

## REVIEW

### MEASURING OUTPUT FROM THE PUBLIC SECTOR: A CRITICAL EXAMINATION OF THE ATKINSON REVIEW

BY RICHARD MURRAY\*

*MAPSEC*

In 1993 a new page was turned in national accounting. The United Nations Standards of National Accounting recommended a new standard for the measurement of output from the public sector. Implementation has recently begun in many countries, in Europe based on a European Union directive. In the U.K. the Atkinson Review in 2005 came up with a series of recommendations. This article examines its recommendations concerning the definition and valuation of government outputs. For the non-market sector a market analog is recommended by the Review. However, several of its recommendations are inconsistent with that, championing social value as a basis for definitions and measurement. If taken seriously it will lead to arbitrary and politically controversial factors inserted into national accounts. The article highlights the norm that GDP is a measure of production, and advocates adhering to the market analog and following well recognized practices of national accounting.

#### INTRODUCTION

Outputs in the public sector are finally recognized as something of importance for the assessment of the gross domestic product of a nation. It has been in the air for some time. In 1993 the UN commission on national accounts published a new set of recommendations, the System of National Accounts 1993 (SNA 93; United Nations, 1993). It proposed standards for the direct measurement of government outputs, doing away with the convention that output = input. This was followed by similar recommendations by the Commission of the European Union in 1996, the European System of Accounts (ESA 95; Commission of the European Union, 1996). And eventually a *Handbook on Prices and Volume Measures in National Accounts* was published by Eurostat in 2001 (Eurostat, 2001), followed by a European Union Commission decision in 2002 that all member states should include output measures along the recommended standards in their national accounts, starting with the year 2006. The Office for National Statistics in the U.K., Statistics Sweden, and other national statistical offices around Europe have begun to implement this directive and are now including output measures for the public sector in their regular national accounts.

In the United Kingdom a special commission was set up to review present practices to handle government outputs in the national accounts and to recommend developments in both the short and the long run. It was headed by Tony

\*Correspondence to: Richard Murray, MAPSEC – Managing the Public Sector, Drottningholmsvägen 1, 112 42 Stockholm, Sweden (richard.murray@mapsec.se).

Atkinson and worked for two years. It presented its findings in a report in 2005, commonly called the Atkinson Review (Atkinson, 2005).

This paper is a critical examination of the Atkinson Review, with comments on SNA 93 and ESA 95. Many of the ultimate recommendations of the Atkinson Review are both practical and sound. There are, however, arguments and recommendations that point in the wrong direction. These arguments are fundamental and illustrate the difficulty in finding a sound basis for the measurement of non-market goods. The arguments reflect a debate that has been going on since the first efforts were made to introduce output measures in the government sector in connection with program budgeting (Planning, Programming, Budgeting Systems, PPBS) in the late 1950s. That debate is about whether to measure output or outcome.

#### BACKGROUND

Looking back it is depressing that progress in understanding the production of public services has been so slow. In the market sector there is a long tradition of studying production functions, demand for inputs, average and marginal cost functions, elasticities of supply, productivity, and technical progress. The non-market sector has gone largely unnoticed. In part this can be explained by general difficulties in measuring the output of services, whether public or private. But in part it must be explained by a completely different perspective on public and private services. Resource use for the production of public services has not been regarded as inputs into a production process, but as an end in itself, in the form of public consumption. Consequently, the production activity in the government sector has not been recognized.

The PPBS approach to managing government programs in the U.S. involved setting targets for and measuring the output of government agencies. Stemming from the PPBS approach a program for output and productivity measurements was set up in the U.S. and conducted by the Bureau of Labor Statistics from 1973. It covered ultimately the outputs of some two-thirds of federal civilian employees. The output and productivity measurements were, however, never integrated into the national accounts of the U.S. The program was discarded in 1994 (Fisk and Forte, 1997).

In the United Kingdom, as probably the only country in the world, direct measures of government output were an integrated part of national accounts in the 1950s and early 1960s. After being criticized for being crude and arbitrary they were discarded. Since 1999 direct measures of government output have again been introduced and integrated in the national accounts and at present cover some two-thirds of government outputs (Atkinson, 2005, pp. 14, 17).

In 1975 Hill addressed problems of measurement of government non-market services and suggested a series of principles (Hill, 1975). His work had been commissioned by the forerunner of Eurostat but led to no results in the form of data collection at the time.

In 1982 the former head of Statistics Sweden, Ingvar Ohlsson, formed a research group within the Expert Group on Public Finances (Expertgruppen för studier av offentlig ekonomi, ESO) with the aim of throwing light on government

outputs, productivity, and the users of government outputs. Ohlsson had written his PhD thesis on national accounting systems in 1961 and for many years wanted to extend output measurements to the government sector (Ohlsson, 1961). In 1986 (English translation in 1987) the research group published a first collection of results for the period 1960–80 (Ohlsson *et al.*, 1987). A summary of the findings was published by the National Bureau of Economic Research in 1992 (Murray, 1992). Also at that time a new round of productivity studies, commissioned by ESO, was published (Murray, 1994, 1996). It contained an enlarged sample of public services, comprising 75 percent of the total of central and local government and covered the period 1980–92. In it various techniques for measuring productivity were compared: the traditional national accounts technique with the non-parametric technique of data envelopment analysis. Non-parametric techniques had been developed by Färe (1988) and others, building on the seminal work of Farrell (1957). Among others, Andreassen, Bjurek, Blank, Försund, Hjalmarsson, and Luoma had performed non-parametric studies of non-market services in the 1990s (see, e.g. Andreassen *et al.*, 1989; Hjalmarsson and Försund, 1974; Bjurek, 1994; Hjerpe and Luoma, 1997; Blank, 2000).

So, why is the EU commission so keen on having government output measured? The answer is simple: because member fees, distribution of regional funds, and the Maastricht convergence criteria for fiscal management are all based on assessments of GDP per capita. Therefore, these accounts have to be compiled “on the basis of unique principles that are not open to different interpretations” (European Union, 2002). Especially the handling of government output differed among member countries, with countries inserting various productivity assumptions—from 0 to 2 percent per year. The Eurostat Handbook argues that harmonizing assumptions about productivity would not make the situation any better. “The more different the developments of productivity among member states, the less comparable are the results from using the same productivity change assumption” (Eurostat, 2001, paragraph 3.1.2.1). Just to show the impact: adjusting the growth of public services by direct output measurements instead of output = input for the 1970s reduces the growth of GDP from 2 to 1.5 percent per year, due to an overall productivity decline of 1.5 percent per year in the government sector during that decade (Murray, 1987).

#### PRODUCTION OR WELFARE?

National accounts may serve several purposes. Ohlsson (1961) distinguishes four:

- Analysis of the generation of income and the connection between different sectors of the economy regarding economic activity. This analysis serves the purposes of understanding and controlling business cycles.
- National budget planning is closely related to the first mentioned purpose.
- Analysis of general welfare.
- Analysis of production and the connections between different sectors of the economy regarding production (input–output).

Neither of the first two purposes require measuring government output. What counts in macroeconomic models is government demand for resources. Hence

government is looked upon as a consumer, not a producer, and the use of resources is captured by the concept of “public consumption.”

From a welfare and production perspective it is of course essential to measure outputs of all sorts, even in the public domain.

Does it matter if the perspective is one of production or of welfare? If the distinction is taken seriously, then the answer is yes. From the very beginning of national accounts proponents have argued for one or the other. From a welfare perspective outputs should be aggregated with weights corresponding to rates of substitution. From a production perspective outputs should be aggregated with weights corresponding to rates of transformation. Even the definition of output would differ. From a welfare perspective only what gives a consumer some benefit will count as an output. From a production perspective anything produced, whether useful or useless, would count.

GDP from a production perspective may be defended as a measure of production capacity, disregarding its actual composition and distribution. GDP is interpreted as a potential, wisely or foolishly used. This stance has been taken to ward off critiques of GDP as a measure of welfare.

It is interesting that the SNA 93 and ESA 95 emphatically state that “GDP is a measure of production” (United Nations, 1993, paragraph 1.69), while the Atkinson Review states that “National income is an indicator of the contribution to welfare of specified economic activities” (Atkinson, 2005, p. 10). Still, the difference between Atkinson on the one hand and SNA 93 and ESA 95 on the other should not be exaggerated. All agree that measurements should be of relevance to welfare.

But being of relevance to welfare—reasonable as it is<sup>1</sup>—is one thing, the question of how far one should go to capture welfare, quite another.

#### OUTPUT OR OUTCOME?

A measure of production is something else than a measure of welfare or of a contribution to welfare. The production perspective makes it clear that it is outputs and not outcomes that should be measured. While the distinction may be clear, however, there is a close correspondence between the two concepts. This has caused, and continues to cause, problems of identification and measurement.

The Atkinson report encounters problems of definition following Eurostat’s recommendations. Distinctions are made between input, activity, output, and outcome. Problems arise in the way “activity” is defined.

#### *Definitions*

*Inputs*, taking health service as an example, are defined “as the time of medical and non-medical staff, the drugs, electricity, and other inputs purchased, and the capital services from the equipment and buildings used.

These resources are used in primary care and hospital *activities*, such as a GP making an examination or the carrying out of a heart operation.

<sup>1</sup>“Reasonable” although not consequent. “The System is inevitably a compromise intended to yield the maximum benefits to different kinds of users and may not therefore be optimal for any one purpose taken in isolation” (United Nations, 1993, paragraph 1.82).

These activities are designed to benefit the individual patient. To the extent that they do, the health care provided constitutes the *output* associated with these input activities.

Finally there is the health *outcome*, which may depend on a number of factors apart from the output of health care, such as whether or not the person gives up smoking” (Atkinson, 2005, p. 40).

According to these definitions it would seem logical that “activities” that benefit the individual patient should count as “outputs.” But they do not. “Output” is defined by the Review as something different from “activity.” “Health care,” an undefined concept, is assigned the role of “output.”

Why is this so? Eurostat reasons that “activity is, for example, the number of operations in hospitals or number of patrols carried out by the police . . . Using activity indicators often does not lead to reasonable productivity numbers . . . Output is the preferred approach . . . For hospital services, the output is the amount of care received by a patient” (Eurostat, 2001, paragraph 3.1.2.1). Atkinson states it in this way: “While activities may be the only available indicator and hence have to be used, they . . . are an intermediate variable” (Atkinson, 2005, p. 41).

Discarding activities that do not benefit the patient directly, like administration, procurement, training, cleaning etc., is logical. But discarding as outputs activities that directly benefit the patient is illogical. Judging what is a direct benefit and what is an indirect benefit may still pose some difficulties, but has a fairly obvious answer when the question is raised: what would the patient be willing to pay for?

Disqualifying “activities” altogether as outputs leaves the question how to define output. It is in the pursuit of a definition of output that includes the benefits that Atkinson goes too far.

Stated clearly: output is the end product of a specified production process. Quality is different attributes of that output, of the product. The product is one thing and the valuation of the product quite another. However, there is still a close correspondence between output and outcome because both output and its qualitative attributes must be defined by taking into account their value for the consumer, or else output will be nonsense.

Outcome, for example whether the patient recovers or not, may serve as an *indicator* of quality, but does not in itself constitute quality. It is an attribute of the patient, not of the treatment.<sup>2</sup> Treating patients beyond hope of recovery constitutes a waste of money, but does not in itself prove that the treatment is of low quality.<sup>3</sup>

<sup>2</sup>Much of the confusion originates from a very common way of defining services: “Services are the result of a production activity that changes the condition of the consuming unit.” If this is taken to be a definition of output, it is no wonder that outcome is mixed up with output.

<sup>3</sup>The debate on whether to measure government outputs as pure products or as impacts, outcomes, effects, benefits etc. has been going on for a very long time. Hill, the pioneer in defining government outputs, even changed his position from 1975 to 1977. In 1975 he wrote: “Thus, the output of advocates is not to be measured in terms of the number of cases they win . . . The service provided by a lawyer is, therefore, no more and no less than the presentation of his client’s case” (Hill, 1975, p. 13). But in 1977 he wrote: “If the pupil’s qualifications and ability are such that he is incapable of understanding and absorbing the teacher’s instruction, there can be no change in his condition as a result of the teacher’s activity and no service is produced in these circumstances. The activity of the teacher is wasted and cannot count as productive” (Hill, 1977, p. 324). Atkinson cites only Hill (1977) (Atkinson, 2005, p. 41).

Mixing up output and outcome leads to the erroneous conclusion that health care may face diminishing returns to scale because expanding services will mean that patients will be brought under treatment that are less able to benefit from the treatment (Atkinson, 2005, p. 13). This is diminishing marginal utility, not diminishing returns to scale in production.

#### MARKET ANALOGY

The Atkinson Review states that it will adhere to the standards promulgated by the European Union, but, when there is latitude, find a basis for itself.

The Review boils down to nine principles. I will comment on each of the first three. They are the most important.

*Principle A:* The measurement of government non-market output should, as far as possible, follow a procedure parallel to that adopted in the national accounts for market output. (Atkinson, 2005, p. 36)

The Review states one very good reason for this principle: a reallocation of production from the public to the private sector or vice versa should not lead to a change in the estimate of national output. This requires not only that output is measured in the same way but also that output is valued alike in the private and the public sectors.

#### *Defining Output*

It is a good principle, as far as it goes. Many public services do not have a private counterpart. But a market analogy may nevertheless be applied by trying to figure out who would be the ultimate consumer and for what that consumer would be willing to pay. For example, a private patient in a hospital would pay for a consultation, therapy session, X-ray, operation, bed-day, etc. Such services are well qualified to be regarded as outputs of a public hospital, not least in the light of Principle A: what is the market analog?

Strangely enough, though, as we have seen, such services do not qualify in the eyes of the Atkinson Review, nor in the Eurostat Handbook.

Atkinson wants to define output in the health care sector as “whole courses of treatment”<sup>4</sup> rather than a number of separate products such as consultations, operations, therapeutic sessions, check-ups, etc. In doing so you are definitely way beyond a market analogy. What hospital would charge for “a whole course of treatment”—either before or after the patient gets well? Instead, hospitals charge for each activity, sometimes joined in “packages,” such as X-ray, operation, and postoperative care (Berndt *et al.*, 1998 argue for “episodes of treatment”). If the operation is not successful—not because of any error on behalf of the hospital—and some other treatment is suggested, this will constitute a new output to be purchased by the patient.

The suggestion to base output measurements on “the whole course of treatment” would be sensible if interpreted as the whole standard course of treatments,

<sup>4</sup>“Ideally, we should look at the whole course of treatment for an illness rather than at its components” (Atkinson, 2005, p. 113).

i.e. a standard bundle of services. Diagnostic related groups (DRG) is precisely that, a standard package of services to treat patients diagnosed to belong to a specific group. However, DRG is a much smaller bundle, not a lifelong treatment story and it may be handled as output without much problem of allocating outputs and costs to the correct period and pricing it for sale.

If it would be possible to define and measure units of general “health care,” so called reallocation gains would be registered as productivity increases. Measuring each service independently may miss that. It is this concern that motivates efforts to look for measures of outputs that mirror outcomes.<sup>5</sup> It is, however, as much a question of valuation of output as of defining it.

### *Valuing Output*

If curing appendicitis by medicine is valued on a par with curing it by operation and the operation is more costly than the medicine, then substituting medicine for operations will increase productivity. If the two cures are valued according to cost, no productivity increase will be recorded. This calls for valuing outputs in relation to benefits. In case there are market prices they should in principle relate to benefits. If there are no markets and no prices to go by, one has to proceed by judgment, at best supported by cost–benefit, cost–effectiveness, or willingness-to-pay studies. Again, the question is how far this should be carried.

The Atkinson Review tries to push the argument of “whole courses of treatment” even further, when considering that outputs even from different branches of government often add up to one common impact, i.e. health, law and order, social protection. However, Atkinson concludes that because of the difficulties in calculating relative contributions to, for example, health, i.e. from schooling, refuse collection, social protection etc., “it may be necessary to remain within cost weights” (Atkinson, 2005, p. 90).

Carrying the procedure of valuing outputs to the point of social value is going too far in a national accounts context. It raises the specter of arbitrary valuations on issues infested with political controversies.

On a lower level of substitution, however, it is important to measure in such a way that reallocation gains will be registered. If no reallocation gains from substitution would be included at all, no productivity increase at all would be registered. So the question is really, on what level of substitution reallocation gains are to be included. What seems to be in line with present practices in the national accounts is to restrict reallocation gains to situations of *immediate substitution*. In market situations, immediate substitution can take place between any goods having a market price. In non-market situations possibilities for immediate substitution must be figured out. When one medical practice is as good as another much more expensive one, they should be counted on par. When training air force pilots in simulators is as good as flying real airplanes, the two activities should be counted equal.<sup>6</sup>

<sup>5</sup>“A change in medical practice could change the total count of activities without a corresponding change in outcome” (Atkinson, 2005, p. 113).

<sup>6</sup>Both examples appear in the Swedish output and productivity studies (Murray, 1994, 1996).

Is it just a regrettable need “to remain within cost weights” or are there any good reasons for doing so?

One good reason is that costs reflect priorities of popularly elected representatives.<sup>7</sup> Who else but these representatives can with authority be said to better judge the relative benefits of different government services?

Another good reason is that costs reflect the rates of transformation between various services, which would be consistent with a production oriented national accounts. Of course, mixing rates of substitution and rates of transformation does not seem logical, unless, referring to the preceding point, there are good reasons to believe they coincide.

### *Adjusting for Quality*

*Principle B:* The output of the government sector should in principle be measured in a way that is adjusted for quality, taking account of the attributable, incremental contribution of the service to the outcome. (Atkinson, 2005, p. 42)

But how to quality adjust? Say that teaching improves so that students learn 25 percent more. Does that mean that output should be adjusted upwards by 25 percent? That is the recommendation by the Atkinson Review (Atkinson, 2005, pp. 130–1). This issue is more complicated.

The national accounts handle a multitude of such instances in the market domain of the economy, but not in the way the Atkinson Review recommends. The most common method is to adjust quality on the basis of the cost increase caused by the quality improvement. Suppose teaching costs per student have increased by 20 percent in order to improve learning by 25 percent. Output would then be adjusted upwards by 20 percent, on the grounds that the improved learning is worth at least as much as 20 percent more, otherwise it would not have been undertaken (again referring to priorities of elected representatives). However, this technique of cost adjusting for quality change does not capture possible productivity changes.

Another technique is to use hedonic prices. How much more costly is teaching in schools with 25 percent better results? Suppose costs are 20 percent higher and that there are municipalities that willingly pay for that. This could motivate a 20 percent upward quality adjustment, regardless of the overall cost increase, thus allowing for productivity change.

Both techniques could well motivate a larger upward adjustment for quality change. Suppose the cost increase willingly paid to have a 20 percent increase in learning is 30 percent. Decreasing marginal productivity is likely to form such a relationship.

<sup>7</sup>“It can of course be argued that, in a democratic society, a central (collective) valuation reflects, via the electoral system, the valuations of various individuals in some unknown type of aggregation . . . What is of fundamental importance here is whether the central valuations, which this government subject could be considered to represent, can in some way be read off or determined for eventual use in NA-work in a mixed economy” (Ohlsson, 1961, p. 89).



*Complementarity Between Public and Private Output*

*Principle C:* Account should be taken of the complementarity between public and private output, allowing for the increased real value of public services in an economy with rising real GDP. (Atkinson, 2005, p. 46)

The application of this principle is illustrated by a number of examples. The starting point is a direct measure of education output, student full time equivalents (FTEs) (Atkinson, 2005, p. 43). However, FTEs do not increase to the extent that inputs in education production do. Therefore, a new measure is sought. It appears that the Atkinson Review finds it strange to accept that taxpayers at large would accept falling productivity while the price of education rises and that therefore there must be something wrong with the measure. The solution lies in arguing that over time the value of education has risen and that this increase in value represents an increase in output. The fundamental argument for this state of affairs is that “. . . the output of government services rises with the real value of private assets and incomes” (Atkinson, 2005, p. 46). Another example is the output of fire services that is taken to increase due to the increase in real estate values (Atkinson, 2005, p. 45).

This reasoning is strange. There is nothing strange in falling productivity and rising unit costs of education. Increased bureaucracy could be one reason, but also increased difficulties in teaching ever more independently minded students. The latter reason would constitute a more reasonable motive for questioning the plain FTE measure. However, changes in production prerequisites are not taken into account in output measurements of marketed outputs. Doing that would imply, for example, that the output of crude oil production should be adjusted upwards by the depth of the wells drilled. This reasoning is rightly rejected by the Atkinson Review in connection with discussion of postal services. And it is also noted, rightly, that this is a matter of statistical convention (Atkinson, 2005, p. 38).

There is nothing strange in taxpayers paying more and more for a service that is becoming more and more costly. It just indicates that with the growth of incomes their willingness to pay increases, which is the same as saying that there is a strong, positive income elasticity, so strong that it dwarfs the negative price elasticity of demand. But this increase in the willingness to pay for education has nothing to do with increased productivity.

One could argue, as does the Atkinson Review, that part of the increase in incomes that in turn affects the valuation of education, stems from education.

In the first place: should the output of education be valued, not just by the value of earnings that the educated students receive, which from a welfare point of view would be consistent, but also by future income increases in income in the whole economy?<sup>8</sup> Let aside the difficulties in correctly assessing that part of the GDP increase that is attributable to education, such reasoning would change the principles of national accounts fundamentally. The price paid for a car should not be the value to be attached to the output of cars but should instead be the value of

<sup>8</sup>This argument has been raised even by others. Malmberg (2006), in a dispute over output measurements in the public sector in Sweden, argued that all of government's output combines to produce and accumulate human capital and should be measured accordingly.

all future changes in GDP due to the purchase of that car, including of course external effects, both positive and negative. It is a principle of national accounts not to include external effects.

In the second place: accounting in constant prices leaves no room for a continuous increase in output on the grounds of a rising value of output. Only if it were possible to calculate value added in nominal prices of, for example, education, then deflating that value in some way, would it make sense to reckon with a rising value of output for education and other government services due to increased demand. But this is not something the Atkinson Review considers. It is too farfetched and it would miss the opportunity to measure genuine productivity, i.e. efficiency of production.

### CONCLUSION

Measuring market goods is relatively simple: output is that which is bought. Price defines the product. Expenditure for non-market goods defines inputs, not outputs. Therefore, for these goods, there is a need to find other criteria for figuring out what is to be considered as output and how to value it.

The market analog is a good starting point. It is consistent with the foundation of national accounts. Regarding citizens as consumers, even when they are not paying for the services directly, does not seem wrong. When there are market substitutes defining the product and its price, it is easy. When there are no markets and no prices, some thinking is needed. But sticking to the market analog is still valid and helpful. It also helps to have in mind that GDP is a measure of production.

Despite claims to the contrary, SNA 93, ESA 95, and Atkinson all argue for definitions of output and evaluations of output based on social value, not market value. This is inconsistent with the foundations of national accounts.

### REFERENCES

- Andreassen, J., F. Försund, and E. Hernaes, "Produktivitet i statlig sektor, Gjennomgang av litteratur och anbefaling om satsing," Report No. 14/89, Senter for anvendt forskning, Norges Handelshøyskole, Universitetet i Oslo, 1989.
- Atkinson, Tony, *Atkinson Review, Final Report—Measurement of Government Output and Productivity for the National Accounts*, Palgrave-Macmillan, 2005.
- Berndt, E. R., D. M. Cutler, R. Frank, Z. Griliches, J. P. Newhouse, and J. E. Triplett, "Price Indexes for Medical Care Goods and Services: An Overview of Measurement Issues," NBER Working Paper No. W6817, December 28, 1998.
- Bjurek, H., "Essays on Efficiency and Productivity Change with Applications to Public Service Production," PhD dissertation, Göteborgs Universitet, 1994.
- Blank, J. L. T. (ed.), *Public Provision and Performance*, Elsevier, 2000.
- Commission of the European Union, *European System of National Accounts 1995 (ESA 95)*, 1996.
- European Union, Commission Decision of 17 December, 2002.
- Eurostat, *Handbook on Prices and Volume Measures in National Accounts*, 2001.
- Färe, R., *Fundamentals of Production Theory*, Springer-Verlag, 1988.
- Farrell, M. J., "The Measurement of Productive Efficiency," *Journal of the Royal Statistical Society, Series A, General*, 120, Part III, 253–90, 1957.
- Fisk, D. and D. Forte, "The Federal Productivity Measurement Program: Final Results," *Monthly Labor Review*, 120, May, 19–28, 1997.
- Hill, T. P., "Price and Volume Measures for Non-Market Services," Mimeo, Statistical Office of the European Communities, April 1975.

- , “On Goods and Services,” *Review of Income and Wealth*, 23, 315–38, 1977.
- Hjalmarsson, L. and F. Forsund, “On the Measurement of Productive Efficiency,” *Swedish Journal of Economics*, 76, 141–54, 1974.
- Hjerpe, R. and K. Luoma, “Finnish Experiences in Measuring and Promoting Productivity in the Public Sector,” Discussion Paper 150, Government Institute for Economic Research, Helsingfors, 1997.
- Malmberg, B., “Offentlig sektor som tillväxtmotor—ett humankapitalperspektiv, in Mått på välfärdens tjänster—en antologi om produktivitet och effektivitet i kommunala verksamheter,” Report No. 2006:2, Expertgruppen för Studier i Samhällsekonomi, 2006.
- Murray, R., “Den offentliga sektorn—produktivitet och effektivitet,” Bilaga 21 till LU 87, SOU 1987:3, Stockholm, 1987.
- , “Measuring Public-Sector Output: The Swedish Report,” in Zvi Griliches (ed.), *Output Measurement in the Service Sectors*, Studies in Income and Wealth, National Bureau of Economic Research, Chicago, 1992.
- , “Den offentliga sektorns produktivitet,” Ds 1994:24, Stockholm, 1994.
- , “Productivity Trends in the Public Sector in Sweden,” Report to the Expert Group on Public Finance, Stockholm, 1996.
- Ohlsson, I., *On National Accounting*, National Institute of Economic Research, Stockholm, 1961.
- Ohlsson, I., M. Blohm, and R. Murray, “Public Services—A Searchlight on Productivity and Users,” Report to the Expert Group on Public Finance, Ds Fi 1986:13, Stockholm, 1987.
- United Nations, *System of National Accounts*, 1993.