid auction. When the right-to-produce is auctioned the auctioneer specifies quantity-payment schedule $P(q)$, which defines how much the purchaser pays for an output q and which also induces each bidder to reveal its cost parameter[2].

In an extended version of the model we allow the public purchaser to become able to monitor unverifiable β after investing in monitoring capacity. We then assume that with a given probability $p(h)$ the purchaser is able to observe β when h denotes the monitoring effort. Then $p(0) = 0$ and $p'(h) > 0$, $p''(h) < 0$ when $h > 0$. If in private production the public purchaser also observes unverifiable β after the producer is selected, q can be adjusted to correspond to actual β and not only to $E(\beta)$ as in the absence of monitoring. This creates an additional benefit and the parties will bargain about how to split this gain. Contractual agreements about readjustment of

[2]See Dasgupta and Spulber (1989/90) and Chen (2003).

q according to mutually observed β are ruled out, because β is not verifiable.

We also make two additional assumptions.

Assumption 1. We assume that q, which is defined by the condition $\underline{\beta}S'(q) - \overline{\theta} = 0$, is positive.

This assumption guarantees that the interior solution for q and the purchaser's payoff are positive in public production and that the system-wide payoff is also positive in all cases. We also introduce another assumption.

Assumption 2. We assume that q^* defined by $E(\beta)S'(q) - (2\theta_k - \underline{\theta}) = 0$ is positive when $\theta_k < \overline{\theta}$ and non-negative when $\theta_k < \overline{\theta}$.

We will also show that $q^*(\theta_k)$ represents a symmetric Bayesian-Nash equilibrium strategy for the suppliers and that the Assumption 2 guarantees that in the private provision (of the basic model) the purchaser's payoff is also positive in all cases. The reserve price - which defines max x_k ($\in [\overline{\theta} - \underline{\theta}]$) for $\pi_k \geq 0$ (when π_k denotes firm $k's$ profits) - will then also be $\overline{\theta}$. The results of the analysis would not change qualitatively even if the reserve price lay inside the range $[\overline{\theta} - \underline{\theta}]$.

3 Results from the basic model

3.1 Private provision and auctioning supply contracts.

In this chapter we discuss public and private provision more closely. We will first consider private provision of the service by assuming that a private firm is selected through a right-to-produce auction, in the procedure which is analysed more closely in Dasgupta and Spulber (1989/90) and in Chen (2003). In private provision, the order of events is the following:

- The nature selects θ_k.

- The principal defines quantity-payment schedule $P(q)$ and arranges a sealed high-bid auction in which a right to produce is sold to the firm which bids the maximum quantity.

- The effectiveness parameter β materialises.

- The winning firm produces and is paid according to $P(q)$, if the quantity target specified is met. Otherwise, the producer is punished.

The expected system-wide payoff $E(SW1)$ in the private provision is

$$E(SW1) = \int_{\underline{\theta}}^{\overline{\theta}} \int_{\underline{\beta}}^{\overline{\beta}} [\beta(S(q(x_k)) - x_k q(x_k)]G'(\beta) f_{(1)}(x_k) d\beta dx_k. \tag{1}$$

where $f_{(1)}(x_k) = nF'(x_k)(1-F(x_k))^{n-1}$ is the density function of $\Phi \equiv \min\{\theta_1, \theta_2, ..., \theta_n\}$ and $q(x_k)$ represents firm $k's$ bid. In the auction considered the purchaser pays $P(q)$

for q units of output. Let $\Pi^k(\theta_k, x_k)$ denote firm $k's$ profits when θ_k is an actual cost parameter and x_k denotes the cost parameter insisted upon on which firm $k's$ bidding is based. Then

$$\Pi^k(\theta_k, x_k) = [P(q(x_k)) - \theta_k q(x_k)](1 - F(x_k))^{n-1}. \tag{2}$$

The truthtelling condition which makes firm k bid according to θ_k is then

$$\left.\frac{\partial \Pi^k(\theta_k, x_k)}{\partial x_k}\right|_{x_k=\theta_k} = 0.$$

This condition implies that

$$\left.\frac{\partial \Pi^k(\theta_k, x_k)}{\partial \theta_k}\right|_{x_k=\theta_k} = -q(x_k)(1 - F(x_k))^{n-1}. \tag{3}$$

The second order condition that $\left.\frac{\partial \Pi^k(\theta_k, x_k)}{\partial x_k}\right|_{x_k=\theta_k} = 0$ defines a maximum so that the incentive compatibility constraint $\Pi_b^k(\theta_k, \theta_k) \geq \Pi_b^k(\theta_k, x_k)$ is fulfilled, requires that $\frac{\partial^2 \Pi^k(\theta_k, x_k)}{\partial x_k \partial \theta_k} \geq 0$. We obtain from (3)

$$\frac{\partial^2 \Pi^k(\theta_k, x_k)}{\partial x_k \partial \theta_k} = -\frac{\partial q(x_k)}{\partial x_k}(1 - F(x_k))^{n-1} + q(x_k)(n-1)(1 - F(x_k))^{n-2} F'(x_k) \tag{4}$$

which is non-negative because $\frac{\partial q(x_k)}{\partial x_k}$, derived from the first-order condition (9) below, is negative. Let Π_{qP}^k denote $\frac{\partial(\Pi^k(\theta_k, x_k)/\partial q}{\partial(\Pi^k(\theta_k, x_k)/\partial P}$. The local condition (3) for truthful revelation is also global because the model considered meets the so called Mirrlees-Spence property or single-crossing property (see Guesnerie and Laffont (1984) and Laffont and Martimort (2002)), according to which $\frac{\partial \Pi_{qP}^k}{\partial \theta_k} = -(1 - F(x_k))^{n-1}$ preserves its sign.

Above, the effectiveness resolves only after the winning supplier is selected. The winning supplier's willingness to pay for the right to produce is not a function of parameter β, and so no such efficiency-improving mechanism exists which would make a winning supplier reveal β after its real value has been materialised and base its behaviour on β. We can say that firm k is unresponsive with respect to β, because such a mechanism does not then exist which would implement the symmetric-information allocation in which output is set on the basis of the true value of the effectiveness parameter[3]. This excludes an opportunity to renegotiate the contract in private provision after the real value of the effectiveness parameter is exposed to the producer.

Define $\Pi^k(\theta_k) = \Pi^k(\theta_k, \theta_k)$. Setting $\Pi^k(\overline{\theta}_k) = 0$, one then obtains from condition (3) for the producer's profits

$$\Pi^k(\theta_k) = \int_{\theta_k}^{\overline{\theta}} q(x_k)(1 - F(x_k))^{n-1} dx_k, \tag{5}$$

The expected profits, derived from (5) are then (see Chen, 2003)

$$E(\Pi^k(\theta_k)) = \int_{\underline{\theta}}^{\overline{\theta}} q(x_k)(1 - F(x_k))^{n-1} F(x_k) dx_k. \tag{6}$$

Equating the right-hand side of (5) to the right-hand side of $\Pi^k(\theta_k, \theta_k)$ in (2), one

[3]Caillaud et al. (1988) refer by unresponsiveness to the situation, analysed by Guenerie and Laffont (1984), in which the implementation of incentive-compatible allocation would conflict with the principal's interests. Implementability - when an agent possesses private information - is also considered more closely in Laffont and Martimort (2002).

obtains for $P(q(\theta_k))$ an expression

$$P(q(\theta_k)) = \theta_k q(\theta_k) + \frac{\int_{\theta_k}^{\overline{\theta}} q(x_k)(1 - F(x_k))^{n-1} F(x_k) dx_k}{(1 - F(\theta_k))^{n-1}} \tag{7}$$

The latter term on the right-hand side of (7) reflects the size of an informational rent which arises when the revelation mechanism implied by an auction deters each bidder from mimicing less efficient bidders. The sum of the producers' expected profits is n times the expression (6). The purchaser's expected profits are obtained by subtracting $nE(\Pi^k(\theta_k))$ from $E(SW1)$ in (1). The difference, denoted by $E(W^p(\theta_k))$, can then be written as

$$E(W^p(\theta_k)) = \int_{\underline{\theta}}^{\overline{\theta}} [E(\beta)S(q(x_k)) - \widetilde{H}(x_k)q(x_k)] f_{(1)}(x_k) dx_k \tag{8}$$

where $\widetilde{H}(x_k) = x_k + \frac{F(x_k)}{F'(x_k)}$. In (8) it has also been taken into account that the government chooses the optimal q independently of actual β. Let $q^* \equiv \arg\max W^p(\theta_k)$. A condition

$$E(\beta)S'(q) - \widetilde{H}(x_k) = 0. \tag{9}$$

then defines q^*. It is clear that schedule $q^*(x_k)$ then maximizes the purchaser's expected profits (8), because the necessary second order condition (4) guarantees that q^* arises as a Bayesian-Nash equilibrium in the auction considered.

The condition (9) also shows that q^* decreases in x_k and, on the ground of Assumption 2, $q^* > 0$, from which it follows that the maximum for x_k below which supplier k will find it worthwhile to participate is $\overline{\theta}$ or above it. Owing to this, a reserve price is set at the level $\overline{\theta}$. The purchaser's expected payoff in the maximum, denoted by $E(\widehat{W}^1)$, is

$$E(\widehat{W}^1) = \int_{\underline{\theta}}^{\overline{\theta}} \widehat{W}^1 f_{(1)}(x_k)dx_k. \tag{10}$$

when $\widehat{W}^1 = E(\beta)S(q^*) - \widetilde{H}(x_k)q^*$. Because $F(x_k)$ follows uniform distribution, $F(x_k) = \frac{x_k - \underline{\theta}}{\overline{\theta} - \underline{\theta}}$ and $F'(x_k) = \frac{1}{\overline{\theta} - \underline{\theta}}$. Furthermore, then $\widetilde{H}(x_k) = 2x_k - \underline{\theta}$ and $f_{(1)}(x_k) = n\frac{(\overline{\theta} - x_k)^{n-1}}{(\overline{\theta} - \underline{\theta})^n}$.

3.2 Public provision

In public provision the production phase succeeds the resolution of θ_g and the output decision is adjusted according to an observed β. The optimal q, denoted q^{**}, is obtained from $\arg\max_q W^2$ when $E(W^2) = \int_{\underline{\beta}}^{\overline{\beta}} [\beta S(q) - \theta_g q] G'(\beta) d\beta$. The assumptions of the model guarantee that the first-order conditions

$$\beta S'(q) - \theta_g = 0 \tag{11}$$

define q^{**}. $E(\widehat{W}^2)$ - which denotes the purchaser's expected payoff in the maximum in the case under consideration - then has the equation

$$E(\widehat{W}^2) = \int_{\underline{\beta}}^{\overline{\beta}} \widehat{W}^2 G'(\beta) d\beta. \tag{12}$$

when $\widehat{W}^2 = \beta S(q^{**}) - \theta_g q^{**}$.

3.3 Comparison

Comparing the outcomes of private and public provision, it is evident that public provision brings for the public purchaser a larger outcome than private provision if $\theta_g = \theta_k$ (= the winning private supplier's efficiency). But when the number of private competitors is at least two, the expected θ_k is less than the expectation for θ_g, and at least in the situation in which the spread $\overline{\beta} - \underline{\beta}$ is insignificant, private provision outperforms public provision. Owing to the continuity of the model considered, it is obvious that such cut-off points exist in which the public purchaser is equally well-off in public and private provision, although $\theta_g > \theta_k$ and $\overline{\beta} - \underline{\beta} > 0$. The assumptions of the model do not, however, guarantee that such a cut-off point exists for any θ_k. Despite this, we are able to show in detail how an increase in the uncertainty related to effectiveness and, on the other hand, the competitiveness of the private market affect the trade-off between public and private provision.

Proposition 1 Part A: *Given* $\underline{\beta}+\overline{\beta} = A$*, and increase in the spread* $\overline{\beta}-\underline{\beta}$ *decreases* $E(\widehat{W}^1)$ *in relation to* $E(\widehat{W}^2)$*.*

Part B: *The above effect is opposite when the number of bidders increases.*

Proof. Part A) of the proof. We first show that an increase in $\overline{\beta} - \underline{\beta}$ increases the relative benefits of public provision. Let us write the integral $\int_{\underline{\beta}}^{\overline{\beta}}$ in the form $\int_{A-\overline{\beta}}^{\overline{\beta}}$ and consider the changes in $E(\widehat{W}^2) - E(\widehat{W}^1)$. We obtain $\frac{\partial \widehat{W}^2}{\partial \beta} = S(q^{**}) > 0$,

$\frac{\partial^2 \widehat{W}^2}{\partial \beta^2} = -\frac{(S'(q^{**}))^2}{\beta S''(q^{**})} > 0$ which shows that $\widehat{W}^2(\beta)$ is increasing in β and is strictly convex with respect to β. Owing to this, $\frac{1}{2}(\widehat{W}^2(\overline{\beta}) + \widehat{W}^2(\underline{\beta})) > E(\widehat{W}^2) = \frac{1}{\overline{\beta}-\underline{\beta}} \int_{\underline{\beta}}^{\overline{\beta}} \widehat{W}^2(\beta)d\beta$, and so $\frac{\partial E(\widehat{W}^2)}{\partial \overline{\beta}} = \frac{1}{\overline{\beta}-\underline{\beta}}(\widehat{W}^2(\overline{\beta}) + \widehat{W}^2(\underline{\beta})) - \frac{2}{(\overline{\beta}-\underline{\beta})^2} \int_{\underline{\beta}}^{\overline{\beta}} \widehat{W}^2(\beta)d\beta > 0$, given $\underline{\beta} + \overline{\beta} = A$. This shows that an increase in the spread $\overline{\beta} - \underline{\beta}$ increases the purchaser's payoff in the public provision. On the other hand, $\frac{\partial E(\widehat{W}^1)}{\partial \overline{\beta}} = 0$, given $\underline{\beta} + \overline{\beta} = A$. The widening of the spread $\underline{\beta} - \overline{\beta}$ thus increases $E(\widehat{W}^2) - E(\widehat{W}^1)$.

Part B) of the proof. In the second part we show that an increase in n increases the relative benefits of the private provision, given $\overline{\beta} - \underline{\beta}$. An increase in n increases $f_{(1)}(x_k)$ when θ_k is near $\underline{\theta}$ and when $\widehat{W}^1$ is also largest, whereas when θ_k is near $\underline{\theta}$ an increase in n decreases $f_{(1)}(x_k)$. But in the latter case the value of $\widehat{W}^1$ is below the average. From this and from the fact that $\int_{\underline{\theta}}^{\overline{\theta}} f_{(1)}(x_k)dx_k = 1$, it follows that an increase in n increases $E(\widehat{W}^1)$ in (10). ■

The result which is derived above is rather intuitive. The benefits of private provision arise from the competitive auction mechanism, which selects the most efficient (private) producer. In choosing the production mode, the purchaser then trades off these efficiency gains against the losses in allocative efficiency which accrue from the lack of opportunities to observe individual needs in private provision. The intense of competition also affects this trade-off in that respect that competition also decreases informational rents and raises the level of private production closer to the social optimum.

4 Monitoring in private provision

4.1 Monitoring investments and bargaining

We now focus on the situation in which the purchaser invests in monitoring the private provision. This offers an opportunity to obtain an additional benefit by adjusting output according to β, instead of $E(\beta)$, if β is also observed by the purchaser. The mutual observation of β would make it, in any case, beneficial for both the parties - the public purchaser and the private provider - to recontract and bargain on splitting the additional benefit. The splitting ratio would reflect the bargaining power of the parties. Bargaining would occur only after the winning supplier is selected. Recognising this, the public purchaser will also auction the right to bargain simultaneously as the right-to-produce is auctioned in order to obtain a maximal advantage of the bargaining opportunity.

In private provision the purchaser observes β with probability $p(h)$. In the situations to be considered an investment h is, in any case, completed before β materialises. The investment in h is relation specific and sunk at the moment of the actual bargain. From this it follows that the investment costs associated with h are solely carried by the purchaser alone and that the right to bargain must already be sold in conjunction with the regular right-to-produce auction. An option to adjust the pre-specified output target via bargaining is sold in an auction at the fixed price, denoted by $c(\theta_k)$, because it is not possible to fix the target level for q before β materialises. The winner in the extended auction, in which the right to bargain is also sold, is the producer whose cost parameter θ_k is the lowest.

Let $E(SWB1)$ denote that part of the system's expected payoff which accrues from the right-to-produce contract (in the absence of bargaining). Then:

$$E(SWB1) = \int_{\underline{\theta}}^{\overline{\theta}} E(\beta)S(q(\theta_k)) - x_k q(x_k) f_{(1)}(x_k) dx_k.$$

Let $E(SWB2)$ denote the expected maximum of the system-wide payoff when β is mutually observed. Then

$$E(SWB2) = \int_{\underline{\theta}}^{\overline{\theta}} \int_{\underline{\beta}}^{\overline{\beta}} [\beta S(q^o(x_k)) - x_k q^o(x_k)] G'(\beta) f_{(1)}(x_k) d\beta dx_k.$$

Above, $\int_{\underline{\beta}}^{\overline{\beta}} q^o(x_k) G'(\beta) d\beta$ represents an anticipated value for q when bargaining is possible. The condition

$$\beta S'(q) - x_k = 0 \tag{13}$$

then defines $q^o =: \arg\max_q E(SWB2)$. Output q^o is then a function of β, too. We, however, use the notation $q^o(x_k)$, instead of $q^o(x_k, \beta)$. The expectetation $\int_{\underline{\beta}}^{\overline{\beta}} q^o(x_k) G'(\beta) d\beta$ is denoted by $E(q^o(x_k))$.

The expected system-wide profits $E(SWB)$ in the situation considered are then

$$E(SWB) = (1 - p(h))E(SWB1) + p(h)E(SWB2) - h. \tag{14}$$

The parties - the purchaser and the private producer - then bargain over the split of an additional benefit $E(SWB2) - E(SWB1)$ with probability $p(h)$. The purchaser is assumed to obtain a share λ, $(0 \leq \lambda \leq 1)$ of $E(SWB2) - E(SWB1)$. The level of λ resembles the purchaser's ex post bargaining power. Let us then analyse more closely the implications of a bundled auction in which the right-to-produce and the opportunity to bargain over the additional benefit are auctioned simultaneously.

4.2 Bundled auction - Investment after the auction and the optional price

4.2.1 Output decision

The purchaser must invest in monitoring capacity in any case before β appears. The supplier $k's$ total payoff $\Pi_b^k(\theta_k, x_k)$ is then

$$\begin{aligned}\Pi_b^k(\theta_k, x_k) &= \{P(q(x_k)) - \theta_k q(x_k) + p(h))[(1-\lambda)(SWB2(\theta_k, x_k) - SWB1(\theta_k, x_k)) \\ &\quad -c(x_k)]\}(1 - F(x_k))^{n-1} \qquad (15)\end{aligned}$$

where $SWB2(\theta_k, x_k) = \int_{\underline{\beta}}^{\overline{\beta}}[\beta S(q^o(x_k)) - \theta_k q^o(x_k)]G'(\beta)d\beta$ and $SWB1(\theta_k, x_k) = E(\beta)S(q(\theta_k)) - \theta_k q(x_k)$. The supplier's income in (15) consists of three parts. The first is $P(q(x_k)) - \theta_k q(x_k)$, the income from the right-to-produce contract. The second is $p(h))(1-\lambda)(SWB2(\theta_k, x_k) - SWB1(\theta_k, x_k))$, the share of the additional income which accrues, if output is adjusted according to actual β. The supplier must also pay $c(x_k)$ for the right to bargain if β_i is mutually observed and the parties decide to bargain.

The auction induces supplying firms to reveal their type and maximise $\Pi_b^k(\theta_k, x_k)$ with respect to x_k so that $\frac{\partial \Pi_b^k(\theta_k, x_k)}{\partial x_k} = 0$. Applying the envelope theorem, we obtain from (15)

$$\left.\frac{\partial \Pi_b^k(\theta_k, x_k)}{\partial \theta_k}\right|_{x_k=\theta_k} = -[q(x_k) + p(h)(1-\lambda)(E(q^o(x_k)) - q(x_k))](1-F(x_k))^{n-1}. \quad (16)$$

The second-order condition for the incentive compatibility is given in the Appendix. Because $\frac{\partial \Pi_{aP}^k}{\partial \theta_k} = -[1-p(h)(1-\lambda)](1-F(x_k))^{n-1}$ preserves its sign, the incentive compatible condition is also valid globally.

Define $\Pi_b^k(\theta_k) = \Pi_b^k(\theta_k, \theta_k)$. Setting $\Pi_b^k(\theta_k) = 0$, one obtains from (16)

$$\Pi_b^k(\theta_k) = \int_{\theta_k}^{\overline{\theta}} [q(x_k) + p(h)(1-\lambda)(E(q^o(x_k)) - q(x_k))](1-F(x_k))^{n-1} dx_k \quad (17)$$

The expected profits derived from (17) are

$$E(\Pi_b^k(\theta_k)) = \int_{\underline{\theta}}^{\overline{\theta}} [q_i(x_k) + p(h)(1-\lambda)(E(q^o(x_k)) - q(x_k))](1-F(x_k))^{n-1} F(x_k) dx_k \quad (18)$$

The sum of all n producer's expected profits is $nE(\Pi_b^k(\theta_k))$. The purchaser's expected profits $E(WPU)$ are then

$$\int_{\underline{\theta}}^{\overline{\theta}} (WPU) f_{(1)}(x_k) dx_k = E(SWB) - nE(\Pi_b^k(\theta_k)) \quad (19)$$

when $E(SWB)$ is defined in (14) and $E(\Pi_b^k(\theta_k))$ in (18). WPU in (19) then has an equation

$$\begin{aligned} WPU &= (1-p(h))[E(\beta)S(q(x_k)-x_k q(x_k)] \\ &+p(h)[\int_{\underline{\beta}}^{\overline{\beta}}[\beta S(q^o(x_k))-x_k q^o(x_k)]G'(\beta)d\beta \\ &-[(1-p(h)(1-\lambda)q(x_k)+p(h)(1-\lambda)(E(q^o(x_k))]\frac{F(x_k)}{F'(x_k)}-h \end{aligned} \tag{20}$$

WPU in (20) is increasing and concave in q, and so the condition

$$E(\beta)S'(q(x_k))-\widetilde{H}(x_k)+\lambda\frac{p(h)F(x_k)}{(1-p(h))F'(x_k)}=0, \tag{21}$$

obtained from (20), defines $q^+(x_k) \equiv \arg\max_q WPU$. The output schedule $q^+(x_k)$ also maximises $E(WPU)$, because the validity of the second order condition (27) (presented in the Appendix) proves that $q^+(x_k)$ is a Nash-equilibrium bidding strategy for the winning supplier. An opportunity to readjust the output and bargain over the extra benefit also has an effect on the level of output q in the right-to-produce auction.

Proposition 2 *When $h > 0$ and $\lambda > 0$ an opportunity to obtain an extra benefit through bargaining shifts output $q(\theta_k)$ upwards, given θ_k.*

Proof. Comparing $q^+(x_k)$, defined by (21) with $q^*(x_k)$ defined by (9), proves $q^+(x_k) > q^*(x_k)$, because $\lambda\frac{p(h)F(x_k)}{(1-p(h))F'(x_k)} > 0$ in (21) and $S'(q(x_k))$ decreases in q. ■

The opportunity to monitor β corrects the downward bias of q which is created by the pre-fixing of q and concavity of $S(q)$. In the appendix it is also shown that the output level defined by (21) is, however, below $E(q^o(x_k))$. This auxiliary result - which is used in analysing the level of h - is proved in two stages.

4.2.2 Monitoring decision

Concerning the monitoring investment we first consider a situation in which this investment is taken after the auction (but, of course, before effectiveness parameter β materialises). We use the following notation: $SWB1(\theta_k) \equiv SWB1(\theta_k, \theta_k)$ and $SWB2(\theta_k) \equiv SWB2(\theta_k, \theta_k)$. The purchaser's profits can then be written in the form

$$\begin{aligned} WPU2 &= E(\beta)S(q^+(\theta_k)) - P(q^+(\theta_k)) + p(h)\lambda[SWB2(\theta_k) - SWB1(\theta_k)] \\ &\quad + p(h)c(\theta_k) - h \end{aligned} \tag{22}$$

when $q^+(\theta_k)$ is replaced by $q(\theta_k)$ in the expression $SWB1(\theta_k)$. Replacing $q^+(\theta_k)$ by $q(\theta_k)$ and writing (15) in the form $\Pi_b^k(\theta_k, \theta_k)$ and equating the right hand-side of the equation obtained to the right-hand side of (17), one can solve expressions for $P(q^+(\theta_k))$ and $c(\theta_k)$ in (22). For the quantity-payment schedule $P(q^+(\theta_k))$ one again obtains the equation (7). For the price of the bargaining opportunity we obtain an equation

$$c(\theta_k) = (1 - \lambda)[SWB2(\theta_k) - SWB1(\theta_k)] \tag{23}$$

$$-\frac{\int_{\theta_k}^{\overline{\theta}}(1-\lambda)(E(q^o(x_k))-q^+(x_k))(1-F(x_k))^{n-1}dx_k}{(1-F(\theta_k))^{n-1}}.$$

The above expression of $c(\theta_k)$ shows that by auctioning the bargaining opportunity, the purchaser is able to obtain the supplier's share of the ex post bargain minus the informational rent, which is the second term on the right-hand side of (23). Inserting the derived expressions for $P(q(\theta_k))$ and $c(\theta_k)$ into (22), we obtain

$$\begin{aligned} WPU2 &= E(\beta)S(q^+(\theta_k))-\theta_k q^+(\theta_k)-\frac{\int_{\theta_k}^{\overline{\theta}}q^+(x_k)(1-F(x_k))^{n-1}dx_k}{(1-F(\theta_k))^{n-1}} \\ &\quad +p(h)[SWB2(\theta_k)-SWB1(\theta_k) \\ &\quad -\frac{\int_{\theta_k}^{\overline{\theta}}(1-\lambda)(E(q^o(x_k))-q^+(x_k))(1-F(x_k))^{n-1}dx_k}{(1-F(\theta_k))^{n-1}}]-h \end{aligned} \tag{24}$$

The first-order condition, obtained from (24), is

$$p'(h)[SWB2(\theta_k)-SWB1(\theta_k)-\frac{\int_{\theta_k}^{\overline{\theta}}(1-\lambda)(E(q^o(x_k))-q^+(x_k))(1-F(x_k))^{n-1}dx_k}{(1-F(\theta_k))^{n-1}}]-1=0 \tag{25}$$

and this equation defines $\arg\max_h WPU2$, denoted by h^o.

It is interesting to compare h^o with a socially optimal h, denoted by h^s, which maximizes social welfare $SWB = (1-p(h))SWB1(\theta_k)+p(h)SWB2(\theta_k)$. The condition

$$p'(h)[SWB2(\theta_k)-SWB1(\theta_k)]-1=0 \tag{26}$$

then defines $h^s \equiv \arg\max_h SWB$. The assumptions of the model do not guarantee that the inner-point solution of the condition (26) defines a maximum. If the additional benefit, which accrues when q is adjusted according to the mutually observed β, is small and if the marginal benefits of monitoring investments $p'(h)$ are small in relation to the respective marginal costs whose size is -1, the left-hand side of (26) can be negative with all $h > 0$. The investments in monitoring would then be zero, even if one does not take into consideration the fact that the winning supplier will appropriate part of the additional benefit.

We obtain the following proposition concerning the level of monitoring investments:

Proposition 3 *Part A) When $h^s > 0$ and $\lambda < 1$, the purchaser sets h^o below h^s. Part B) The distortion in h^o decreases in λ. Part C) Given θ_k, the distortion in question decreases in n.*

Proof. Part A) Because $E(q^o(x_k)) - q^+(x_k) > 0$ in (25) and because $p'(h)$ decreases in h, h^o defined by (25) must be smaller than h^s.

Part B) It is straightforward that an increase in λ decreases h, defined by (25).

Part C) Given θ_k, the informational rent $\frac{\int_{\theta_k}^{\overline{\theta}} (1-\lambda)(E(q^o(x_k))-q^+(x_k))(1-F(x_k))^{n-1} dx_k}{(1-F(\theta_k))^{n-1}}$ decreases in n. This and the decreasing $p'(h)$ makes h^o increase in n and become closer to h^s. ■

The result obtained shows that the purchaser's bargaining power can even promote social welfare because the "hold-up" weakens the purchaser's (the government's) own investments. The previous results (see, for example, Hart et al., 1997) focused on the suppliers' incentives to invest in innovations. Then the purchaser's bargaining power improves the social welfare insofar as the positive cost savings effect dominates the negative quality deteriorating effect. It is also remarkable that competitiveness in terms of n will strengthen the purchaser's incentives to invest in h.

If the purchaser is supposed to invest in h before the auction, the first-order conditions which govern the investment decision are obtained by differentiating $EWPU$ in (19) with respect to h (when WPU is defined by (20)). The derived first-order conditions yield for h , however, a value which is exactly the same as h^o is expected to be before the auction. Regarding the level of h, the timing of investments is thus not decisive.

It is clear that the option to achieve extra benefit by adjusting q according to β is foreseen by the purchaser and suppliers. Therefore such a situation, in which the right to bargain is sold only after the winning supplier is selected in the right-to-produce auction, is excluded. In such a hypothetical situation the only potential utilizer of an opportunity to adjust q according to mutually observed β would be the winning supplier besides the purchaser. The purchaser would then loose all the power to obtain some extra benefit by making the potential suppliers compete against each other.

5 Only inputs are verifiable

We next consider a situation in which only the input but not the output is observed by the purchaser. We then address the question as to whether indirect control of an output through an input target could work when the input is verifiable. We assume that the quality of input - like labour input - largely determines the intrinsic quality of individual output. This is understandable; by making sure that the producer has a sufficient amount of properly educated staff the purchaser can, to a certain extent, make sure that the most severe violations in the quality of the service are cancelled. This resembles the situation in which ownership does not affect the motives of the individual employees who are in charge of the quality. In the procurement contracts of welfare service the purchaser then controls the quality of the service delivered by making requirements about the quality of inputs.

When only z and not q is verifiable, the private information is then no longer responsive. This is seen when one replaces q by $\frac{z}{\theta_k}$, after which θ_k appears only in the gross benefits $S(\frac{z}{\theta_k})$ and thus not in the firm's payoff function. According to this, firm k becomes unresponsive with respect to θ_k, too, and so the most efficient firm cannot be selected by an auction mechanism.

6 Discussion

Our study departs from the previous analysis in that we abstract from the incentives to exert effort. Despite this, we are able to present a natural explanation for the trade-off between public and private production. In our approach, the assumptions of the parties' ability and power to bargain over the split of unverifiable benefits do not explain the choice between private and public provision in the basic setting considered either. Abstracting from moral hazard, our results do not reflect such an asymmetry in the severity of the principal-agent conflict between the private and public ownership which is considered by Hart et el. (1997). In Hart et al.'s (1997) model the principal-agent conflict in the private ownership is faded out by assuming that a private firm is represented by a manager/owner, while in the public ownership this conflict is exposed by the separating of ownership and management.[4] We take for granted the extent of the governmental failure - which appears as relatively low cost efficiency - and regard it as being unresponsive to those factors which determine the scope of private failure. This lets us specify those conditions which determine the relative eligibility of public production.

[4]This set-up was already criticised by Schmidt (1996). Aghion and Tirole (1994) applied an incomplete-contracting approach in analysing an inventor's behaviour. Assuming an inventor as being a manager/owner then seems to be natural in this framework. But when one analyses the behaviour of large institutions like hospitals or prisons the above assumption is highly dubious.

All in all, the implications of our model crucially depend on what we assume about the information of effectiveness. Let us consider more closely why we think that information of effectiveness matters so much in the provision of welfare services. The service in the situation under consideration is defined to mean the responsibility of taking care of the needs of many people in a certain area and in a specific field. A service considered is then running foreign or security policy, running a hospital, running a school or running a home for the elderly. To produce a service in a special field requires the production of multiple outputs of which each is a response to a special need. It is typical of the services in the above fields that individual needs arise randomly and one cannot foresee when and on what scale they will arise and how one is to respond to them. It is logical to assume that in the absence of monitoring opportunities the producer itself - and not the purchaser - will observe individual needs. Because of this, it is impossible in the contract to specify the actions which should be taken to satisfy the individual needs in an appropriate way. We, however, have extended the analysis to cover a situation in which the purchaser invests in monitoring to become able to observe the individual needs when they materialise.

Concerning private goods, one may also argue that letting individuals choose the service provider by themselves could increase the effectiveness in the delivery of services. We, however, abstract from the conduct in which a public provider gives, for example, a voucher which entitles its holder to buy a service from alternative producers. We think that vouchers act in certain situations, but in many instances the holder of a voucher faces similar problems as the benevolent governmental purchaser. When individual needs arise randomly and, on the other hand, when the costs related to the specification of individual needs and to the switching of the provider are large, the voucher is designed to buy a bunch of services which are to be produced in the future. Then inadequate control of the service level is still present. In addition, the individuals' ability to monitor the service level and make the suppliers compete is often even more restricted than the governmental purchaser's ability.

7 Conclusions

Contracting out of the service production seems to be most difficult in the core of various governmental and municipal policies. In addition, despite the recommendations given by various economic advisors and international organisations such as OECD, the tendency toward contracting out in the field of welfare services has been rather slow in those industrialised countries in which the state and municipalities still produce themselves a huge part of those services which cover education, health and various social services. The tendency toward private provision is slowed down by the cautious attitude of political decision-makers and authorities. Maybe the experiences of private provision do not encourage them to take big steps toward privatisation of these services. On the other hand, in the field of technical services - which used to be quite widely produced by the state and municipalities - the pace toward private production has been rather fast. On the whole, the extent to which public entities are involved in the production of services varies very much from one country to another in the developed industrial world. Simultaneously, economic theory and the advisory apparatus of professionals do not see much scope for public production. We think that, after all, the trade-off between public and private provision is still a neglected subject in economic theory. By focusing on the unverifiable and unforeseen nature of individual needs which service production should satisfy, we introduce new insight into the topic under consideration. At the same time we add some understanding of the countries which still continue to produce welfare services publicly.

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8 Appendix

8.1 The second order condition

The second-order condition related to (16) requires that the expression

$$\frac{\partial^2 \Pi_b^k}{\partial x_k \partial \theta_k} = -(1-p(h)(1-\lambda))\frac{\partial (q^+(x_k)(1-F(x_k))^{n-1})}{\partial x_k} \tag{27}$$

$$-p(h)(1-\lambda)\int_{\underline{\beta}}^{\overline{\beta}}[\frac{\partial(q^o(x_k)(1-F(x_k))^{n-1})}{\partial x_k}))^{n-1}G'(\beta)d\beta.$$

is non-negative. Clearly, $q^+(x_k)$ defined by (21) and $q^o(x_k)$ defined by (13) decrease in x_k, and so $(1-F(x_k))^{n-1})$. This guarantees that the above condition is valid.

8.2 $q^o(x_k)$ is greater than $q^+(x_k)$

The proof is given in two stages. First stage: Above $\frac{F(x_k)}{F'(x_k)} = x_k - \underline{\theta}$, and so the left-hand side of (21) can be written in the form

$$E(\beta)S'(q(x_k)) - [x_k + \frac{(x_k-\underline{\theta})(1-p(h)(1-\lambda))}{(1-p(h))}].$$

From this one sees directly that $q^+(x_k)$ is below $q^a(x_k)$ when q^a is defined by $E(\beta)S'(q(x_k)) - x_k = 0$.

Second stage: Let $q^a(E(\beta))$ denote q^a, given x_k and $E(\beta)$ and $q^o(\beta)$ denote q^o, given x_k and β. We obtain from the above condition and, from the condition (13), the equation:

$$E(\beta)S'(q^a(E(\beta)) = \beta S'(q^o(\beta))$$

with all β. From this it follows that

$$E(\beta)S'(q^a(E(\beta))) = \int_{\underline{\beta}}^{\overline{\beta}} \beta S'(q^o(\beta))G'(\beta)d\beta. \qquad (28)$$

Suppose now that $\int_{\underline{\beta}}^{\overline{\beta}} q^o(x_k)G'(\beta)d\beta = q^a(E(\beta))$. On the other hand, owing to the assumptions of the model, $S'(q^o((\beta))$ is convex in β from which it follows that

$$\int_{\underline{\beta}}^{\overline{\beta}} \beta S'(q^a) G'(\beta) d\beta > E(\beta) S'(q^a(E(\beta))).$$

The equation (28), however, requires that the left-hand side of this inequality must decrease. Accordingly, q^o rises above q^a, and so also above q^+.