Productivity and the Public Sector

by

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Summary

1. The role of public capital in driving private productivity growth. What is the empirical evidence?

2. Regional implications, and aggregation issues. Should Christchurch pay for Auckland's road?

3. Caveats to the empirical findings.

4. Issues in assessing the performance of the public sector.

Public Capital and Private Productivity

1. Aschauer (1989): Relatively slower growth in public capital accumulation in 1970s and 1980s was largely responsible for the private sector productivity slowdown.

2. Wide range of estimates of output elasticities of public capital in the literature.

3. Aggregate production function and cost function specifications common.

4. Evidence suggests very high estimates of the elasticity of private output with respect to public capital, 0.35 to 0.45. (Aschauer, 1989; Munnell, 1990; Otto and Voss, 1994).

5. Spurious regression, endogeneity and causality issues examined in considerable detail.

6. Estimates using more sophisticated analysis of time series data typically half these estimates. Wide range of estimates in the literature, some not so sensible (Berndt and Hansson, 1991; Swedish data). Often constrained by lack of data.

7. Otto and Voss (1996): "While it is possible to imagine circumstances where public infrastructure induces economic growth in the private sector, it is also clear that existing empirical studies do not shed much light on the likelihood of such outcomes."

8. Otto and Voss (1998): Declining growth in public capital in Australia can be explained by the rising price of public investment goods relative to private investment goods; may reflect higher quality specifications.

9. Aggregate economy results may mask what is happening at sectoral level. Connolly and Fox (2004): Sectoral results for Australia (11 sectors, 1965/66-2001/02). Positive and significant impact of public capital on private MFP

for Manufacturing, and Wholesale and Retail.

10. Aggregate empirical results suggest much higher return to public capital than suggested by cost-benefit analysis of individual projects — externalities or aggregation effects?

Regional Issues

1. Morrison and Schwartz (1996): State-level data for U.S. manufacturing. Infrastructure investment provides a significant return to firms, and augments productivity growth.

2. Haughwout (1998): "[I]t is important to distinguish investments in public goods which add to the productive capacity of the nation as a whole from those that simply provide advantages to some places over others."

3. Boarnet (1998): California data, 1969-1988. "The data show that changes in county output are positively associated with changes in street-and-highway capital within the same county, but output changes are negatively associated with changes in street-and-highway capital in other counties."

4. Because the aggregate production function approach is a partial equilibrium approach and ignores local price effects, it "cannot identify the productivity of public goods" and "national policymakers must avoid using its results in the formation of national investment policies." (Haughwout, 1998)

5. "[T]he public investment decisions we observe are the result of local political processes, and may not be designed to maximize private sector economic returns." (Haughwout, 2002)

Aggregation over Regions

1. Divergence of results using aggregate and regional data may be due to aggregation effects.

2. Returns to scale aggregation (Basu and Fernald, 1997; Diewert and Fox, 2004).

3. Simple cost-benefit analysis can yield quite different results depending on the level of aggregation.

Further Issues

1. Public sector capital is not only an input into private sector production. Produces consumption services, e.g. roads, hospitals, schools. May be more important as input into development of human capital.

2. Thus, not all public capital is equal. Policy choices.

3. "Because residents vote and firms do not, it is perhaps unsurprising to discover that the marginal public investment dollar provides larger benefits to households than to firms." (Haughwout, 2002)

4. Little guidance on the optimal level of public sector capital. Most studies use static partial equilibrium framework. Mixed evidence.

5. "[R]ecent disaggregated studies suggest that the structure of the government budget has much more impact on growth outcomes than does the size of the budget." (Grimes, 2003)

6. Efficiency of use of public capital affects service flows.

Assessing Performance of the Public Sector

Managers unconstrained by the rigours of competition "are likely to exploit their advantage much more by not bothering to get very near the position of maximum profit, than by storming themselves to get very close to it. The best of all monopoly profits is a quiet life." (Hicks, 1935)

Increasing pressure on the public sector to "perform" efficiently.

Some Characteristics of the Public Sector

1. Big: General government expenditure as proportion of GDP in NZ 34.3% in 2001 (IMF, 2002), or 36.5 (OECD, 2003) (Grimes, 2003).

2. "Owners" are dispersed so that performance monitoring may be difficult.

3. Can be difficult to measure the outputs.

4. Public sector managers may not have control of the mix of services they offer (regulation).

An Aggregation "Paradox"

A standard measure of (cost) efficiency for the production of product j by firm i is:

$$E_j^i = \hat{C}_j^i / C_j^i. \tag{1}$$

The more efficient a firm is in producing j, the greater is E_j^i.

Consider two firms which both produce two products. Then let

$$E_1^1 > E_1^2, \tag{2}$$

and

$$E_2^1 > E_2^2, \tag{3}$$

i.e., firm 1 is more efficient than firm 2 at producing both products.

Let TC^i denote actual total cost for firm i, (i.e., $TC^i = C_1^i + C_2^i$), and let $\hat{TC}^i$ denote predicted total cost for firm i, (i.e., $\hat{TC}^i = \hat{C}_1^i + \hat{C}_2^i$). Overall measure of efficiency for firm i:

$$TE^i = \hat{TC}^i / TC^i \tag{4}$$

PARADOX: (Fox, 1999) *While (2) and (3) hold, so that firm 1 is more efficient at producing each product, we may also have*

$$\hat{TC}^1/TC^1 < \hat{TC}^2/TC^2, \tag{5}$$

so that firm 2 is more efficient overall.

$$\hat{TC}^1/TC^1 = s_1^1(E_1^1) + s_2^1(E_2^1), \tag{6}$$

where s_j^i is the share of product j in total costs for firm i.

$$s_1^1(E_1^1) + s_2^1(E_2^1) < s_1^2(E_1^2) + s_2^2(E_2^2). \tag{7}$$

We see that by using (4), we are taking the share-weighted average of the disaggregated efficiency scores. It is the share-weighting which leads to the seeming paradox.

Public "firms" often do not have control over the shares: hospitals, schools, regulated industries.

A similar result can be shown for assessing productivity growth (Fox, 2003).

Suggests that should assess ability to perform each task, rather than at the aggregate level.

Conclusions

1. Difficult to know how much public capital is "enough". Depends on purpose, consumption attributes and impacts on prices.

2. Underinvestment can be just as undesirable as overinvestment.

3. Evidence does not provide comprehensive cost-benefit analysis: social user cost versus social user benefit (Morrison and Schwartz, 1996).

4. Location matters, but little empirical evidence.

5. Quality matters, but difficult to measure.

6. Efficiency matters, but difficult to measure.

7. Disaggregate level of analysis seems preferable.

Some areas where progress seems possible:

1. Disaggregation of public capital into components to allow investigation of productivity impacts. Some (e.g. schools) would be expected to have long-run impacts, some (e.g. roads) more immediate impacts.

2. Regional disaggregation:

- Point versus network effects — some capital impacts on broader regions than others (roads versus water works). (Boisso, Grosskopf and Hayes, 2000)
- Positive impacts on one region could lead to negative impacts on other regions. Opportunity costs of each investment option.
- Private-sector (and household) resource re-allocation caused by public infrastructure choices.

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