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Valuing publicly-provided services

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Abstract

Decisions about expenditure on health, education and other publicly-provided services require choices regarding how much of our collective income we should allocate to these services and which services should be given priority. The attempt to answer this question has stimulated many developments in economic theory and practice, from human capital theory to systems of extended national accounts. This paper is a brief survey of some of the most important ideas, with reference to their implications for Australian public policy.

Keywords

health, education, publicly-provided services, human capital, natural capital, social capital

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Introduction

Expenditure on health, education and other publicly-provided services accounts for a large share of government outlays. Hence, we are faced with ineluctable choices regarding how much of our collective income we should allocate to these services and which services should be given priority. The view that we are not spending enough on publicly-provided services was encapsulated in Galbraith's (1962) memorable phrase 'private affluence and public squalor'. On the other hand, the desirability of reducing public expenditure has been an article of faith for recent Australian governments. Such disagreements naturally give rise to the question: 'How should we value publicly-provided services?'.

The attempt to answer this question has stimulated many developments in economic theory and practice, from human capital theory to systems of extended national accounts. It is not possible to present a comprehensive survey of these developments in this paper, which is written with the more modest objective of identifying some of the most important ideas, with reference to their implications for Australian public policy. Furthermore, the paper deals primarily with developments arising from the mainstream neoclassical theory of value, in which the starting point for analysis is the set of values that would be generated by a perfectly competitive general equilibrium.

The paper is organised as follows. Section 1 sets the scene with a discussion of the growth of expenditure on publicly-provided services and the pressures for improvements in methods of valuing such services. Section 2 deals with the concepts of human, natural and social capital, which provide the theoretical basis for many attempts at the valuation of publicly-provided services. Section 3 is a survey of methods used in valuation, including benchmarking, studies of voter choice, stated preference methods, analysis of

land value and wage premiums, and growth accounting. Section 4 deals with the development of the national accounting framework in the context of an industrial economy, and the difficulties associated with adapting this framework to a post-industrial economy in which publicly-provided human services play a crucial role.

1. Background

A wide range of goods and services are provided by the public sector, and may therefore be referred to as 'publicly-provided'. In practice, the most difficult problems of valuation arise in relation to services rather than goods. Attention in this paper will therefore be focused on services.

It is rare for publicly-provided services to match the standard economic definition of pure public goods, which are both non-excludable and perfectly non-rival in consumption. However, in most cases, the decision that governments rather than markets should provide services reflects a judgement that market provision is unsatisfactory, either because the service in question displays some degree of non-excludability and non-rivalry or because of some other market failure, such as externality.

It follows, in general, that even if a market price could be observed for publicly-provided services it would not be a reliable measure of the social value of those goods. Except in cases where public enterprises sell services in competitive markets, the problem of valuing publicly-provided services must be addressed.

The growing importance of pure services

Although the growth of the service sector has been noted for many years, much discussion of the economy has been based on a three-stage model of production in which primary products are supplied as inputs to the secondary sector, predominantly manufacturing. In this model, services are provided by the tertiary sector, which provides the transport, distribution, wholesaling and retailing services needed to deliver goods to

their final consumers, as well as ancillary business services such as financial and property services.

Such a model is no longer appropriate. The shares of the primary and secondary sectors in total employment are shrinking and that of the tertiary sector is static. More than 40 per cent of the workforce is employed in the provision of pure services, unrelated to the sale or distribution of physical goods, and this proportion is rising steadily.

Although private sector services such as recreation and accommodation services employ a significant and rapidly growing proportion of the workforce, the most important area of long-term growth has been in the provision of services, such as health, education, police and welfare services, which provide social infrastructure for a modern society relying primarily on a skilled, well-educated population. These industries, which correspond to the Australia New Zealand Standard Industry Classification (ANZSIC) divisions of education, health and community services will be referred to collectively as the human services sector. Although there is a mixture of private and public provision of human services, most such services are publicly funded and supplied either free of charge or at prices that bear little relationship to the cost of provision.

The change in the structure of employment can be illustrated using the ANZSIC data for the period 1966–1998. In Table 1, the ANZSIC classifications have been aggregated into primary and secondary industries, tertiary services and pure services. Between 1966 and 1998, the proportion of the workforce employed in primary and secondary industries fell by around 18 percentage points from 46.1 per cent to 28.5 per cent. The proportion employed in the tertiary sector remained static at just under 30 per cent, while the proportion employed in the provision of pure services rose from 25.5 per cent to 42.7 per cent. Despite consistent attempts to constrain growth in public expenditure from the late 1970s onwards, the proportion of the workforce employed in the provision of human services rose from 13.5 per cent in 1966 to 15.8 per cent in 1985 and 17.8 per cent in 1988.

Table 1: Changes in the structure of employment: Australia 1966–98

Industry[a]	1966	1985	1998
	Share[b,c] (%)	Share[b] (%)	Share[b] (%)
Primary and secondary			
Agriculture, forestry, and fishing	8.9	6.4	5.3
Mining	1.2	1.5	1.1
Manufacturing	25.6	18.2	13.6
Electricity, gas and water	2.0	2.2	0.8
Construction	8.5	7.9	7.7
All primary and secondary	**46.1**	**36.1**	**28.5**
Tertiary			
Wholesale trade	}20.6	6.7	6.6
Retail trade		14.6	15.5
Transport and storage	5.6	5.8	4.9
Communications	2.1	2.5	1.8
All tertiary	**28.4**	**29.5**	**28.8**
Pure services			
Personal and other services	}5.9	3.5	4.2
Accommodation, cafes and restaurants		3.7	5.3
Finance and insurance	}6.1	4.5	4.0
Property and business services		7.0	11.4
Education	}13.5	7.2	7.6
Health and community services		8.6	10.2
All pure services	**25.5**	**34.5**	**42.7**

a: Australia New Zealand Standard Industry Classification division or subdivision

b: Proportion of all employed persons employed in industry division or subdivision

c: Fully disaggregated data not available

Source: Calculated from Australian Bureau of Statistics (1999)

The relative growth of the service sector has been driven both by supply and demand. On the supply side, productivity growth has been more rapid in the goods-producing sector than in the service sector. Hence, for any given mix of goods and

services output, the share of services in employment and total expenditure must rise over time. As Baumol (1967) notes, this differential productivity growth is a major contributor to the financial problems that have faced governments since the 1960s.

On the demand side, it appears that a number of services are superior goods, so that with given relative prices, their share of expenditure will rise over time. The superior-good characteristics of human services such as health and education reflect their special role in the development of human capital discussed below. In addition, since the biggest single category of expenditure on physical goods, namely food, is an inferior good, it is reasonable to suppose that services in aggregate must be superior.

Public sector reform and publicly-provided services

Public sector reform, and microeconomic reform more generally, has generated an increasing demand for more accurate measurement of the value of particular services. In part, microeconomic reform has been associated with an ideological preference for market-oriented solutions, with a belief in the superiority of private over public enterprise, and with claims that the social democratic welfare state is obsolete in an era of globalisation. The attempt to estimate market or pseudo-market valuations for publicly-provided services may then be seen as a step towards an ultimate goal of competitive market provision of such services.

Quiggin (1999a) criticises these arguments and presents the alternative view that reform is necessary because the growth in demands on governments, arising from the rapid expansion of demand for human services, has outpaced governments' capacity to raise tax revenue, leading to a 'fiscal crisis of the state' (O'Connor 1973). On this view, the need for more accurate valuation of publicly-provided services arises primarily from the need to justify expenditure on particular services in the face of competing demands for the provision of other services.

2. Human, natural and social capital

Any economic assessment of the value of human services must be based on the concept of human capital, and the associated observation that human services have both a current consumption component and an investment component. For a broader assessment of the value of publicly-provided services, it is useful to consider the related concepts of natural capital and social capital.

Human capital

Most attempts at valuation of human services have treated these services as if they were pure items of current consumption. A more appropriate economic analysis begins with the observation that it is appropriate to treat education primarily as an investment. The idea that education is an investment was formalised by Mincer (1958) and Schultz (1961) using the concept of human capital, which is now central to the economic analysis of education, labour markets and economic growth. The human capital model is an elaboration of the commonsense notion that the function of schools is to teach students, that is, to provide them with information and skills that will be valuable in later life.[1] As with other investments, a sacrifice of current income (the goods and services that teachers and students could produce if they were not engaged in education) is accepted in order to generate monetary and non-monetary returns in the future.

In narrow versions of the human capital model, knowledge and skills are valued instrumentally, insofar as they contribute to increased productivity and hence, other things being equal, to higher earnings. However, the human capital model may be

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[1] An alternative view, that education provides socially unproductive 'screening' services has been popular among advocates of lower education spending. This view is contradicted by a wide range of empirical evidence (Quiggin 1999b).

interpreted more broadly, to encompass learning that does not contribute to higher market earnings. A knowledge of, and capacity to appreciate, literature, for example, provides a future consumption stream not reflected in market earnings.

It is also important to assess the extent to which education generates positive externalities, or, equivalently, the extent to which the benefits of education are private, rather than social. The fact that information is a pure public good is a central theme of the 'new growth theory' (Hartwick 1992). It follows that educated individuals can share their information with others at little cost and will therefore generate positive externalities. Of course, 'information is not knowledge'. That is, the benefits of education consist as much in the capacity to acquire and use new information (converting information into knowledge) as in the possession of specific facts. To the extent that the transmission of knowledge requires that both the transmitter and receiver be educated, education is characterised by network externalities.[2]

A good deal of microeconomic analysis based on the human capital model has involved the estimation of earnings equations and the derivation of estimates of private and social returns to education investment. Analysis of earnings excludes both externalities and non-monetary benefits of education, and therefore yields lower-bound estimates of the return to education. Higher estimates of the benefits of educational investment may be obtained from studies of the determinants of economic growth, such as that of Mankiw, Romer and Weil (1992). Such studies have found that investment in human capital is consistently and significantly related to subsequent economic growth. The use of earnings equations and growth accounting models to estimate the benefits of education is discussed further in Section 3.

The analysis of education as a form of investment is well-established in modern economic theory. By contrast, in much current policy discussion, education is treated as

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[2] I am indebted to Peter Kenyon for this point.

an element of current consumption. This analysis leads to mistaken policy conclusions, such as the view that a reduction in expenditure on education implies an increase in national savings, as suggested by Fitzgerald (1993). Depta, Ravalli, and Harding (1994) show that when expenditure on education is correctly classed as investment, the apparent decline in national savings during the 1970s is fully offset by an increase in educational investment.

The analysis of education in terms of investment in human capital may be applied to a wide range of human services including children's services and labour market programs. In particular, active labour market programs have been defended on the grounds that they may offset 'skill atrophy', the loss of human capital in periods of unemployment (Layard, Nickell and Jackman 1991).

More complex issues arise in the analysis of health services. Some items of health expenditure, such as preventative health programs are appropriately classified as capital expenditure while others, such as palliative care for the elderly represent consumption. Depta, Ravalli, and Harding (1994) classify expenditure on treatments for acute health conditions as current consumption and expenditure on treatments for chronic conditions as investment in human capital.

A fundamental difficulty with the economic analysis of health expenditures is that current health status is not merely an item of current consumption, but a complement to productive and consumptive activity. For an employed worker, the main benefit of health treatment may be a reduction in time spent off work, rather than an improvement in subjective well-being. If so, health services are appropriately regarded as an intermediate input to production, rather than as an item of final consumption.

More generally, the benefits of many kinds of consumption are reduced by illness. Bleichrodt and Quiggin (1999) show that the widely-used Quality-Adjusted-Life-Year (QALY) model of health benefits implies that individual preferences must take a multiplicatively separable form $q(h)u(c)$, where q is the quality of life associated with a

given health state and *u(c)* is the utility arising from general consumption. A corollary of this analysis is that health is a superior good, in that the proportion of expenditure allocated to health care should rise as income increases.

Natural capital

As with human capital, the concept of 'natural capital' has been found to be useful in a number of contexts. The simplest form of natural capital is land — 'the original and inexhaustible powers of the soil'. Since these powers can be privately appropriated through land ownership, it is incorporated in standard measures of national wealth, as are mineral resources and some forest resources. More recently, Australian accounting standards have been extended to included privately-owned 'self-generating and regenerating assets' (Australian Accounting Standards Board 1998). The standard has been designed primarily to improve accounting in agriculture and forestry enterprises, but has been applied to privately-owned wildlife (Earth Sanctuaries 1999). However, stocks of natural capital such as watersheds, airsheds and fish stocks that are not privately owned are not normally included in measures of national wealth. The depletion or enhancement of natural resource stocks is similarly disregarded in measures of national income.[3](Mishan 1967).

The issue of natural capital has been particularly important in debates over the environmental sustainability of economic growth. Although it is not possible to summarise this vast literature, or even to list the many definitions of sustainability, a couple of key points emerge. First, exploitation of a particular resource stock is sustainable at a given level of service flow if the rate of extraction is equal to the sum of

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[3]   Note however, that most attention is paid to measures of gross product, which do not even take account of depreciation of physical capital. This reflects the origins of national accounting in Keynesian macroeconomics, where the object was to obtain an accurate measure of economic activity, rather than an assessment of economic welfare.

the rate of growth of the stock (in the case of a renewable resource) and the rate of resource-saving technical change (which is particularly relevant for non-renewable resources). Second, a level of service flow from resource stocks in general is sustainable if any decline in stocks is offset by substitution of physical capital (Solow 1974; Hartwick 1977). The question of sustainability is therefore closely related to the need to take appropriate account of resource depletion and enhancement.

A number of attempts have been made to incorporate measures of natural capital into national accounting systems. One approach is represented by adjusted GDP measures such as the 'Green National Product' (Cobb and Cobb 1994) and the 'Genuine Progress Indicator' (Hamilton 1997). Hamilton notes the following shortcomings of GDP:

- the failure to account for the way in which increases in output are distributed within the community;

- the failure to account for the contribution of household work;

- the incorrect counting of defensive expenditures (such as spending on pollution clean-ups) as positive contributions to GDP; and

- the failure to account for changes in the value of stocks of both produced and natural capital.

Of these, only the third and fourth points are directly relevant in valuing publicly-provided services. It is obviously desirable to take account of the costs of pollution and other activities that deplete natural capital, rather than treating all such activities as net additions to GDP. A logical corollary is that the provision of public services which add to environmental capital should be valued directly in terms of environmental indicators, rather than being measured by the value of inputs.

Unfortunately, development of the adjusted GDP approach has been limited, and in some respects, unsatisfactory. Cobb and Cobb (1994) assume that expenditures on pollution control are a proxy for the level of pollution and therefore treat them as

deductions from national income. In many cases, however, levels of pollution have declined as control expenditures have risen. Furthermore, for no clear reason, Cobb and Cobb exclude most publicly-provided services from their output measure. In part, at least, some of the choices made by Cobb and Cobb appear to reflect a presumption that, while measured GDP is rising, any valid measure of welfare must, like their Green Domestic Product measure, be declining. By contrast, Hamilton rejects the argument that publicly-provided services should be excluded from an indicator of genuine progress.

An alternative approach is the development of 'satellite accounts' in which changes in the stock of natural capital, environmental quality and so on are assessed, but not assigned a monetary value or added to changes in Gross Domestic Product. Whichever approach is adopted, this is an area that requires substantial further development.

Social capital

Successful application of the concepts of 'human capital' and 'natural capital' has led to considerable interest in the idea of 'social capital'. Although there is no generally accepted definition of social capital, the basic idea is that a society's set of institutions and relations is analogous to a stock of capital in much the same way as is the set of skills and knowledge possessed by an individual. The analogy certainly seems useful. Societies work more smoothly and efficiently if they have a set of social institutions which encourage individuals to trust one another and to take socially beneficial actions in the confidence that these actions will be reciprocated. Conversely, societies characterised by extensive rent-seeking and conflict over income shares will generally display poor economic performance. Putnam (1993) compares regions of Italy characterised by high and low levels of trust and argues that social and economic outcomes are better in regions where levels of trust are high. Similarly, Collier and Gunning (1999) report cross-country regressions supporting the view that low levels of social capital contribute to the

explanation of poor economic performance in Africa. However, the measures used by Collier and Gunning, including government corruption and the frequency of civil war, are not particularly relevant to the Australian policy debate.

Thus while the social capital metaphor is useful, converting the metaphor into an operational concept is more difficult. The problems of measuring human and natural capital stocks pale into insignificance when we consider how to measure the amount of 'trust' in a given society, let alone the extent to which particular government policies and services act to increase or decrease the level of trust. For example, whereas social democrats such as Cox (1995) argue that reductions in the value of social welfare payments diminish the stock of social capital by undermining belief in fairness, advocates of free-market policies, such as Norton (1998) claim that such cuts enhance social capital by diminishing the corrosive effects of welfare dependency.

Some progress on measurement has been made. Onyx and Bullen (2000) discuss a range of measures of social capital, including volunteering, connectedness and feelings of trust and safety for five communities in New South Wales. Cox and Caldwell (2000) consider conceptual issues regarding management. Nevertheless, as Woolcock (2000, p. xix) observes: 'While the idea of social capital may have a long intellectual pedigree, the same cannot be said for the state of our empirical knowledge about it'.

It seems unlikely that a consensus on how to measure or value social capital will be reached in the near future. However, discussion of social capital reminds us that quantitative measures of the supply of publicly-provided services are unlikely to capture all the effects arising from the provision of those services. Although cultural variables like social capital are hard to quantify, there is widespread agreement that they are crucial determinants of economic growth. The task of improving our understanding of, and capacity to measure, social capital is important for the future development of economics and other social sciences.

The most promising approach to the economic analysis of social capital and related issues is based on the 'new institutional economics' pioneered by Williamson (1975), which focuses on the concept of transactions costs. Although considerable progress has been made in this area, it seems clear that economic analysis alone will prove insufficient to yield a proper understanding of social capital, and that tools from such fields as sociology, social psychology and political science will be needed.

2. Methods of valuing publicly-provided services

In this section, a range of methods of valuing publicly-provided services are considered. They include benchmarking, studies of voter choice and stated preferences, the analysis of land values and wage premiums, and growth accounting.

Outputs, outcomes and benchmarking

Largely as a result of public sector reform, attempts have been made in recent years to produce detailed measures of the output of publicly-provided services and of the outcomes for the beneficiaries of those services. In some cases, as with 'case-mix' funding of hospital services, funding of particular services is tied directly to output measures. In other cases, the publication of output measures has been pursued to increase accountability through processes such as 'benchmarking'.

Benchmarking involves comparing service providers on the basis of a range of measures of input and output. The simplest case arises when there is a single output, a single input (both measured without error) and a technology that displays constant returns to scale. In this case, the ratio of output to input is a productivity measure which provides an unambiguous ranking of service providers. The highest productivity level achieved is the 'benchmark' or 'best practice' to which other service providers should aspire. Moreover, if it is possible, to assign a monetary value to the output of any one

provider, and therefore an estimate of value added per unit of input for that provider, the output of other providers may be valued similarly. In Australia, the most systematic attempt at benchmarking the provision of public services has been undertaken by the Steering Committee for the Review of Commonwealth/State Service Provision (2000).

The simple benchmarking approach may be extended to the case of multiple inputs and outputs using the technique of data envelopment analysis (Charnes, Cooper and Rhodes 1978). The basic approach may be traced back to the work of Farrell (1957) on frontier production functions. The deviation from best practice may be measured using distance functions, as described by Luenberger (1992). Hence, if output can be valued for any provider, it can be valued for all providers.

There are, however, substantial difficulties with benchmarking. In particular, the results of data envelopment analysis will be unreliable if some inputs and outputs are omitted, or measured with error (Quiggin 1996;1997). In practice, some errors of this kind are unavoidable.

The difficulties of benchmarking are particularly relevant when funding is tied directly to output measures, as in case-mix funding for hospitals. If some outputs are omitted from the funding formula, public service providers will face pressure to reduce provision of those outputs. The more the provision of public services is opened up to competition, the more intense this pressure will be. Similarly, if measurement error leads to overpricing of some outputs and underpricing of others, opportunities for arbitrage will be created, with service providers seeking to shift responsibility for underpriced outputs and maximise provision of overpriced outputs. Cost-shifting between the Federal and State governments in the health sector is an example of this process.

Studies of voter choice

Elections and referendums are the most important (though not the only) opportunities for citizens to express their views on policy issues. Voting behaviour has been interpreted in a number of ways. Standard accounts of democracy rest on the assumption that voters make considered judgements regarding the policies that would produce the socially optimal outcome and the representatives most capable of implementing those policies, then vote accordingly.

Interest group theories are based on the assumption that voters act to maximise their own self-interest or the interests of some class or group with which they identify. Marxism, in which the relevant interest groups are social classes defined by their roles in the production process, is the most prominent interest group theory of politics. However, most economic studies of political behaviour have been based on some form of public choice theory, in which individuals maximise self-interest.[4] Although superficially plausible, public choice theory has not been very successful empirically (Quiggin 1987). In particular, because the chance of affecting the outcome is very small, individuals motivated by rational self-interest would normally choose not to vote.

The fact that the effects of an individual vote are small have led Brennan and Lomasky (1993) to argue that voting will be dominated by a desire to express particular attitudes rather than by an instrumental desire to affect the outcome. An obvious difficulty with this account is the fact that voting processes such as the secret ballot are designed to allow people to conceal rather than express their political preferences. Moreover, most voters are highly reticent about revealing their choices, say, by wearing party buttons, or even by selecting only the 'how to vote' card of their preferred party, and rejecting those of other parties.

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[4] A good summary of the public choice literature is Mueller (1989). Quiggin (1991) discusses the relationship between public choice theory and Marxism.

Both the standard democratic model and the public choice model imply that voting behaviour provides evidence about the value of publicly-provided goods and services. In the standard democratic model, voting is a method of aggregating information, including voters' private information about their demand for public goods. Broadly speaking, voters should support more provision of public goods if they judge that their private information would lead the population as a whole to favour more provision. In the public choice model, voters support more provision of public goods if they believe that they personally would benefit.

General elections usually involve a choice between two parties putting forward different proposals on a wide range of economic and non-economic issues. A vote for a given party may reflect support for some, but not all of those proposals. In Australia, Labor governments have generally raised more tax revenue, and spent more on publicly-provided services than conservative governments (Gruen 1982), but it is difficult to interpret a Labor (or conservative) election victory as evidence that the majority of the population supports (or opposes) some particular expenditure proposal.

In the United States, however, significant use is made of referendums to approve or reject individual expenditure proposals, particularly those linked to bond issues by local governments. There is an extensive literature devoted to the analysis of voting behaviour in such referendums, beginning with the work of (Bergstrom, Rubinfeld and Shapiro 1982). A survey of US evidence and a study of Australian voter preferences regarding education is presented by Papadakis and Shapiro (1992). Although much of the literature on voting behaviour has been based on simplistic private-interest models, Brokaw, Gale and Merz (1990) discuss the role of public attitudes, and Papadakis and Shapiro (1992) discuss the importance of altruism.

Stated preference methods

Referendums, like other 'natural experiments', are expensive and outside the control of economic policy analysts. Hence, there has been considerable interest in lower-cost substitutes, the simplest of which is the opinion poll. The standard opinion poll question of the form 'Do you support policy X ?' may be seen as a 'hypothetical referendum' on the subject. Opinion polls have found that most Australians are willing to accept higher taxes in return for improved services (Baldry and Vinson 1998; Papadakis 1990; Withers, Throsby and Johnston 1994). Shapiro and Papadakis (1993) found that a majority of voters in most states preferred higher education expenditure to lower taxes. However, Saunders (2000) reports survey results showing that a majority of respondents would prefer tax cuts to an expansion of 'welfare services', a reversal of the situation which prevailed in the 1960s.

Economists have approached the 'hypothetical referendum' from a rather different starting point: the use of 'contingent valuation' methods to estimate willingness to pay for environmental goods, such as the preservation of particular wilderness areas. Crude versions of the 'contingent valuation' method such as direct questions of the form 'How much would you be willing to pay for the preservation of area X?' produced unreliable results. Economists have responded to these problems by presenting preservation or development as alternative policy options and using more realistic 'payment vehicles' such as increases in taxes.

As more sophisticated methods of eliciting preferences have been adopted, the monetary valuation element of the process has become less and less central, and the 'hypothetical referendum' element more and more prominent. New techniques, such as choice modelling, involve considering a range of proposals varying along a number of dimensions, including the cost of the proposal, the areas of particular habitats preserved and the number of jobs created or lost. The term 'stated preference methods' has been used to encompass both the 'contingent valuation' method and related techniques such as

choice modelling. Recent Australian surveys of the literature include Blamey (1998) Lockwood (1998) and Quiggin (1998a). Although these methods show considerable promise, numerous technical difficulties remain and it is premature to draw strong policy conclusions from the results obtained so far.

A separate development of stated preference methods, centred on the concept of Quality Adjusted Life Years (QALYs), has taken place in health economics. The basic approach has been to elicit preferences regarding possible health profiles, differing in such variables as length of life, mobility, capacity to undertake employment and household tasks, and the presence or absence of pain. For example, if ten years of additional life in good health is judged equivalent to twenty years of additional life with some chronic condition h involving pain and loss of mobility, then each year of life with condition h is supposed to provide 0.5 QALYs.

Initial attempts at elicitation of preferences for QALYs involved asking questions about uncertain health outcomes. Analysis of stated preferences was based on the assumption that respondents maximised expected utility (Pliskin, Shepherd and Weinstein 1980). As had already been observed in studies of preferences regarding risky monetary outcomes (Machina 1987), this assumption is not satisfied by respondents in studies of health preferences (Loomes and McKenzie 1989). However, Bleichrodt and Quiggin (1997), show that the QALY model can be developed and estimated without relying on the restrictive assumption of expected-utility maximisation.

The main focus of work using the QALY model has been on cost-effectiveness analysis. In cost-effectiveness analysis, the benefits of different procedures are compared on the basis of the QALY criterion. The aim is to achieve the best allocation of any given health budget, that is, the allocation that yields the most additional QALYS for any given expenditure.

For a variety of practical and ethical reasons, medical decision-makers have preferred cost-effectiveness analysis to cost–benefit analysis, in which explicit monetary

values are assigned to health outcomes. Despite this, a folk wisdom has emerged which suggests that, for developed countries, health procedures will generally be considered worthwhile at cost–benefit ratios below $US50 000 per QALY gained and will be considered excessively expensive at cost–benefit ratios above $US100 000 per QALY gained. That is, a health procedure which gives 50 years of additional life in good health to someone who would otherwise have died immediately would be evaluated as having benefits of between $US2.5 million and $US5 million. This range of values is consistent with that obtained using other methods, including the contingent valuation approach discussed above, and estimates of wage premiums for dangerous work (discussed in the next section).

Land values and wage premiums

To the extent that government services are specific to residents of particular jurisdictions, the benefits of those services should be reflected in land values. Particularly in the United States, where local government jurisdictions in the same area may offer very different sets of services, there have been attempts to measure the impact on land values of differences in a range of amenities, including tax rates and government services (Cheshire and Sheppard 1995). Smith and Huang (1995) survey the literature, focusing on studies of air quality.

A similar approach may be applied if the benefits of publicly-provided services are received by individual workers and reflected in their wages. The most important example of this approach is the calculation of social rates of return to education based on the wage premium associated with higher levels of education. In the absence of such supply growth, a greater increase in the inequality of earnings would have been observed. Chia (1990) estimates that the investment in a bachelor's degree in Australia yields a private rate of return of 9.6 per cent for males and 12.6 per cent for females. Maani (1996) provides

similar estimates for New Zealand. Borland (1996) and Borland and Wilkins (1996) show that expansion of the supply of skilled labour has roughly balanced growth in relative demand for skilled labour. However, Nevile and Saunders (1998) argue that globalisation has increased wage inequality in the private sector by raising the relative demand for skilled labour. Preston (1997) reviews a large literature on private and social rates of return to education, based on the estimation of earnings functions.

Studies of wage premiums for dangerous work may also be used to provide estimates of the benefits of reductions in ambient environmental hazards or improvements in health care. The crucial problem in studies of this kind is the need to take account of the fact that dangerous work is most commonly performed by workers with low human capital, with the result that the simple correlation between occupational hazards and wage rates is negative. To estimate the wage premium associated with occupational hazards correctly, it is necessary to compare the wage obtained by workers in dangerous occupations with that paid to workers with similar education and experience in safer occupations. Estimated values of the wage premium imply that, on average, each additional workplace death is associated with annual wage premiums of $US 2–4 million (Viscusi 1993). That is, if the annual risk of workplace death faced by a given group workers increases by 0.01 per cent (1 in 10 000), the wage paid to each worker must rise by between $200 and $400 per year.

A general policy implication of this result is that public health aspects of policy issues should be given greater prominence than is generally the case. Updating the Viscusi estimates and using a purchasing power parity exchange rate implies that public health interventions in Australia should be valued at between $4 million and $8 million per life saved. In the case of activities giving rise to negative externalities, this is a lower bound, since it is necessary to take account of the costs of self-protection (Berger et al. 1987).

Applying this analysis to the case of road transport indicates that a lower bound estimate for the social cost of crashes in Australia, based on 2000 deaths per year, is

between $8 billion and $16 billion, considerably more than annual expenditure on road construction and maintenance even when a capital return on existing roads is taken into account, as discussed by Pender (1987). Some, but not all, of this cost is internalised by motorists. It follows that road safety, rather than, for example, traffic congestion, should be the primary focus of transport policy.

Growth accounting

Improvements in human and natural capital contribute to economic growth. The marginal productivity of human and natural capital may therefore be estimated by growth accounting techniques. The first such techniques were developed by Denison (1962) on the basis of the neoclassical growth model.

The standard neoclassical growth model, first put forward by Solow (1956) and Swan (1956) involves the assumption of an aggregate production function. In the Cobb–Douglas case, we have:

$$Y = L^{\alpha} K^{1-\alpha}$$

where

L is the input of human capital;

K is the input of physical capital (including natural capital);

and is a residual.

The aggregate production function yields the growth-accounting equation:

$$\partial \log Y / \partial t = \alpha \, \partial \log L / \partial t + (1-\alpha) \, \partial \log K / \partial t + \partial \log \varepsilon / \partial t$$

where

$\partial \log L / \partial t$ is the rate of growth of the human capital input;

$\partial \log K / \partial t$ is the rate of growth of the physical capital input; and

log ∂/∂t is the 'Solow residual', measuring the rate of disembodied technical progress.

Within this framework, the provision of government services may affect growth through changes in L, K or . Changes in the stock of human capital may arise from provision of education, improved health care or social services and labour market programs which facilitate the return of long-term unemployed workers to the labour market. Public investment in physical capital such as infrastructure affects K. Finally, the residual may be affected either by publicly-provided research and development or by the affects of macroeconomic and microeconomic policies. The microeconomic reforms undertaken in Australia over the past twenty-five years may be seen as attempts to raise (Quiggin 1998b).

The effects of publicly-provided services on economic growth may be either positive or negative. However public investment in physical or human capital is financed, it is likely to crowd out private investment to some extent. If the increase in capital stocks resulting from public provision of services is smaller than that which would have arisen from the private investments displaced in this way, growth will be reduced.

In evaluating the relationship between economic growth and publicly-provided services, it is necessary to consider whether the marginal rate of return on public investment in physical or human capital is greater or less than the marginal rate of return on private investments. In the case of human capital, evidence from growth accounting studies supports the conclusion derived from studies of wage determination, namely that the social return to public investment in education is higher than the marginal rate of return to private investments (Barro 1991; Mankiw, Romer and Weil 1992).

With respect to physical capital, a number of writers have argued, on the basis of growth accounting evidence, that public infrastructure projects have high external benefits associated with increases in the productivity of the private sector (Aschauer 1988; Kenyon 1997; Otto and Voss 1996). As is usual in problems of this kind, different

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econometric approaches yield different results with some studies producing negative or statistically insignificant estimates of the marginal productivity of public infrastructure investment (Evans and Karra 1994). In a useful survey, Dowrick and Lau (1998) conclude that the preponderance of evidence supports the original conclusion that public infrastructure investment yields high marginal benefits. More important than the econometric complexities, they argue, is consideration of the dynamic linkages between infrastructure investment and private investment.

In assessing the costs and benefits of public investment in physical or human capital it is also necessary to consider the extent to which such investment is financed by reductions in private investment or by reductions in private consumption[5]. If the level of private investment is suboptimal, because of taxation distortions or market failures, the opportunity cost of foregone private consumption will be less than the marginal rate of return to private investment. The appropriate opportunity cost of public investment is therefore a weighted average of the private rate of return to capital and the discount rate for consumption.

The biggest challenge to the neoclassical growth model in recent years has come from the advocates of 'new growth theory' (Romer 1990). The key point of new growth theory is that, in the absence of an exogenous trend in the 'Solow residual', sustained growth is feasible only if the aggregate production function displays increasing returns to scale, and this implies the existence of externalities. The most plausible source of scale economies and externalities sufficient to sustain long-term growth is the fact that knowledge is a public good. Hence, investments in the generation of knowledge (research and development) are crucial in explaining sustained growth. Empirical studies thus far have failed to provide definite answers on whether new growth theory has

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[5]   In the short run, public expenditure may have Keynesian expansionary effects, but these are generally assumed not to be maintained in the long term.

greater explanatory power than the Solow–Swan model. However, there is no doubt that the new growth model represents a significant conceptual advance. On the whole, new growth models suggest that the benefits of publicly-provided services particularly those related to research and higher education, have been underestimated in the past.

4. National accounts and publicly-provided services

The need for measurement of the value of publicly-provided services arises naturally in the measurement of national product and national income. The valuation of services is particularly important in recent policy debates about productivity and the measurement of inflation. Particularly in the United States, it has been argued that productivity growth in the service sector has been under-estimated and inflation correspondingly over-estimated (Boskin et al. 1998).

The development of national accounts

The original motivation for the development of national accounts was the need for accurate measures of aggregate economic activity as a basis for Keynesian stabilisation policy and wartime economic planning. The central requirement for these purposes was accurate measurement of changes in market output and employment in the short and medium term. The first efforts to develop such measures were undertaken in the 1920s and 1930s, notably by Clark (1932) and Kuznets (1934).

The systematic construction of annual national accounts by public statistical agencies began during World War II, and became a general practice in the 1950s (Studenski 1958). Although they were designed as measures of economic activity, national accounting measures such as gross domestic product (GDP) were immediately interpreted as measures of long term economic performance. Over time, this emphasis has become increasingly dominant.

In a pre-industrial economy, the great majority of economic activity consists of subsistence agricultural production and household production, which are not intermediated through markets. A system of national accounts is not meaningful in this context. The problems that faced the developers of national accounting systems arose specifically from the nature of production in an industrial economy.

In an industrial economy, economic activity may be analysed in terms of primary industries (agriculture and mining) supplying raw materials to be turned into finished goods by secondary industries (manufacturing) which were assisted in the tasks of distribution, finance and so on by tertiary industries (services). The crucial accounting problem is to avoid double-counting by measuring only the value added at each stage of the production process. The system of national accounts represents an elegant solution to this problem.

Publicly-provided services such as health and education do not fit naturally into the model of the industrial economy on which the system of national accounts is based. These activities have therefore been treated in an *ad hoc* fashion, on the basis that the value of outputs is assumed equal to the value of inputs.

As the importance of the pure services sector has grown, statistical agencies have attempted to improve estimates of prices, quantities and productivity for this sector. A number of the techniques discussed above have been used in this process, but considerably more remains to be done.

5. Implications for public policy

The main purpose of the discussion above has been to survey methods of valuing public goods, rather than to report the results of studies evaluating particular public goods. Nevertheless some consistent themes relevant to public policy emerge from a broad overview of the literature.

First, estimates of the value of human services tend to support the view that the allocation of a higher proportion of expenditure to human services would, *ceteris paribus,* lead to an improvement in social welfare. Estimates of the value of education derived from earnings equations imply that increased provision of education is a profitable social investment at the margin. Studies of willingness-to-pay for reduced health risks imply that higher expenditure on a wide range of medical services and on public health measures such as road safety would yield positive net social welfare benefits. Direct questioning of voters indicates that a majority would be willing to pay higher taxes in return for improved services.

Advocates of lower public expenditure on services have rarely responded to these arguments directly. The economic case for reduced or constrained public provision of services has been based primarily on arguments concerning the desirability of reducing aggregate levels of taxation. These arguments have some force, since, in the absence of some policy changes, the growth in demand for services would lead to steadily rising taxation levels which would at some point, create adverse incentive effects so great as to outweigh the economic benefits of the services concerned.

However, these arguments have relatively reduced force in Australia, where the ratio of public expenditure to GDP is low by OECD standards. Moreover, valid economic arguments about the deadweight costs of public expenditure are frequently accompanied by invalid assumptions that investment in physical capital is preferable to investment in human capital or that the consumption of human services represents a cost burden on the goods-producing sector of the economy. Economic analysis can help to refute these fallacious ideas.

The debate over appropriate total levels of public spending is unlikely to be settled by economic or econometric analysis. In practical terms, improved methods of valuing public goods will prove most useful in allocating fixed budgets across a range of desirable services. Despite the significant difficulties associated with explicit rationing of

health care, for example, QALY-based analysis is increasingly influential in the setting of health budgets.

Concluding comments

Much public discussion of economic problems is based on the implicit assumption that the market sector provides the basic needs of individuals and households, and that publicly-provided services represent an overhead cost burden on the market sector. Whatever its relevance in the past, such an assumption is clearly obsolete today. The market sector does meet basic needs for food, clothing and shelter, but the proportion of market activity associated with supplying basic needs is small and declining.

As basic needs are met, and individuals and societies move up Maslow's (1968) hierarchy of needs, it is the adequacy of human services such as health and education that is most critical in determining well-being. An economic framework that neglects these services, or regards them as being of secondary or tertiary importance, will inevitably be misleading.

The need for improvements in the valuation of publicly-provided services, particularly human and environmental services, is already pressing and is likely to become more so as the importance of the pure services sector grows. Economists have responded to this need by developing a wide range of techniques, including benchmarking, stated preference methods, and inference from market outcomes such as land prices and wage premiums. These techniques have yielded considerable insights. Nevertheless, substantial difficulties remain to be resolved.

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