
Part

6

**Public
Supply of
Goods and
Services**

Delivering Efficient Public Services

I see it is impossible for the King to have things done as cheap as other men.

Samuel Pepys, Diary

Issues in the Supply of Public Services ♦ Principles of Public Sector Management ♦ Public Expenditure Budgeting and Management ♦ Estimating the Costs of Services ♦ Organising Service Delivery

Publicly funded services account for about a fifth of the total output of goods and services in most OECD countries. In previous chapters we have examined why and when governments should provide these services. In this chapter we discuss issues in the delivery of efficient public services.¹

The first part of the chapter outlines some issues in the public supply of services and general principles of efficient management in the public sector. We then turn to issues associated more specifically with the efficient management of public expenditure and with budgets that lie at the heart of the government process. In the second half of the chapter we discuss two core issues for delivery of efficient services: how to estimate the costs of services and how to organise efficient delivery of these services, including whether to deliver publicly funded services in-house or by outsourcing.

Issues in the Supply of Public Services

At one level, efficient provision of public services is simple: identify the benefits and costs of services, prioritise, deliver and regularly evaluate. This is essentially the message of the Productivity Commission's major five-year review (2017). However, public services have two important characteristics. First, many services are intermediate rather than final goods. Examples are school classes, hospital operations or police on the street. In the public administration literature, these services are usually described as 'outputs'. These outputs are, of course, intended to provide benefits (outcomes) to individuals or firms, such as educational skills, improved health and increased security. But, whereas outputs are usually visible, outcomes are less certain. A related second feature of many public services is that, in the absence of market prices, the outcomes have no immediately observable value. This means that there is no clear connection between the value of the outcomes and their cost.

¹ In this chapter, 'services' should be understood to include goods and services. Also, 'public' services should be understood to mean all publicly funded services.

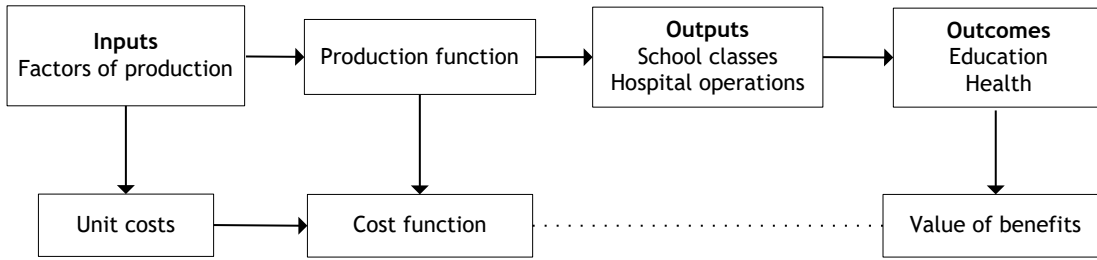


Figure 16.1 Framework for analysing the supply of publicly funded services

The process of supplying public services, from inputs to outputs to outcomes, is illustrated in Figure 16.1. Integral to this process are the production function and the cost function. A **production function** relates levels of output measured in physical units to quantities of inputs of land, labour and capital also measured in physical units.² A **cost function** shows total cost in dollars as a function of the level of output. A cost function is generally derived from a production function (which shows the inputs required for given amounts of output) and the unit costs of the inputs. Thus, a change in the production function will generate a change in the cost function.

To evaluate the supply of public services we need estimates of both the costs of producing the outputs and the value of the outcomes generated from these outputs. However, the identifiable and measurable service deliverables are most often the outputs. Thus, many public expenditure management decisions are based on the costs of delivering outputs in different ways.³

The supply process is depicted in Figure 16.2. Panel (a) shows a partial production function, with output as a function of labour inputs. In this panel, inputs of capital and land are assumed to be fixed and output increases at a declining rate as labour inputs are added to these inputs. Panel (b) shows a cost function inclusive of fixed and variable costs. The variable cost here rises throughout at an increasing rate as marginal productivity falls in panel (a). Panel (c) shows a relationship between outcomes and outputs, for example between educational courses and educational attainment. The concave curve implies declining marginal effectiveness of outputs, in this case of additional courses. Panel (d) shows the value of outcomes in relation to physical measures of outcome, for example the value of increasing educational

Production function
A function that relates the level of output in physical units to quantities of inputs

Cost function
Shows total cost as a function of output

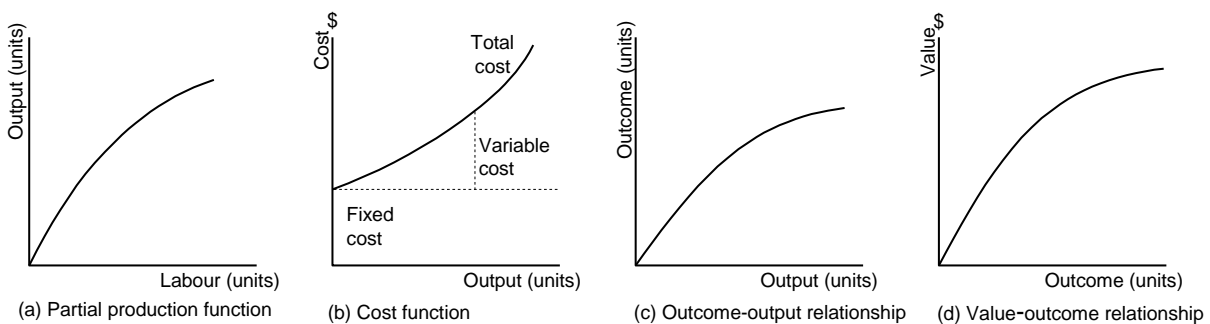


Figure 16.2 Graphical depiction of the supply process

² In Chapter 5 we described an aggregate production function for a whole economy.

³ Methods for valuing outcomes were discussed in earlier chapters, notably in Chapters 6, 8 and 11.

achievement. The concave curve implies declining marginal value of outcomes. Thus, increasing educational achievement would have a positive, but declining, marginal value. Of course, these curves are hypothetical and could take many other shapes. Note also that the slope of the curve at each point in each panel shows the **marginal** change in the dependent variable (on the y -axis) as a function of a **marginal** change in the determining variable (on the x -axis). Because efficiency in supply requires that the marginal benefit from a change in output should equal the marginal cost, we need to estimate the shape of the curves or the relevant parts of each curve in each panel.

Principles of Public Sector Management

As we saw in Chapter 10, there are significant obstacles to efficient supply of public services. These include monopoly supply, a lack of measurable outcomes and the decoupling of supply from demand. In the 1980s and 1990s, concern about the efficiency of public service provision generated a new management literature for the public sector, described as the New Public Management (NPM) (see Box 16.1). Although this literature was generated mainly by political scientists and public management experts, much of it draws on economics and responds to the government failures discussed in Chapter 10. The following are the main principles of NPM.

Objectives of government agencies should be stated as precisely as possible. Many government departments observed by the writer have unclear, non-quantified, objectives. Without clear and quantified objectives, efficiency is difficult to achieve and impossible to monitor. To achieve this, the New Zealand government broke up large conglomerate ministries into performance-based agencies or business units, headed by chief executives on fixed-term, output-based contracts with authority to hire and fire personnel. Singapore also has performance-based statutory boards.

Government should serve consumers rather than producer interests. A corollary of this principle is that, where feasible, citizens should have choice of service. For example, parents should be able to choose schools for their children (and whether their children should attend scripture classes). Low income households receiving government support should be able to choose their own housing.

Government activities should be separated according to functions. Public service was divided traditionally into policy making and administration. NPM proposes that the major administrative functions (revenue raising, purchasing of services, delivery of services and regulation) should also be separated. In particular, funding and delivery of programs should

Box 16.1 New Public Management (NPM)

In 1987 the New Zealand Treasury produced a systematic exposition of the new ideas in public management (*Government Management: Brief to the Incoming Government*). Over the next 10 years the NZ government implemented most of the proposals (see Boston *et al.*, 1996). Osborne and Gaebler (1993) espoused similar ideas in *Reinventing Government*, which influenced the Clinton Administration in the United States. Lane (2000) provides a useful summary of the models of public sector management and their implementation in many OECD countries.

In Australia the National Competition Agreement, signed in 1995 by the Commonwealth and state governments, embodied some of the principles of NPM. The report of the National Commission of Audit (1996) also recommended sweeping changes in government practice. As described in Chapter 14, National Competition Policy has had a significant effect on the Australian economy. However, arguably, Australian governments have tended to adopt the recommended efficiency practices piecemeal rather than with total enthusiasm.

be separated—this is known as the purchaser–provider split. This facilitates monitoring of work and competition among suppliers of services and helps to ensure that suppliers do not determine policy or choice of supplier. Also, regulation should be separated from service provision. Referees should not be players. Institutional arrangements should minimise the scope for regulatory capture. For example, an agency supplying water and sewerage services should not also be the agency for environmental protection.

Activities should be separated according to responsibilities. The responsibilities of ministers and departmental chief executives should be separate and distinct. Ministers should determine the outcomes to be pursued and provide the funds to achieve these outcomes. Departmental heads should be responsible for producing these outcomes with minimum interference from ministers and central agencies. A core mantra of NPM is ‘let the managers manage’. But this must be subject to checks and balances (review and accountability). Without regular review and accountability, managers run an unaccountable monopoly service.

Government should adopt best practice management. Government should supply services as efficiently as possible. The public service should not itself be a welfare service. Employment relations in the public sector should draw on the more efficient flexible relations in the private sector. This may involve the use of contract work, fixed terms and remuneration scales to attract appropriate staff. This would be combined with use of individual incentives.

Where feasible, government should employ market pricing rather than taxes. User charges for services and cost recovery encourage financial and management disciplines. Prices improve measurability and provide information about consumer preferences. However, we should note a caveat here about pricing of welfare services (see Chapter 17).

Public supply should be provided competitively where feasible. Service deliverers, whether public or private, should compete by tender or other methods for the right to provide publicly funded services. Subject to appropriate specifications of work required (see further discussion below), this helps to ensure service efficiency.

Provision of services should be decentralised. Decision making should be located as close as possible to the place of implementation, subject to an efficient scale of service being achieved. Information cannot travel quickly up and down a large centralised hierarchy—there is commonly administration overload. A local agency is better informed about local preferences and more likely to provide customers the services that they want. Local provision provides more variety of services. Also, costs are more transparent in local administrations.⁴

Improve transparency: where subsidising, do so directly and transparently. In *Yes Minister*, when Jim Hacker (the newly appointed Minister for the Department of Administrative Services) meets Sir Humphrey Appleby (Permanent Secretary of the Department), Hacker observes that ‘Opposition’s about asking awkward questions.’ ‘Yes’, Sir Humphrey replies ‘and government is about not answering them’. By contrast, transparency is another mantra of NPM. For example, government subsidies should be provided by explicit grants to consumers or by ‘community service obligation’ payments to organisations that provide deemed community services, such as public transport or telephones. Subsidies should not be supplied by tax expenditures or by cross-price subsidies. These hidden payments cannot be readily assessed.

⁴ As someone who has over 12 years’ experience in working with both state and local jurisdictions in Australia, I would strongly endorse these generic observations on decentralised decision making and services.

Suppliers of public services should be accountable. There are three main principles for effective accountability. First, responsibilities and outputs must be specified. Agencies should publish regular plans that explain proposed outputs (and where possible outcomes), strategies to improve output, and progress against these plans. Output measures are an essential basis for performance appraisal. This facilitates benchmarking as an aid towards best practice productivity. Second, there should be freedom of information. The general principle should be that information paid for by taxpayers belongs, and is available, to them other than for clearly defined exceptions, for example for public security and occasionally details in commercial-in-confidence contracts. Watchdogs such as the Auditor General and parliamentary committees should have full access to government information. Third, provision and monitoring of services should be separated. There should be independent auditors of powerful departments, such as police, health and education departments.

Public Expenditure Budgeting and Management

Efficient management of public expenditure has three major components:

1. Aggregate fiscal discipline—total government expenditure should be set before decisions are made on the separate parts of the budget, and this limit should be maintained unless circumstances change. Expenditure should not simply accommodate the demands of spending departments.
2. Allocative efficiency—public expenditure should be allocated to the highest priorities.
3. Operational efficiency—public services should be delivered at least cost.

The central instrument of expenditure management is the **government budget**. The principles and practice of budgeting are critical to efficient provision of public services.

The basic principles of budgeting are that budgets should be comprehensive (including all revenue and expenditure), accurate (recording actual transactions and flows), cover a defined period (usually a year), be authorised appropriately and transparent (government should publish timely information about estimated and actual flows). These principles in conjunction with the formal procedures for developing the budget and for auditing expenditures comprise due budgetary process. Typically, due process is achieved by centralising the management and control of public expenditure.⁵

In practice, central Treasury departments have traditionally emphasised expenditure control and funded each government agency on an annual basis for their expected use of inputs rather than for supply of outputs. Budgets itemised the amounts that departments could spend on each category of inputs. Line-by-line allocations identified the allowable expenditure for regular employees, casual workers, overheads such as workers' compensation, equipment and supplies, travel expenses, materials and so on, often in considerable detail. Agencies were expected to conform to these line-item budgets. Expenses could be audited before or after expenditure. With a pre-expenditure audit, each expense is vetted in advance, which is burdensome. Post-expenditure audit is based on a sampling of expenditures after they have been incurred to ensure that the process works properly.

This traditional budgeting process establishes the basis for effective financial controls and management of public expenditure. However, it has significant limitations. This process encourages spending by the rules, conforming to budget estimates, getting approval before taking actions and, above all, spending all allocated funds. Relatively little attention may be paid to prioritising expenditures in relation to outcomes. Typically, agencies get more funds by requesting incremental funds rather than by shifting funds from lower to higher priorities.

⁵ The discussion in this section draws especially on Schick (1998).

Once established, public programs often escape systematic and rigorous evaluation. Such budgets, based on input controls, are not related closely to outcomes. Nor do they provide spenders with incentives to economise. Expenditure is audited on the basis that spending is duly authorised rather than in terms of what it has achieved.

Public expenditure management

Governments have tried to deal with the limitations of traditional budgeting in various ways. In the 1980s and 1990s, governments introduced various budgeting instruments, described as **program budgeting**, **planning-programming budgeting systems** (which included evaluation of program budgets), and **zero-based budgets** (which attempted to avoid incremental budgeting by requiring that budgets be developed from scratch each year). The common aim was to relate budgets to outputs and thereby to integrate program evaluation and financial management. However, limited success was achieved. The aims of the reforms were too ambitious for the instruments available. Programs often ran across departments. The information needs of program evaluation and management were considerable and hard to integrate with line-item, agency-based accounting systems. Departments threatened with loss of control over expenditure decisions to central agencies or loss of resources resisted changes. Accordingly, many governments continued to use traditional financial control methods and to generate program data on an ‘as needs’ basis.

In recent years, many governments have rebadged the reforms as **performance or output budgeting**. With output budgeting, agency funding depends on performance of an explicit stipulation of the outputs that the agency should deliver. For example, payments for hospital services in many parts of Australia are now based on provision of services based on “defined diagnostic related” groups. Output budgeting is consistent with the purchaser-provider principle, in which the function of purchasing (financing) services is separated from that of supplying the services.

Under output budgeting, central agencies (the purchasers) determine strategic objectives and priorities and inter-sectoral strategic expenditure claims. However, delivery agencies are responsible for intra-agency expenditure decisions. Under the key principle of **managerial accountability**, managers are accountable for delivering pre-specified outputs. Managers receive global budgets based on the expected costs of the outputs to be delivered. They decide on the mix of inputs to deliver the outputs. They are responsible for delivering the outputs and for controlling costs. Managers need budget flexibility and control over resources. They are accountable for program results. Spending must be justified by what it achieves.

Another important management principle is **contractualism**. The principal who funds the services should have an explicit service agreement with the agent who supplies them. Contractualism decouples policy from operations. Performance budgeting aims to overcome principal-agent problems, reward good performance and encourage effort. However, to be effective, performance measures must be clearly defined and easy to observe. In particular, performance budgeting must deal with three important issues: output heterogeneity, contingent capacity and cost containment incentives (Robinson, 2002). Outputs should be defined clearly in terms of quality as well as quantity. For example, university outputs may be gauged by the number of effective full-time students enrolled or by the number of research publications. But if there is no allowance for the quality of the educational process or the publications, these performance measures may be misleading. Second, excess capacity may be required for some services, especially for emergency services. Third, if budgets are determined by outputs the agency may have more incentive to expand services than to contain costs. Separate mechanisms are required to provide incentives to control costs.

Accrual accounting is also important for efficiency. As described in Chapter 2, accrual accounting records expenses and receipts when they are incurred, not when cash is exchanged. Accrual accounts also include the costs of using capital equipment. Annual

balance sheets include actual and contingent liabilities. Accrual accounting shows how much an agency is really spending. It also improves transparency and efficiency in use and maintenance of assets. However, accrual accounting can be misused. Operating expenses and asset valuations depend on depreciation estimates which require technical judgements and which may be distorted to achieve a preferred paper outcome.

Schick (1998) summarises the instruments for achieving operating efficiency as follows. Managers are given global operating budgets—a single allocation for all operating expenses. Line officers should also have devolved global operating budgets. Accountability of outputs is maintained by a series of performance agreements and contract-like documents. There is an efficiency dividend. Agencies should receive part of the savings they achieve (providing that they are due to lower costs, not lower outputs). Outputs are specified in the budget or related documents. Purchasers and providers are separated. The costs of supplying services should be market tested by comparisons with the costs of outside suppliers. Agencies should regularly report quantified outputs (generally called key performance indicators, KPIs) and outcomes. KPIs would typically include measures of volume of services, timeliness, quality (service errors), recipient satisfaction and unit costs. And there should be independent audits.

Conclusions. Traditional budgets emphasise input controls and financial process rather than policy analysis. Current public expenditure management emphasises outputs and outcomes. The move to performance management is designed to increase allocative and operational efficiency. The reform bargain is managerial freedom over inputs in return for accountability over outputs. Implementation requires performance contracts.

However, problems remain. First, a true performance budget is a variable budget. But variable budgets are hard to design. Budget appropriations are generally fixed limits on expenditure but not tightly related to performance. Second, in so far as budgets are related to performance, they are generally based on outputs, which can be measured and verified, rather than outcomes. The link between outcomes and services is often hard to demonstrate. For example, it is hard to show whether public health programs change individual behaviour and improve health outcomes. Also, outcomes are often hard to value. Third, performance budgets require accurate information on costs and outputs. However, government agencies control the information flow to the central agencies and have little incentive to minimise costs if savings accrue to Treasury. Also, the contribution of individual public servants to outputs is hard to identify. This may explain the slow development of effective in-house performance contracts. As Box 16.2 indicates, Australian practice falls short of the aims of performance budgeting.

Estimating the Costs of Services

Estimates of the costs of services are fundamental to efficient delivery of services. However, before we can estimate costs, we need to recognise that there are various kinds of costs and to identify those that matter for the relevant policy decision.

The following are the key categories of costs.

- Total cost: fixed costs plus variable costs.
- Fixed costs: costs that do not vary with output.
- Variable costs: costs that vary with the level of output.
- Average or unit cost: total cost divided by the number of units supplied.
- Average variable cost: total variable cost divided by the number of units supplied.
- Short-run marginal cost: the cost of producing an additional unit of output with fixed capital stock.
- Long-run marginal cost: the cost of producing an additional unit in the long run inclusive of the cost of additional or new capital stock.

Box 16.2 Performance budgeting in Australia

In 1999-2000 the Australian government introduced accrual accounting and an explicit purchaser-provider model involving an output and outcomes framework. For this budget, 45 major agencies accounting for nearly all Commonwealth expenditure were provided with an accrual-based budget, inclusive of depreciation allowances, capital injections, estimates of long-term liabilities and capital charging for assets at 6 per cent. The government defined outcomes as the key results that the government sought to achieve. Outputs were the goods and services that government purchased from the agencies to achieve these outcomes. Once quantities of outputs were determined, the agency and the Department of Finance and Administration (DoFA) agreed a set of prices or costs to achieving these outputs. In the words of DoFA (2000), the:

outcomes and outputs are at the centre of how agencies plan, budget, manage and report ... Under accruals, agencies are resourced for the price of their outputs—what they produce to contribute to outcomes. The agency output price will include full costs, such as depreciation and employee leave entitlements.

Although the reforms were intended to improve expenditure efficiency, it is not clear whether real improvements in resource allocation or expenditure control have been achieved. A major problem with the new process is the high-level nature of the proposed outcomes.

For example, in the 2002-03 budget, Outcome 1 under Population Health and Safety is 'promotion and protection of the health of all Australians and minimising the incidence of preventable mortality, illness, injury and disability'. For the Department of Education, Science and Training, Outcome 1 was defined as 'school systems that provide their students with high quality foundation skills and learning outcomes'. Other proposed outcomes in the health and education portfolios are equally vague.

By contrast the UK public service agreements set much more precise outcome targets. For example, there are numerical targets for reducing mortality rates from heart disease and cancer and for improving the literacy and numeracy outcomes for schoolchildren (UK Treasury, 2002).

Hawke (2007) described how the Commonwealth agencies regularly report on a range of key indicators and how the Department of Finance has developed a set of questions to diagnose the quality of performance and improvement over time. Portfolio budget statements include details of uses of funds by outcomes. However, he noted that a key challenge remains 'to ensure that the links between programmes, outputs and outcomes are clear and measured effectively'. Also, limited use was made of performance information for decision making for the budget. But it should be noted that this view is dated and practice may have improved.

The cost of interest depends on the issue. Fixed cost, total cost and average cost include past or sunk costs. Variable and marginal costs are forward looking. Past costs affect balance sheets, debt and financing costs. However, current policy decisions should be based on present and related future costs. Sunk costs are not relevant. Of course, an estimated total cost function provides information implicitly on most kinds of costs.

We should also recall the differences between financial and real costs. Financial costs are the monetary costs to government in cash or accrual terms. The real cost of employing resources (factors of production) is their opportunity cost (the value of output forgone). This may be greater or less than the financial cost. In budgeting, government agencies are generally most concerned with financial costs. However, the real (opportunity) cost of production is the relevant cost for determining service delivery. For example, the use of public land has an opportunity cost but often little or no financial cost.

Service costs can be estimated in two main ways. The most common method is to estimate the quantities of inputs required for supply of a service (essentially to estimate a production function) and then to apply relevant unit costs to estimate the costs. The inputs required can be estimated in various ways, notably by experts in the relevant production activity, statistical estimates of a production function or activity-based costing. Alternatively, it may be possible to estimate a cost function directly from financial and output data.

Estimating production functions. Estimates of the inputs required for a given service or product are typically provided by experts in the relevant area drawing on a combination of experience and data. For example, a quantity surveyor may estimate the material and other

inputs required to construct a building. An educational expert may estimate the labour and other inputs required to run schools of various sizes. This approach requires detailed knowledge and specification of the relevant production activity, often gained from data in similar situations. Once the inputs have been estimated, the cost is the product of these inputs and their unit costs.

Generally, a production function may be estimated from relevant data as follows:

$$Q = f(K, L, X_i) \quad (16.1)$$

where Q is a physical measure of output, K is capital inputs, L is labour and X_i is a vector of other $i = 1 \dots n$ inputs. For example, Q could be bus passenger kilometres, K the number of buses and L the number of bus company employees. The capital units may be disaggregated into buses of various sizes and the labour units into various kinds of labour, for example bus drivers and other employees. Equation 16.1 could be estimated from either time series or cross-sectional data. Hensher (2007) reviewed production functions for urban buses. Box 16.3 overleaf provides some further details on production functions.

More sophisticated techniques for comparing production efficiency across agencies have been developed. For example, stochastic frontier analysis and data envelope analysis aim to identify the production frontier, that is, the maximum feasible output given various input quantities. The methods then aim to provide measures of shortfalls between observed outputs and the maximum feasible output. These are measures of relative efficiency (Coelli *et al.*, 1998; NSW Treasury, 2001).

Activity-based costing. Using this method, an analyst allocates an agency's inputs to its outputs, usually based on a survey of an agency's work over a sample period, such as two to four weeks. The analyst then uses the agency's financial data to estimate the cost of services. Typically, this process involves three main steps:

1. For each line section of the agency that produces final services, determine the inputs (labour, materials and so on) that vary with the level of each service and attribute these to that service.
2. Determine the fixed inputs of each line section (such as line section administration and equipment) and allocate these inputs to the services.
3. Allocate the overhead costs of the agency (such as property rent) and the costs of internal service agencies (such as IT services) to final line service sections by use of some formula. For example, rent may be allocated according to the amount of space occupied by the line section. The line agency then distributes these costs to its services.

When all costs of an agency are accounted for, costs are described as 'fully distributed'. The process can involve several steps. Take, for example, a hospital. It may be quite straightforward to estimate the variable and fixed costs associated with a ward; however, to allocate central hospital expenditures, such as accounting, laundry and catering, to final service areas such as wards, theatres and so on, it may be necessary first to allocate part of these expenditures to service departments such as radiology, pathology and cleaning. The costs of these service departments must be allocated in turn to hospital wards and theatres, along with the direct nursing and material costs. After the total costs of wards or theatres are estimated, unit costs can be estimated by dividing total cost by activity level.

There are three main difficulties with activity-based costing. First, standard budget line accounting shows costs incurred but not how inputs are allocated. Accordingly, sample period surveys are required to determine how inputs are allocated to services. The results may reflect the period chosen. Second, book costs may not reflect real (opportunity) costs, especially for use of capital assets. Third, financial accounts do not specify which costs are fixed and which

Activity-based costing

The allocation of an agency's inputs to its outputs and estimating the costs of the inputs

Box 16.3 Estimating production functions

The Cobb-Douglas production function, which we introduced in Chapter 5, is a commonly used production function. The specific form of this function is: $Q = KL^aK^b$, where Q is output, K and L are units of capital and labour respectively, and A , a and b are constants ($0 < a$ and $b < 1$).

The exponents a and b represent the elasticity of output with respect to L and K respectively. When $(a + b)$ is equal to one, this production function exhibits constant returns to scale, which means that output changes proportionately with any change in inputs. When $(a + b)$ is greater (less) than one, there are increasing (decreasing) returns to scale.

The logarithmic form of the Cobb-Douglas production function for firm i can be written as:

$$\log Q_i = A' + a \log L_i + b \log K_i + u_i$$

where u_i is the stochastic disturbance term, which accounts for variations in the productive capabilities of the i^{th} firm. Subject to the availability of the data on Q_i , L_i , K_i , the parameters A' , a and b can be estimated directly from cross-sectional or time series data, assuming the parameters and prices are the same for all firms.

Estimates of the production function may be handicapped by poor data on capital inputs. Another problem is the aggregation of the capital used in production due to its diversity of components. The imputed depreciation value of capital may be problematic.

Direct estimation of the production function may also be problematic if the exogenous variables $\log L_i$ and $\log K_i$ are

jointly determined with $\log Q_i$, which leads to a problem of simultaneous equation estimation. If L_i and K_i are dependent on each other, there may be a multicollinearity problem. If the variance of u_i is not constant, a heteroskedasticity problem may arise.

An alternative approach is to assume constant returns to scale (i.e., $a + b = 1$). The production function can then be written as:

$$\log Q_i = A' + a \log L_i + (1-a) \log K_i + u_i$$

With some manipulation this can be represented as output per worker as a function of the capital to labour ratio:

$$\log \frac{Q_i}{L_i} = A' + (1-a) \log \left(\frac{K_i}{L_i} \right) + u_i$$

This form of equation reduces the problems associated with multicollinearity and heteroskedasticity. However, because of the assumption of constant returns to scale, we cannot test for increasing or decreasing returns to scale.

For empirical work, the constant elasticity of substitution (CES) production function is also commonly used. The general form of the CES production function is $Q = A [bK^c + (1-b)L^c]^{1/c}$, where A , b , c are constants. The ratio of the proportional changes in quantities of inputs to the proportional changes in relative prices is the elasticity of substitution. When $c = 1$, the elasticity of substitution is 1 and the CES production function becomes a Cobb-Douglas function. For more details see Intriligator *et al.* (1996, Chapter 8).

ones vary with output. More analysis is needed to obtain a breakdown between fixed and variable costs. The analyst can then estimate a cost function by extrapolation based on estimated variable costs as a function of output.

Estimating a cost function directly. It is sometimes possible to estimate directly the relationship between cost and output from a sample of operating experiences, using statistical techniques such as multiple regression analysis. The analyst typically draws on observations of costs and services from time series data for a single agency or cross-sectional data for several agencies to estimate a cost function. In both cases the cost data are generally based on accounting measures of cost. Time series analysis for a single agency is usually interpreted as providing a short-run cost function as capital assets do not change significantly between periods. On the other hand, cross-sectional data from several agencies yield long-run cost functions if it is assumed that producers have adjusted their fixed assets to optimal levels to meet demand.

However, interpretations must be made carefully. An underlying problem with both time series and cross-sectional analyses is that the quality of services may vary over the sample period or firms. In addition, the usual problems of multiple regression analysis occur. Various functional forms of the relationship may have to be tested (see Box 16.4 overleaf). Also, the appropriate variables need to be included in the analysis. If this is not done, cost differences may be ascribed wrongly to output levels instead of to other relevant factors.

Box 16.4 Estimation of cost functions

We have seen in Box 16.3 that, for estimation of production function, output is assumed to be endogenous and the inputs are exogenous. For estimation of cost functions, cost and input quantities are assumed to be endogenous and output exogenous. The Cobb-Douglas cost function, which is related to the Cobb-Douglas production function, can be written as:

$$C = f(w, r, Q)$$

where C is total cost, Q is the output, w is the wage rate and r is the return to capital. The elasticity of the cost function with respect to output is the reciprocal of the degree of homogeneity of the production function.

A function is said to be homogeneous to the degree n if multiplying all the independent variables by a constant λ multiplies the value of the dependent variable by λ^n . The elasticities a and b can be estimated from the linear model (considering firm i):

$$\log C_i = B' + \frac{a}{a+b} \log w + \frac{b}{a+b} \log r + \frac{1}{a+b} \log Q_i + u_i$$

Similarly, a cost function related to a CES production function can be defined and estimated.

Benchmarking
Comparing an agency's costs with the costs of similar providers

Efficiency comparisons. The cost-efficiency of service delivery may be assessed in three main ways: by detailed micro assessment, benchmarking and market testing.

A detailed micro assessment of an agency's operations may be made by personnel employed in the service, who are often aware of ways to make operations more efficient, or by an independent external expert who would review the operations.

Benchmarking involves external comparisons with other agencies. For example, the Productivity Commission provides an annual report on the costs of a wide range of government services across Australian jurisdictions (see Productivity Commission, 2011b). Benchmark comparisons range from the informed to the not very precise. The former may be based on detailed costing studies across a range of similar agencies and subject to detailed statistical analysis. Given adequate sample size, statistical analysis may provide a cost model, which shows total or unit costs as function of several variables, along with estimated variances. For cost comparisons to be meaningful, outputs and production environments should be similar. Canada is a more relevant comparison for Australia for, say, transport or telecommunications costs than is Hong Kong. Also, the output and cost data must be reliable, often in the absence of markets for the factors of production services provided. Reliable information may be hard to obtain if public agencies have an incentive to conceal the true costs.

Market testing, via contracting for services, is a major response to these problems. It introduces competition, benchmarks and increased cost transparency.

Organising Service Delivery

In this section we discuss the role of contracts in service delivery, the choice between in-house delivery and outsourcing of services, and user cost models.

The role of contracts in service delivery

Government employees who supply in-house services have employment contracts. Under such a contract the employer usually has exclusive power over the work and output of employees in specified working hours (and sometimes even outside these hours) and can usually require the employee to work as directed. Government agencies may complement employment contracts with specific service duty statements. However, the services are often specified in broad terms.

On the other hand, under a service contract, typically an outsourced contract, firms or individuals are engaged to provide specific services. The contracted agent can usually provide

services to other contractors where there is no conflict of interest. A service contract is usually, but not always, for a shorter period than an employment contract.

Following Schick (1998), there are five conditions in efficient contracts.

1. The two sides must have an arm's length relationship.
2. The purchaser must be able to purchase the services from alternative suppliers.
3. The supplier must have freedom to produce the contracted services.
4. The contract must specify the cost of the services.
5. The contract must specify the performance required of the supplier.

These contract conditions can be achieved with in-house or with outsourced contracts, but are usually easier to achieve with the latter.

Outsourced service contracts may be fixed-price or cost-plus contracts. A fixed-price contract stipulates the work to be done for a fixed fee. It may allow for cost escalation for inputs based on a recognised price index and may stipulate rates payable if variations in output are required. A fixed-price contract provides incentives to contractors to economise on inputs. On the other hand, the contractor bears all or most of the risk, depending on the details of the contract specification. Typically, the contractor builds the cost of risk into the offer price for the fixed-price contract.

With a cost-plus contract the purchasing agency pays all costs incurred by a firm in completing a project. In this case the contractor does not charge for bearing risk. The government can control costs by negotiating low work payment rates, by progressively specifying the work to be done and by carefully monitoring the work. However, the contracted firm has an incentive to increase inputs and costs rather than to reduce them.

If a purchasing agency wishes to minimise the total cost of service delivery, it would select a cost-plus contract (competitively delivered) when it can clearly specify and monitor the work and thus control the risks. Alternatively, it could select a hybrid contract in which some costs are fixed and other costs that can be specified and monitored are paid for on a cost-plus basis.

In practice, most public agencies prefer to pay for risk via a fixed-price contract rather than run the political risk of a cost-plus contract. The main exception arises when a contracting agency cannot specify all the work in advance due to various uncertainties, as in technical design work. Cost-plus contracts are often used for professional advice, such as legal work, and development of military hardware. However, this work needs to be carefully monitored to avoid cost blow-outs.

Choosing between in-house and outsourced services

The two main economic arguments for in-house supply of public services are achieving economies of scale and minimising transaction costs. Where economies of scale exist, one supplier can provide services more cheaply than can two or more suppliers. There is limited scope for ongoing competition and if a private supplier is established there is a risk of establishing a private monopoly. Transaction costs are the costs of negotiating, monitoring and enforcing contracts. Outsourcing raises these costs. Surveillance of private firms is harder than surveillance of in-house employees. In contrast, the continuous and vertically integrated nature of government organisation reduces the need for regular formal contracts, transaction and monitoring costs (Khursheed and Borcharding, 1998).

There are two related sets of costs associated with outsourcing services. First, when services are difficult to describe, and contracts cannot be specified clearly, transaction costs escalate. When contracts are difficult to monitor, costs cannot be controlled and quality of service may fall. Firms may take advantage of this lack of surveillance by not fulfilling their contracts or by exploiting loopholes in contracts to cut services or seek extra payments.

Second, potential costs also increase when contracting out is feasible only for long periods, in which case a private contractor may exploit an effective monopoly supplier position. Problems also arise when contractors default and supply is disrupted.⁶

On the other hand, outsourcing has some significant advantages. First, most public agencies suffer from structural problems, such as rigid appointment procedures and wage setting. Private agencies tend to be more flexible and innovative (Rainey and Chun, 2005). Also, links between behaviour, performance and rewards are greater in private firms than in the public sector. Thus, it may be possible to define operational outcomes and to provide financial incentives related to achieving these outcomes.

Lundsgaard (2002) noted the following related advantages. Contracting

- focuses the attention of service suppliers on core objectives and user needs,
- provides suppliers with clear incentives to operate efficiently,
- reveals best practices so that slack cannot be hidden, and
- makes budget constraints harder.

In addition, competition for contracts allows the purchasing agency to obtain best value for money. Even if there is to be a sole supplier, a competitive auction for the right to provide this supply may produce significant cost savings.

Savings in supply costs with outsourcing. Turning to the evidence, many studies have shown that private firms generally supply services more cost effectively than do public agencies. Borcharding *et al.* (1982) reviewed 52 studies of productive efficiency in 19 economic sectors in five OECD countries, mainly in Germany and the United States, and concluded that in 40 studies private supply was ‘unequivocally more efficient’. Only in three cases was public supply less costly than private. Khursheed and Borcharding (1998) and Mueller (2003) cite many studies of the cost advantages of the private sector, mainly from the 1970s and 1980s. Lundsgaard (2002) provided more recent case studies. Table 16.1 gives results from Bailey (2002). These results show that competitive contracting of services traditionally supplied by the public sector, such as waste collection, office and street cleaning, water supply, printing and road and park maintenance, produced large savings often of 20 per cent or more.

In Australia, Domberger (1994) and Domberger *et al.* (1995) reported that contracts let by NSW Departments of Transport, Education, Health and Housing reduced costs by an estimated average of 20 per cent compared with the cost of in-house services. The Productivity Commission has also reported significant cost savings from contracting out services in various reports. For example, the Productivity Commission (2002) found that the 200 private members of the Job Network provided public employment services, such as job matching and job searching, at significantly less cost than the Commonwealth Employment Service that they replaced, although the effectiveness of the service was similar. Abelson (2005) found significant cost savings and service quality improvements in seven case studies of outsourcing by local governments.

On the other hand, contracting for services is not always efficient. Box 16.5 (p. 291) describes a costly failure by the Australian government to achieve a major outsourcing initiative for information technology.

⁶ Private firms use various methods for dealing with long-term contracts. These include price adjustment mechanisms, minimum purchase requirements, methods for monitoring quality and dispute resolution procedures. Public agencies can use similar methods.

Table 16.1 Cost savings from competitive contracting: international evidence

<i>Country</i>	<i>Activity</i>	<i>Reported savings</i>
Australia	Water supply	Estimated potential cost savings of 15 per cent
Canada	Refuse collection	Public collection up to 50 per cent more costly
Denmark	Fire services	Public provision almost three times more expensive than private contractors
Germany (West)	Office cleaning	Public sector provision 42-66 per cent more expensive
Japan	Refuse collection	Municipal collection 124 per cent more costly
Sweden	Road and park maintenance, water supply, sewerage	Cost reductions of 10-19 per cent in several municipalities
	Waste collection	Average cost reductions of 25 per cent
	Leisure activities	Cost reductions of 13-15 per cent
	Child care	Cost reductions of 9-15 per cent in nurseries
Switzerland	Refuse collection	Costs of private contracts 20 per cent cheaper
UK	Domestic services in local government and the NHS	Saving of 20-26 per cent, costs being reduced by more than a third in some cases
	Refuse collection	Cost reductions of about 20 per cent
	Central government (e.g. IT and printing)	Average saving of 25 per cent
USA	Refuse collection	Savings of 29-37 per cent
	Street cleaning	Savings of up to 43 per cent
	Office cleaning	Savings of up to 73 per cent
	Federal government	Cost savings of up to 35 per cent with an average saving of around 20 per cent
	Mass transit	Potential savings of 20-50 per cent

Source: Bailey (2002) based on Parker (1990) and OECD (1993).

Most studies find that the key driver of the cost savings is competition. Competitive tendering ensures that the lowest cost producer supplies the service and provides data on costs and efficiency benchmarks. Some economists argue that, given both competition and information on costs, public services can significantly increase their productivity and lower costs and can be as efficient as private sector. For example, Hoxby (1994) found that when public schools in the United States compete strongly with private ones, both educational attainment and graduation rates improve.

Welfare gains. It is also important to note that financial savings to government from competitive tendering may not equate to welfare gains. Financial savings are welfare gains in so far as they reflect productivity improvements, which release resources to other sectors. When competitive tendering produces financial savings only by reducing wage rates, there is no efficiency gain. In this case, outsourcing represents a loss of rent to public employees. The savings here represent a transfer from the workers providing the service to the purchaser of the service (in effect taxpayers).

Box 16.5 Outsourcing can go wrong

In the 1997-98 budget the Australian Government announced that all information technology (IT) infrastructure and telecommunication requirements of its agencies would be consolidated in common groups to be offered to the market. The initiative was based on a centralised model, in which the needs of organisations of varying sizes and differing functions were clustered together for the purposes of tender. The government forecast that consolidation and outsourcing would improve service delivery, achieve economies of scale, improve management of IT services and deliver cost savings of \$1 billion over a seven-year period.

The initiative met with strong bureaucratic resistance ranging from opposition to change to concerns about the secu-

urity of sensitive information relating to personal privacy, scientific research and intelligence.

With the outsourcing initiative three times over budget and two years behind schedule, the government commissioned an independent review. The review (led by Richard Humphrey) found that IT outsourcing had been exercised without adequate regard to the sensitive risks and complex processes of transition and without adequate regard to the business needs of each government agency.

Despite these criticisms, the Commonwealth government remained committed to outsourcing IT services. However, responsibility for outsourcing has reverted to the individual agencies.

Conclusions. Competitive tendering encourages clear specification of the services required and ensures that services can be delivered most cost effectively. Occasionally, in-house suppliers may win contracts; more often, competitive tendering results in outsourcing.

Services can be outsourced most efficiently when the key elements of supply (quantity, quality, delivery times and so on) can be specified precisely, transaction and monitoring costs are low, and the service can be competed for on a regular basis. Outsourcing works well for routine services (such as street or office cleaning, vehicle maintenance, printing and waste collection) for which complete contracts can be written. It can also work efficiently for more complex services such as property maintenance, construction of roads, hospitals and schools, management of recreational and sporting facilities, and for specialised services such as architectural design, traffic modelling, or some policy advice, which can be contracted on an as needed basis. Indeed, the scope of contracting for services is large.

Outsourcing is not efficient when contracts are vague or incomplete or involve numerous contingencies. Thus, the administration of foreign policy could not be contracted out, although running small consular offices can be. Also, functions essential to the continued running of government would rarely be outsourced. Governments need core management and technical skills, the capacity to manage contracts, continuity and corporate memory.

Finally, the politics of outsourcing should be recognised. Outsourcing may upset groups, notably politicians and public sector workers, who have a vested interest in public production. Thus, to achieve outsourcing, the efficiency benefits must be clearly demonstrable. Some elements in government may also be inclined to closed non-competitive arrangements. Indeed, sometimes government may be captured by private business interests. Such arrangements are generally contrary to the efficiency objectives of outsourcing.

User choice models

User choice models are another way to open service provision to competition. Service users can choose between service suppliers who are reimbursed according to the quantity and kind of services that they provide. Service providers compete for clients. Prices are fixed, but service providers compete in quality and relevance of service.

Alternatively, government can provide service vouchers to users. For example, government may provide vouchers for housing rents to low-income households or vouchers for public transport services to senior citizens. The service provider receives from government the income equivalent of the vouchers it receives. In this case service providers can compete on price as well as quality of service.

Consumers gain directly from user choice because they can choose the service that maximises their welfare. They also gain indirectly from the service and cost competition among suppliers. On the other hand, when government provides funds direct to service suppliers, it may encourage them to absorb higher costs rather than improve service.

An example of the user choice approach in Australia is the funding of tertiary advanced and further education colleges (TAFEs). Increasingly state governments are funding public and private-owned TAFEs based on the numbers and types of students they enrol. Victoria has moved to a user choice model with funds going first to users rather than to training institutions. Another example of user choice is government subsidies for child care. These payments may be made either to a child care centre or to families directly. Either way, the families can choose which (accredited) child care centre they send their children to and the centres are remunerated for the volume of services provided.

Although the arguments for user choice models are strong, there appears to be less clear evidence of the effects of user choice on efficiency and other outcomes than there is for competitive tendering and contracting. Rosen and Gayer (2014) report that allowing parents to choose between schools increases competition and improves learning outcomes of students as measured by test scores. However, these outcomes may also reflect parental motivation and support and peer interaction. Lundsgaard (2002) concluded that for services like long-term care for the elderly and disabled, child care and employment services, there are indications that incentives from funding systems matter but that there are too few systematic studies to draw firm conclusions.

Notwithstanding these reservations, mainstream economic thinking generally favours user choice as a starting point unless there are cogent reasons for not providing user choices. And this is certainly the mindset of the Productivity Commission (2017).

Summary

- Production of services involves turning inputs into outputs, which in turn generate outcomes.
- Efficient supply requires (1) that expenditure is allocated to ensure that the marginal value of an output exceeds its marginal cost and (2) that outputs are produced at least cost.
- Under the principles of New Public Management (NPM), government should set clear objectives to meet consumer rather than producer interests and managers should deliver services. NPM also involves competitive supply, empowerment of consumers, decentralisation of service delivery, transparency and accountability.
- Traditionally public expenditure management focused on budgetary processes and provision and control of inputs. Modern management focuses on outputs and performance budgeting that tie agency funding to outputs rather than inputs.
- To estimate costs, it is generally necessary first to estimate a production function that shows the inputs required to produce a given output. This can be done via expert estimates of inputs, formally estimated production functions or activity-based costing methods. Benchmarking compares an agency's costs with the costs of other providers.
- In-house supply of services usually has lower transaction costs than outsourced supply. On the other hand, contracting for services tends to improve service specification; focuses attention on core objectives and user needs; increases incentives to operate efficiently; reveals best practices so that slack cannot be hidden; and makes budget constraints harder. International and Australian evidence indicates that contracting for services often produces cost savings of 20 per cent or more.
- User choice models provide similar benefits by empowering consumers and encouraging competition among suppliers.
- Competitive tendering for delivery of services is desirable when work is specialised and contracts for services can be clearly specified, monitored and enforced. However, government should maintain core management skills, corporate memory and the capacity to manage contracts efficiently.

Questions

1. What are the main differences between outputs and outcomes? Give some examples.
2. What are the various ways of estimating production functions for public services? What are their strengths and weaknesses?
3. What is the relationship between cost and production functions and how are cost functions estimated?
4. What are the main difficulties that arise in estimating average and marginal costs for a public agency?
5. Public and private sector costs are often compared using either 'before and after' or cross-section analysis. How are these methods applied? What issues might arise in assessing the relative costs of private and public production from these methods?
6. Suppose that you were asked to determine whether public or private buses operated at lower unit cost. What kind of data would you need? What kind of statistical model would you use?
7. In Australia, job search assistance has been contracted out to private organisations. What are likely to be the costs and benefits of doing this?
8. If government wishes to increase the use of child care services, what is the best way to do so?
9. How can users of publicly financed services be given increased choices? What are the advantages and disadvantages of giving users more choice over consumption of public services? Give an example.
10. How would you measure the inputs, outputs and outcomes of police services? Is it possible to estimate the average and marginal costs of police outputs? Does this provide benchmarks for comparing the efficiency of police services?

Further Reading

- Friedman, L.S. (2002) *The Microeconomics of Public Policy Analysis*, Chapter 9, Princeton University Press, Princeton, New Jersey.
- Hawke, L. (2007) 'Performance budgeting in Australia', *OECD Journal on Budgeting*, 7, 1–15.
- Khursheed, A.F. and Borchering, T.E. (1998) 'Organising government supply', Chapter 2 in *Handbook of Public Finance*, F. Thompson and M.T. Green (eds), Marcel Dekker, New York.
- Lundsgaard, J. (2002) *Competition and Efficiency in Public-Funded Services*, Working Paper No. 17, Economics Department, OECD, Paris.
- Productivity Commission (2017) *Shifting the Dial*, Five Year Productivity Review, Report No, 84, Canberra.
- Pyndick, R.S. and Rubinfeld, D.L. (2005) *Microeconomics*, 6th ed., Chapters 6 and 7, Pearson Education, New York.
- Rainey, H.G. and Chun, Y.H. (2005) 'Public and private management compared', pp. 72–102 in E. Ferlie, L.E. Lynn Jr. and C. Pollitt (eds), *Oxford Handbook of Public Management*, Oxford University Press, Oxford.
- Schick, A. (1998) *A Contemporary Approach to Public Expenditure Management*, World Bank Institute, Washington DC.
- Vining, A.I. and Weimer, D.L. (2005) 'Economic perspectives on public organisations', pp. 234–256 in E. Ferlie, L.E. Lynn Jr. and C. Pollitt (eds), *Oxford Handbook of Public Management*, Oxford University Press, Oxford.