THE PROPER SCOPE OF GOVERNMENT: THEORY AND AN APPLICATION TO PRISONS

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INTRODUCTION

- In this paper we

—Deal with the following question-

When should a government provide a service in-house, and when should it contract out provision?

— Develop a model in which the provider can invest in improving the quality of service or reducing cost.

- Private contractor's **incentive** to engage **in cost reduction is** typically **stronger** because he ignores the **adverse effect on non-contractible quality**.
- The model is applied to understanding the **costs** and **benefits** of **prison privatization**.

THE MODEL

A. Basic Assumptions

- Society, represented by the government, wants a certain good or service to be provided.
- We assume that consumers cannot buy this good directly in the marketplace, e.g., because it is a public good.
- Two possibilities are

i. contract out the provision of this good, e.g., the government can write a contract with a private company to run a prison for five years.

ii. provide the good “in-house,” e.g., the government can arrange for public employees to run the prison.

BASIC IDEA

The crucial distinction between these arrangements concerns

- Who has **residual rights of control** over the nonhuman assets used to provide the service—we call these assets the "facility ***F"*** (e.g., **the prison**).
- If the good is **publicly provided** , then the **government** (represented by a bureaucrat), as owner, **has residual control rights** over the facility.
- If the good is **privately provided**, then the **private provider**, as owner, has **residual control rights** over the facility.
- Residual control rights **matter** because

—they **determine who** has the **authority** to approve changes in procedure or innovations in un contracted-for contingencies.

Assumptions.

We suppose

- The facility—**public or private**—is **run by a single manager**, *M*. There is also a **single bureaucrat** , represented by *G*.
- Bureaucrat perfectly represents the interests of society.
- *G* and *M* are able to write a long-term contract specifying **some** aspects of the good or service to be provided and the price.
- In fact, a **long-term** contract is **required** in the case where ***F* is private** in order to support relationship-specific investments.
- The good thus described in the contract is the "**basic**" good and denote its price by P_0.

Assumptions..

- Different **interpretations** of P_0

—If *F* is **private**, i.e., *M* owns *F*, then P_0 is the **price** that *M* as an independent contractor receives for providing the basic good.

— If *F* is **public**, i.e., *G* owns *F*, then P_0 is the **wage** that *M* receives as an employee.

- *M* does not get paid unless he provides the good.
- There are various contingencies that can arise which call for some modification of the basic good that they cannot specify.(e.g. use of force and quality of personnel)
- *M* can suggest a way to modify the prison to increase security. Or *M* may find a way to reduce costs by hiring cheaper (or fewer) guards.

Assumptions…

- There are so many possible contingencies ex ante that it is impossible to anticipate them all and contract on how to deal with them in advance. Instead the parties revise the contract ex post once it is clear what the relevant contingencies are.
- We refer to the basic good modified to allow for relevant contingencies as the "**modified good**."

Modified good yields

- Benefit *B* to society and costs the manager *C* to produce. *C* is a cost **borne directly by** *M.*
- For example, *B* might be the social benefit from having a prison with` few fights between inmates and well-fed and healthy prisoners.
- Although *B* cannot be measured or verified , we suppose that it can be represented by a dollar amount. Similarly, *C* can be represented in dollars.

Assumptions….

- Manager can manipulate *B* and *C* through prior effort choices.
- *M* can devote effort to two types of "**innovation**" relative to the basic good: a **cost** innovation and a **quality** innovation.
- A cost innovation leads to a reduction in costs *C* but is typically accompanied by a reduction in quality (i.e., *B*).
- Similarly, a quality innovation leads to an increase in quality, but is typically accompanied by an increase in costs.
- We write
- $B = B_0 - b(e) + \beta(i)$,
- $C = C_0 - c(e)$,

Assumptions…..

- e, i denote effort devoted to the cost innovation and quality innovation, respectively, $c(e) \geq 0$ is the reduction in cost corresponding to the cost innovation; $b(e) \geq 0$ is the reduction in quality corresponding to the cost innovation; and $\beta(i) \geq 0$ is the **quality increase net of costs** from the quality innovation.
- b plays a key role in this model: it **measures how much (non-contractible) quality falls because of a (non-contractible) cost cut .**
- $b(0)=0$, $b' \geq 0$, $b'' \geq 0$;
- $c(0)=0$, $c'(0)=\infty$, $c'>0$, $c''<0$, $c'(\infty)=0$;
- $\beta(0)=0$, $\beta'(0)=\infty$, $\beta'>0$, $\beta''< 0$, $\beta'(\infty)=0$;
- $c'- b' \geq 0$.

Assumptions……

- $c' - b' \geq 0$ => the quality reduction from a cost innovation does not offset the cost reduction
- $\beta' > 0$ => the cost increase from a quality innovation does not offset the quality increase.
- M's ex ante effort cost + C = M's overall costs. Total effort costs = $e + i$, and assume a zero interest rate (no discounting). Hence M's overall costs are

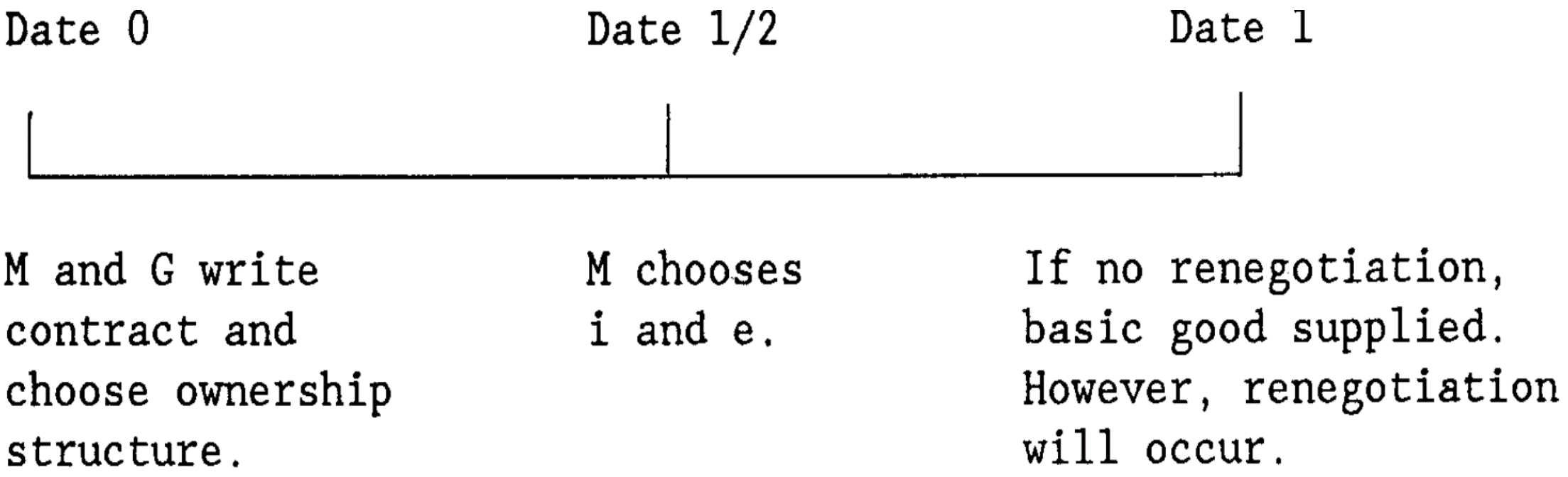
$$C + e + i = C_0 - c(e) + e + i .$$

- **Important assumption** : Although each innovation leads to a change in quality (in the case of the cost innovation, a reduction in quality), the initial contract is sufficiently vague or "incomplete" that neither innovation violates it.

Assumptions…….

- *i*, *e*, *b*, and *c* are observable to both *G* and *M*, but are **not verifiable** (to outsiders) and hence cannot be part of an enforceable contract. Similarly, *G*'s benefits and *M*'s costs are observable, but not verifiable or transferable, which means that revenue and cost-sharing arrangements are infeasible.
- Specifically, there is no facility available other than *F* that can supply society, and there is no other potential customer for the service (e.g., a prison) apart from *G*.
- However, *M*'s labour services may be **partially substitutable** . Finally, we assume that *M* and *G* are **risk neutral** and that there are **no wealth constraints**. A time-line is presented in **Figure I**.

FIGURE I


Date 0
Date 1/2
Date 1
M and G write contract and choose ownership structure.
M chooses i and e.
If no renegotiation, basic good supplied. However, renegotiation will occur.

B. Default Payoffs

- **Note:** The parties want to renegotiate the contract at date 1 once they learn the nature of potential quality improvements and cost reductions.
- **Assume:** *G* and *M* divide the gains from renegotiation according to Nash bargaining, i.e., they split the surplus 50:50.

=> the parties' default payoffs—that is, what occurs in the absence of renegotiation—influence final payoffs.

- Any innovation requires the **agreement of the owner**(the possessor of the residual control rights) of the facility *F*.
- In case of

—Public- G needs to agree

—Private- M can change without G's agreement.

- But it is **not** in *M*'s interest to **introduce a quality innovation** without the approval of *G* since no payment will be forthcoming for an un contracted-for quality improvement unless *G* agrees to make it; i.e., unless a new contract is written.
- Suppose

— *M* has an idea about how to reduce costs or increase quality

— **a fraction** of the benefits of this idea **requires** *M*'s participation,

— but the **remainder** can be realized **without** *M* because

—some aspects of *M*'s ideas **become public knowledge** (at least within the organization).

- In particular, in the case where *F* is public, *G* can realize a fraction $0 \leq (1-\lambda) \leq 1$ of the net social gains $-b(e)+c(e)+\beta(i)$ from innovation without *M* by **hiring a different manager** and paying him at cost.
- If *F* is private, *G* can obtain **none** of these benefits since *M* has the **residual control rights** and can avoid being replaced.
- **λ measures the weakness of the incentives of government employees**.
- $\lambda = 1$ => the public employee **(M) is irreplaceable**, and hence can command the same share of the total rents in the negotiation with *G* as a private manager (but, in contrast to a private manager, a public **warden will have to get *G*'s permission** to implement a cost reduction).

We can sum up the above discussion as follows

- (A) ***F* is privately owned**
- *in the absence of renegotiation*

—the cost innovation is implemented (since it is in *M*'s interest to implement it and *M* has the residual control rights)

—but the quality innovation is not (since no payment from *G* will be forthcoming).

=>*G*'s default payoff is B_0-P_0-*b*(*e*) and *M*'s default payoff is P_0-C_0+*c*(*e*)-*e*-*i*.

- (B) ***F* is publicly owned**
- *in the absence of renegotiation*

— both cost and quality innovations are implemented.

— However, *G* must replace *M* and hence gets only a share (1- λ) of the gains from these innovations.

=>*G*'s default payoff is B_0-P_0 + (1- λ)[-*b*(*e*)+*c*(*e*)+ β(*i*)], and *M*'s default payoff is P_0-C_0-*e*-*i*.

C. The First-Best

- ***e*** and ***i*** are contractible .
- ***G*** and ***M*** would choose ***e*** and ***i*** to maximize the total net surplus from their trading relationship, and divide the surplus between them using lump-sum transfers. $i.\ e.$

(1) $$\max_{e,\ i}\{-b(e)+c(e)+\beta(i)-e-i\}$$

- (1) has a unique solution (***e****,***i****), characterized by first-order conditions:

(2) $$-b'(e^*)+c'(e^*)=1,$$

(3) $$\beta'(i^*)=1.$$

- At the social optimum, the **marginal social benefit of spending extra effort to reduce costs**, measured to **take account of marginal quality deterioration**, **must equal the marginal cost of that extra effort**, which **equals one**. Similarly, the **marginal social benefit of spending extra effort to improve quality** must equal the **marginal cost of that extra effort**, which again **equals one**.

D. Equilibrium under Private Ownership

- In light of (*A*), the **renegotiation** takes place **over** the **quality** innovation.
- The gains from renegotiation are β(*i*) , which are split 50:50. (There is symmetric information about *i*.) The parties' payoffs are

$$(4) \qquad U_G = B_0 - P_0 + 1/2\beta(i) - b(e) \,,$$

$$(5) \qquad U_M = P_0 - C_0 + 1/2\beta(i) + c(e) - e - i \,.$$

- **Note:** Because *M* can reduce costs without seeking *G*'s approval, *G* bears the full brunt of quality deterioration resulting from cost reduction.

- Since the parties are assumed to have rational expectations, M chooses e and i to maximize U_M, that is, to solve

  (6) $\max_{e,i} \{1/2\beta(i) + c(e) - e - i\}$

- Denote the (unique) solution by (e_M, i_M) (where M stands for ownership by M). The first-order conditions for (6) are

  (7) $c'(e_M) = 1$,

  (8) $1/2\beta'(i_M) = 1$.

- Two deviations from first-best

i. *M* **ignores** the deterioration of **quality** resulting from cost reduction, and hence **exaggerates** the social benefit of **cost reduction**.

ii. because *M* must get *G*'s approval to implement a quality improvement, on the margin he gets only half the benefits of that improvement, which **stunts** his **incentive to improve quality**.

- The total surplus S_M under *M*'s ownership

$$(9) \qquad S_M = U_G + U_M = B_0 - C_0 - b(e_M) + c(e_M) + \beta(i_M) - e_M - i_M \, .$$

- Price P_0 is chosen to allocate this surplus between the parties according to their relative bargaining positions at date **0**. The formula for S_M reflects the fact that the parties bargain efficiently ex post, but there is a distortion in relationship-specific investments *e* and *i*.

E. Equilibrium under Public Ownership

- In light of *(B)* the renegotiation takes place over the fraction λ of both the cost and quality innovations that *G* cannot appropriate: $\lambda[-b(e) + c(e) + \beta(i)]$. The gains are split 50:50, and so the parties' payoffs are

$$(10) \quad U_G = B_0 - P_0 + (1 - \lambda/2)[-b(e) + c(e) + \beta(i)],$$

$$(11) \quad U_M = P_0 - C_0 + \lambda/2[-b(e) + c(e) + \beta(i)] - e - i\ .$$

- **Note:** $\lambda = 1$ => the manager is **completely irreplaceable**, the parties split the gains from innovation 50:50.

- *M* chooses *e* and *i* to solve

  (12) $\max_{e,i} \{\lambda/2[-b(e) + c(e) + \beta(i)] - e - i\}$.

- Denote the (unique) solution by (e_G, i_G) (where *G* stands for ownership by *G*). The first order conditions for (12) are

  (13) $\lambda/2\,(-b'(e_G) + c'(e_G)) = 1$,

  (14) $\lambda/2\,\beta'(i_G) = 1$.

- In **contrast to** the **private** ownership case, because the **publicly employed** *M* needs to negotiate the cost reduction with *G*, he takes account of quality reductions that may result from cost-cutting innovations.

- However, there are **new distortions** in the case of public ownership.

i. for both **quality and cost** innovation, the **public** manager needs the approval of *G* and hence **surrenders half the gains** from trade.

ii. if $\lambda < 1$, the public manager can be replaced, and hence has even **weaker incentives to innovate**. Both of these factors stunt a public manager's incentives.

- The total surplus S_G under *G* ownership

$$(15) \quad S_G = U_G + U_M = B_0 - C_0 - b(e_G) + c(e_G) + \beta(i_G) - e_G - i_G.$$

- Again the price P_0 is chosen to allocate the surplus at time 0 according to relative bargaining power.

F. The Choice of Ownership Structure

- The **optimal ownership** structure is the one that **produces the largest total surplus** . If G ownership is superior to *M* ownership i.e.

$$(16)\quad S_G > S_M$$

$\Leftrightarrow -b(e_G) + c(e_G) + \beta(i_G) - e_G - i_G > -b(e_M) + c(e_M) + \beta(i_M) - e_M - i_M.$

- Renegotiation under symmetric information ensures that

— All ownership structures yield an **ex post efficient** outcome.

— The **only difference** between the ownership structures concerns the **choice of** the ex ante investments *e* and *i*.

ANALYSIS OF THE OPTIMAL OWNERSHIP STRUCTURE

PROPOSITION 1. $e_M > e^*$, $i_M < i^*$.

Proof: A comparison of (1) and (6) shows that private ownership leads to two distortions relative to the first-best.

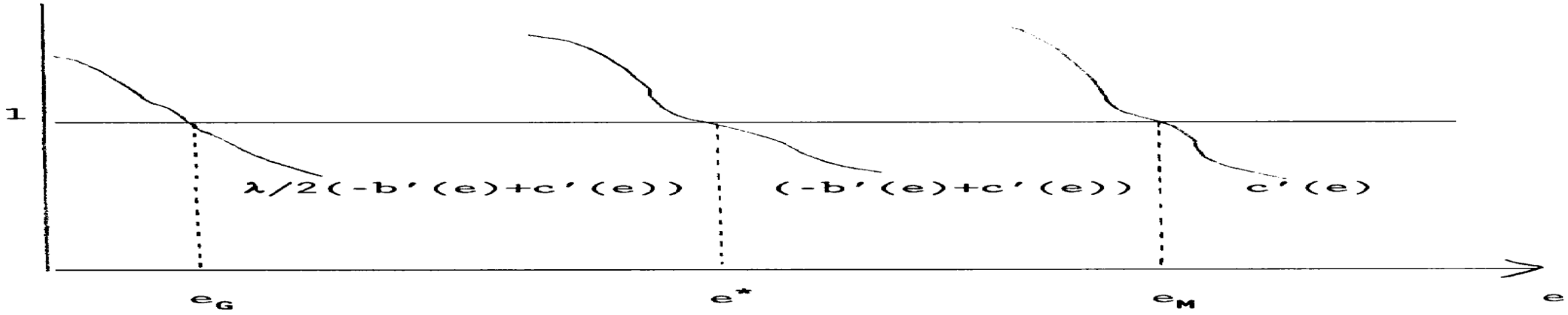
i. *M* ignores the fact that *e* reduces non-contractible quality *b*(*e*); in other words, that he damages *G* through his effort to reduce costs.

ii. *M* places 50 percent weight on the gains from quality innovation β(*i*) as opposed to 100 percent weight.

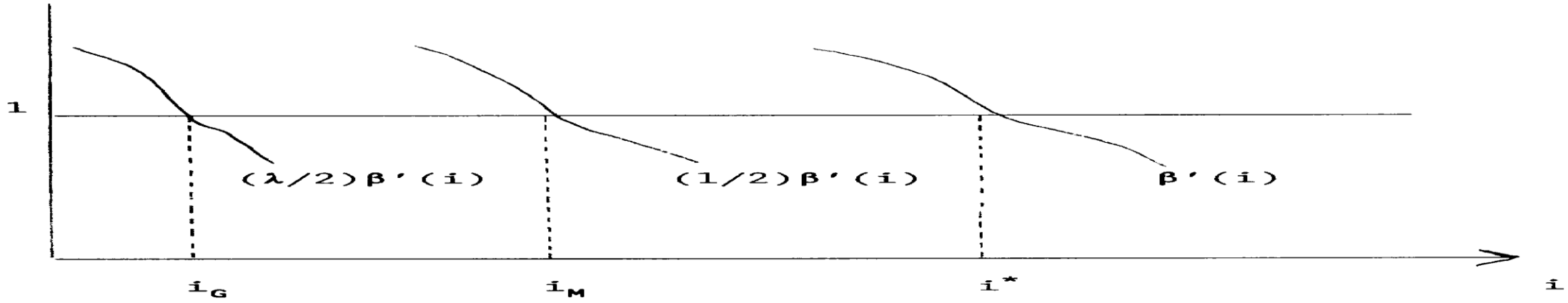
It follows immediately from the first-order conditions (2), (3), (7), (8), and concavity that

e is inefficiently high and *i* is inefficiently low under private ownership.

Figure II



Equilibrium Levels of e under Different Ownership Structures



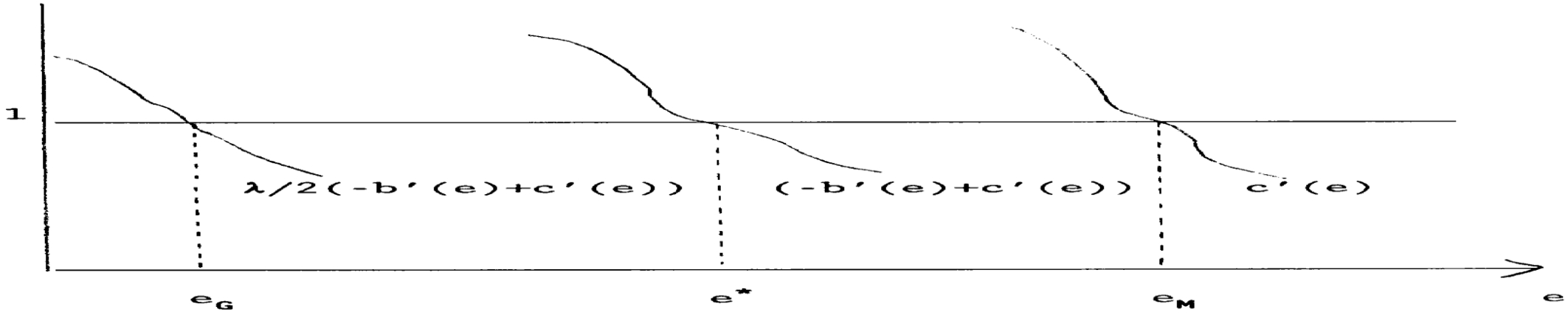
Equilibrium Levels of i under Different Ownership Structures

PROPOSITION 2. $e_G < e^*$, $i_G \leq i_M < i^*$ (with $i_G < i_M$ unless $\lambda = 1$).

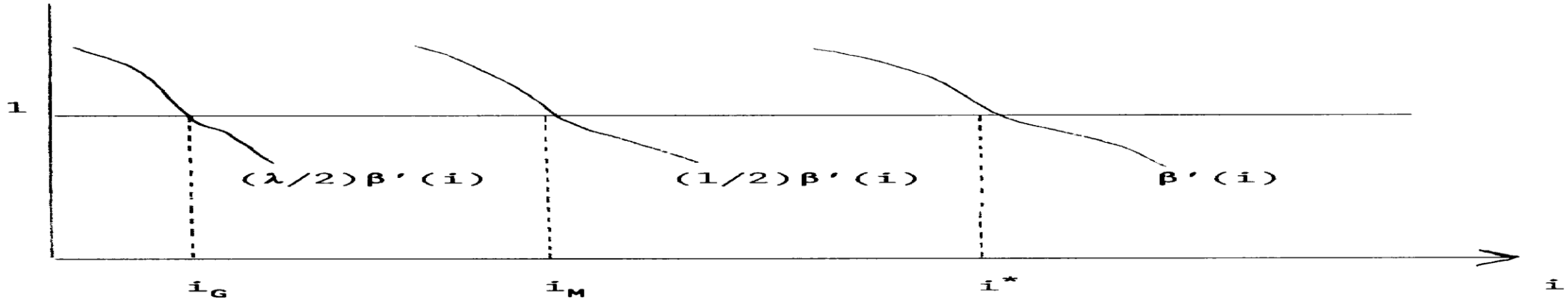
Proof: The private and public ownership equilibrium is illustrated in Figure II.

- Consider public ownership. A comparison of (1) and (12) shows that under public ownership M places weight $\lambda/2$ on the gains from cost innovation $-b(e) + c(e)$ and on the gains from quality innovation $\beta(i)$, as opposed to 100 percent weight in the first best.
- It follows from the first-order conditions (13)–(14) that e and i are **both inefficiently low** under public ownership. Moreover, i is lower under public than under private ownership unless $\lambda = 1$; i.e., unless M is irreplaceable.

Figure II



Equilibrium Levels of e under Different Ownership Structures



Equilibrium Levels of i under Different Ownership Structures

- The trade-off between public and private ownership is now fairly clear.
- **Private** ownership leads to an excessively **strong** incentive to engage in **cost reduction** ($e_M > e^*$) and to moderate— although still too weak—incentives to engage in quality improvement ($i_M < i^*$).
- Public ownership **removes the excessive tendency to engage in cost reduction** but replaces this with a **weak** incentive to engage in both **cost reduction and quality improvement**. Which arrangement is superior therefore depends on which distortion is less damaging.

Cases Where Private Ownership is Superior

PROPOSITION 3.

- (1) Suppose that the function $b(e)$ is replaced by $\theta b(e)$, where $\theta > 0$. Then for θ sufficiently small, private ownership is superior to public ownership.
- (2) Suppose that the function $b(e)$ is replaced by $\theta b(e)$ and the function $c(e)$ is replaced by $\phi c(e)$, where $\theta, \phi > 0$. Then, for θ, ϕ sufficiently small and $\lambda < 1$, private ownership is superior to public ownership.

Proof of Proposition 3

- Part (1)

follows from the fact that, as $\theta \to 0$, the damage to quality from **cost reduction disappears**. Under these conditions, private ownership leads to the efficient choice of e (since $c'(e) \approx -b'(e) + c'(e)$). Since the level of i is always **closer to the first-best** under private ownership than under public ownership, private ownership dominates public ownership.

- Part (2)

follows from the fact that, as $\theta, \phi \to 0$, e^*, e_M and e_G all converge to zero. Thus, only the choice of i matters; private ownership is better than public ownership because it yields a level of i closer to i^*.

Interpretation of Proposition 3

- There are basically two cases when private ownership is unambiguously superior.

i. when the **deterioration** of quality from cost reduction **is small**. In this case, the stronger incentives that a private contractor has to reduce costs *and* improve quality are both desirable.

ii. when the **opportunities** for cost reduction (and hence the damage to quality as well) are **small** and the government employees have relatively **weak incentives** (λ is **small**). In this case, the private contractor would not do much of the potentially damaging cost reduction, and his stronger incentive to make quality innovations gives him the edge over in-house provision.

Example

- **Weapons procurement** is a case where our model points to the **superiority of private provision**. Although the damage to quality from cost reduction might be significant, to a large extent this problem can be dealt with contractually through the requirement that weapons meet well-specified performance requirements. Moreover, **quality innovation** is enormously **important** in weapons design, and the incentives of private suppliers are probably stronger than those of public employees. As a consequence, if $b(e)$ can be **limited through contracts**, Proposition 3 points to the superiority of private ownership.

Cases Where in-house Provision is Superior

PROPOSITION 4.

- (1) Suppose that $b(e) \equiv c(e) - \sigma d(e)$, where $\sigma > 0$. Then for σ sufficiently small and λ sufficiently close to 1, public ownership is superior to private ownership.
- (2) Suppose that $b(e) \equiv c(e) - \sigma d(e)$, where $\sigma > 0$. Suppose also that the function $\beta(i)$ is replaced by $\tau\beta(i)$, where $\tau > 0$. Then for σ, τ sufficiently small public ownership is superior to private ownership.

Proof of Proposition 4

Part (1)

- follows from the fact that as $\sigma \to 0$ the social gains from cost reduction, $-b(e) + c(e)$, converge to zero: the quality damage fully offsets the cost savings.
- Thus, the weak incentives for cost reduction under public ownership are socially efficient. In contrast, the incentives for cost reduction under private ownership are inefficient, since the private owner ignores the substantial damage $b(e)$.
- If λ is close to 1, the incentives for quality innovation under public ownership are similar to those under private ownership, and so public ownership dominates private ownership.

Part (2)

- Replaces the condition λ close to 1 with the condition that τ is small. In this case i^*, i_M and i_G are all approximately zero, and so only the choice of e matters. For σ small, public ownership is superior to private ownership because it delivers a socially more efficient level of e.

Interpretation of Proposition 4

- Public ownership is most likely to be better when the adverse effect of cost reduction on quality is large. But that is **not enough**.
- For public ownership to be **definitely superior**, it must also be the case that either **quality** improvement is **unimportant or** that government employees do not have weaker incentives in quality improvement (λ **is large**). If one of the latter conditions holds, then private contractors are not significantly superior at improving quality, and hence public ownership is preferred.

Example

- Suppose as an extreme case that **nuclear weapons** were sold off to a **private company** and an (incomplete) contract was written with the company as to how these weapons should be used in the event that the country is threatened with attack. The concern is obviously that the private company would wriggle out of the incomplete contract and either threaten to withhold the weapons in the event of an emergency to extract a huge side-payment from the government, or even threaten to use the weapons against the country itself unless it receives such a side-payment.

Cost/Quality Comparison between Private and Public Ownership:

PROPOSITION 5. Costs ($C_0 - c(e)$) are always lower under private ownership. Quality ($B_0 - b(e) + \beta(i)$) may be higher or lower under private ownership.

- We know that e is higher under private ownership than under public ownership ($e_M > e^* > e_G$) and hence costs are always lower under private ownership. Quality may be higher or lower, since although e is higher, so is i.

- One case where **quality is higher** under **private** ownership is when $b'(e)$ is small (more precisely, we replace $b(e)$ by $\theta b(e)$ and let $\theta \to 0$); then quality is determined by differences in *i* and not differences in *e*.

- On the other hand, if $\beta'(i)$ is small, **quality is higher** under **public** ownership; in this case quality is determined by differences in ***e*** rather than differences in ***i***.

Proposition 5 Explains…

- **Private** contracting typically **yields greater cost efficiency**, but there is **ambiguity about quality**.
- We could not get ambiguity if we had a **simpler model**, in which there was **no investment in quality** improvement.

What Does Our Model Say about Prison Privatization?

- The world may not be far from the assumptions of Proposition 4.
- First, the welfare consequences of quality deterioration might be of the same magnitude as those of cost reduction ($b(e)$ and $c(e)$ are comparable).
- Second, the opportunities for quality innovation are limited ($\beta(i)$ is small). Under these conditions, Proposition 4 suggests that public ownership is superior.

Conclusion

- We have examined the conditions that determine the relative efficiency of in-house provision versus outside contracting of government services.
- Our theoretical arguments suggest that the case for **in-house provision** is generally **stronger** when non-contractible **cost reductions** have **large** deleterious **effects on quality**, when **quality** innovations are **unimportant**.
- In contrast, the case for **privatization** is **stronger** when quality-reducing cost reductions can be controlled through contract or competition, when **quality** innovations are **important**.