

**Building and Managing Facilities  
for Public Services**

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## *Provision of public services*

Recently: use of PPPs in North America, Europe, Developing Countries

### **Traditional procurement**

G: finance and design

F build

F/G operate

### **PFI and PPP**

DBFO model

Output Specification and control rights to F

Long-term contract

Private Finance

We examine: *desirability of PFI/PPP model:*

- 1** *Bundling of 'building' and 'management'*
- 2** *Allocation of control rights/ownership of facility*
- 3** *Role of residual value of facility*

- two specialized firms
- contractual incompleteness

## Existing evidence (NAO, 2003)

- 22% price exceeds price agreed under PFI
- 73% price exceeds price agreed under TP
  
- 76% completed on time under PFI
- 30% completed on time under TP
  
- PFI positive evidence for roads, bridges, prisons
- PFI negative evidence for IT
- Hospitals, schools: mixed evidence

## *The Model*

Firm 1 is specialized in building

Firm 2 is specialized in managing

'Bundling' if 1 and 2 form a consortium

'Unbundling' if 1 and 2 separate

Beginning of building stage:  $a$

Beginning of management stage:  $e$

$a, e$  observable but unverifiable

*Social benefits in management stage*

$$B(a, e) = B_0 + u(a) + v(e)$$

*Costs at the management stage*

$$C(a, e) = C_0 - \gamma c(a) - d(e)$$

*Residual value*

$$R(a) = R_0 + t(a)$$

Two cases.

1)  $\gamma = 1$  positive externality

2)  $\gamma = -1$  negative externality

$R(\cdot)$ ,  $B(\cdot)$ ,  $C(\cdot)$ , observable but unverifiable.

Implementation of innovation requires owner's approval

Private firms maximize profits

Government maximizes:  $B(\cdot)$  - payments (+ residual value)

*First-best*

$$u'(a^*) + t'(a^*) + \gamma c'(a^*) = 1$$

$$v'(e^*) + d'(e^*) = 1$$

## *Timing*

Period 0:

ownership, basic standards chosen

Period 1:

firm 1 chooses  $a$

renegotiation to implement it

Period 2:

firm 2 chooses  $e$

renegotiation to implement it

Period 3:

owner gets facility  $\Rightarrow$

possible sale

*Positive Externality:  $\gamma = 1$*

Private Ownership

*Ownership to Firm 1*

$$t'(a) = 1$$

$$\frac{1}{2}d'(e) = 1$$

underinvestment problem:

do not internalize effect of  $a$  on externality across stages  $C()$  and on social benefits  $B()$

do not internalize effect of  $e$  on social benefits  $B()$

do not fully internalize effect of  $e$  on externality across stages  $C()$

## *Ownership to Firm 2*

$$\frac{1}{2} [t'(a) + \gamma c'(a)] = 1$$

$$d'(e) = 1$$

underinvestment problem:

do not fully internalize effect of  $a$  on residual value  $R()$ , costs  $C()$

do not internalize effect of  $a$  and  $e$  on social benefit  $B()$

## *Ownership to Consortium (PFI)*

$$t'(a) + \gamma c'(a) = 1$$

$$d'(e) = 1$$

Consortium:

- 1) fully internalize effect of  $a$  on residual value  $R()$ ,
  - 2) fully internalize externality across stages  $C()$
  - 3) do not internalize effect of  $a$  and  $e$  on social benefit  $B()$
- *still underinvestment problem*

## *Public Ownership*

### *Bundling*

$$\frac{1}{2} [t'(a) + u'(a) + \gamma c'(a)] = 1$$

$$\frac{1}{2} [v'(e) + d'(e)] = 1.$$

*under-investment* still occurs

Consortium:

partially internalize effects of  $a$  and  $e$  on residual value  $R()$ , social benefits  $B()$  and externality across stages  $C()$

## *Unbundling*

$$\frac{1}{2} [t'(a) + u'(a)] = 1$$

$$\frac{1}{2} [v'(e) + d'(e)] = 1$$

Neither government nor firm 1 is interested in the effect of  $a$  on the cost of managing the facility.

→ Externality  $c'()$  not internalized

*Effect of a on*

$R(a, e) \rightarrow$  Firm 1 or Consortium Ownership

$B(a, e) \rightarrow$  Government Ownership

$C(a) \rightarrow$  Consortium Ownership

*Effect of e on*

$C(a, e) \rightarrow$  Firm 2 or Consortium Ownership

$B(a, e) \rightarrow$  Government Ownership

## Positive externality

Prop. 1. Bundling is always optimal

underinvestment problem  $\Rightarrow$  internalization of positive externality is good

Prop. 2.

(i) if externality effect ( $c'(\cdot)$ ) is high or if residual value effect ( $t'(\cdot)$ ) is high then PFI

(ii) if social benefit effect ( $u'(\cdot)$ ) is high then TP+ bundling

PFI

Consortium internalizes effect of  $e$  and  $a$  on residual value  $R$ , and on costs  $C$ ; but it disregards social benefits  $B$

TP+ bundling

Consortium partially internalizes effects on  $R$ ,  $C$ ,  $B$

Results generally consistent with existing evidence on benefits from whole-life approach (*a*)

- Enterprise LSE: Sample of PFI project: cost saving 17%
- NAO (97,03): innovative design on prisons → cost saving 30% (80% prisons costs are staff costs)
- HM Treasury (04) for highway projects: use of high modulus roadbases and stone mastic asphalt reduces maintenance costs and noise
- NAO (03): IT projects; main innovation is through continuous adaptations (*e*); PFI not suitable

*Negative Externality:  $\gamma = -1$  ( $e$  as before)*

*Prop.3.* If "weak" externality ( $c'(a)$  small):

*Optimal NOT to internalize externality  $\Rightarrow$*

- i) if private ownership: Firm 1 ownership
- ii) if public ownership: unbundling (TP)

*Prop. 4.* If effects of  $a$  on social benefit are large compared to effects on the residual value ( $u'(a) > t'(a)$ ), public ownership with separation of firms (TP) is optimal for  $a$

In the opposite case ( $u'(a) < t'(a)$ ), Firm 1 ownership optimal for  $a$

Results generally consistent with existing evidence:

Audit Commission (04): little design innovation in schools, where also poor acoustic, air quality and noise problems

## *Conclusion and Policy Implications*

*If positive externality:*

bundling is optimal

but private ownership (PFI) may or may not be optimal

*If negative externality:*

weaker case for bundling and PFI

In general, PPP is more likely to be preferred

(a) the more positive (or less negative) is the externality; (value of whole-life approach)

(b) the stronger the effects innovations have on the residual private value of facility, and the lower the specificity of facility for public service

(c) the higher prob. facility not needed for public purposes

(d) the weaker the effect of innovations on benefits from provision of public service