THE SWEDISH
MINISTRY OF FINANCE

PUBLIC SERVICES
- a searchlight on productivity and users

Report to the Expert Group
on Public Finance

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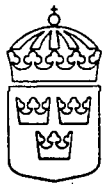

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English summary of Offentliga tjänster - sökarljus på produktivitet och användare, Ds Fi 1986:13

FOREWORD

The size and functions of the public sector in Sweden make its effectiveness and productivity a matter of very great interest. To study such questions, the Ministry of Finance in 1981 appointed a group of experts, the Expert Group on Public Finance.

For some years the Expert Group has been pursuing a project of 'studies pertaining to the production of services in the public sector'. The project has been headed by Dr Ingvar Ohlsson, former Director-General of Statistics Sweden. The working group attached to the project has included both methodological experts and representatives of interested parties, e.g. the Ministry of Public Administration, the Federation of Local Authorities and the Federation of County Councils. Special studies have been made by various research institutes and individual researchers.

Considerable efforts have been invested in the development of methods for estimating output, cost and productivity trends for various types of public services. The project has had an explorative design, the aim being both to provide information on the trends and, above all, to develop methods for description, measurement and comment. Distribution profiles for the services have also been studied.

The findings of the productivity and distribution studies have been presented in a Swedish report (Offentliga tjänster - sökarljus på produktivitet och användare, Ds Fi 1986:13. Stockholm, 1986) in terms related to the Swedish national accounts. The results have been noted and referred to in Parliament and Cabinet as well as in the public debate. At the same time, the studies have inspired methodological discussions. Since the approach seems to be of general interest, it was considered appropriate to make the findings available to an international audience.

This is a summary of the Swedish report. It has been prepared by Dr. Ingvar Ohlsson (Summary and Appendix 1), Ms. Margareta Blohm (Appendix 2) and Dr. Richard Murray (Appendix 3).

Stockholm in February 1987

The Expert Group
on Public Finance

Daniel Tarschys

Chairman

Göran Arvidsson

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CONTENTS

PUBLIC SERVICES IN SWEDEN

A summary of some productivity and user studies

Introduction

This is a summary account of a series of studies on public sector services in Sweden. The focus is on productivity and distribution. The approach is macro-economic, and the calculations are related to the Swedish national accounts system.

There exists a fairly extensive international literature on general concepts and problems concerning public sector productivity and effectiveness, and calculations based on real data have been made, above all in the United States. It seems, however, that approaches along the lines of national accounts and general socio-economic analysis are practically non-existent. An English summary of the main project report therefore seemed indicated to make the findings available to a larger public and to facilitate a more comprehensive discussion of how to survey public services.

The work is based on studies of international literature and on a series of tentative calculations for various government sectors. The Swedish report on which this summary is based contains the following chapters:

This abridged English version has been arranged as follows: A comprehensive summary is supplemented by three appendices, which are largely based on Chapters 3, 4 and 6 in the original report. This means that on the whole, the appendices cover the productivity measurements with special regard to the methodological aspects, the measurements and their results, and the significance of these results in socio-economic analysis. The productivity measurements in the various fields of the public sector also facilitate a presentation of the distribution profile of the public services, which might increase the knowledge of their importance in the national economy.

It should be emphasized that this report outlines a first step in a development project. It describes an attempt to improve the knowledge about the public sector in a way that can be used in socio-economic analysis. In this study, the public sector is not regarded as a final consumer of resources, but primarily as a producer of services for various purposes. Productivity measurements are of major importance in this process, and make it possible to contrast data on produced services against data on input of resources.

The studies have been result- as well as method-oriented. The production of real data on productivity trends - albeit tentative and uncertain - has yielded material for further discussions, more detailed analyses of the problems, and improvements of the estimation models. As the estimation problems have been solved along slightly different lines, the studies also provide examples of conceivable methods and measures, demonstrating merits and shortcomings of the statistical materials used and suggesting improvements and further studies.

There is, too, a growing interest in micro-analysis of public activities, and the studies will benefit such analyses as well. Data and methods are to some extent the same. When therefore the question of further studies is raised, micro-analysis can be regarded as an extension of the project, quite in line with the directives of the Expert Group. Several studies might be of importance here, pertaining to calculations as well as methods, which have been essential parts of the work now completed. In a manner of speaking, this is a question of advancing the whole frontline of knowledge about the public sector.

Background and aim

The structure of the Swedish economy has changed considerably during the last 50 years. This can be illustrated by the following figures, which show the percentage contributions from various industries to the gross national product (GNP) at fixed prices[1)].

	Agriculture and forestry	Manufacturing industries	Private services	Public services
1930	20	35	40	5
1955	11	48	33	8
1980	5	49	24	22

It is mainly the public services that have grown in importance during the post-war era. In terms of total employment, there has been an increase from 6 % in 1930 via 12 % in 1955 to 30 % in 1980.

However, the national accounts do not clearly distinguish the functions of the public sector in the economy. This sector is not regarded as an industry in the way it would be, if the same services (e.g. medical care, education, culture) were produced in the private sector.

The aim of the present project has been to supplement the Swedish national accounts with some more sophisticated knowledge about the development and utilization of the public services, and to present some new approaches to the Swedish economy, applicable in socio-economic and structural analyses. For short-term economic analyses on the other hand, there seems to be little need for such supplementations.

1) Source: The Swedish Public Sector, Statistics Sweden, 1985

Such knowledge would improve the basic material for planning, decisions and public debate in respect to

- the allocation of resources to various public services. This aspect is related to the increased political attention given to these questions
- the efforts to improve productivity and effectiveness in public services
- the distribution of social welfare. The background is found in the growing importance attached to welfare distribution questions, where the distribution of services forms an important part
- the growth and employment questions in a long-term perspective.

At present, the national accounts give a picture of a public sector, where

the production in the sector is measured as
A CONSUMPTION OF RESOURCES.
This is termed
PUBLIC CONSUMPTION.
It is assumed that
THE PRODUCTIVITY DOES NOT CHANGE OVER TIME.

Thus, the public sector is regarded as a consumer of resources. There is no follow-through to the further steps in the production process leading to the final users of the public services. Expenditure has become the central item in the discussion of the public sector.

Planning in various fields of the sector is also frequently a question of resources rather than of results. There is a tendency to focus the attention on the employment opportunities created by the public sector rather than on the services produced. Data on output in the public sector enable us to make a more detailed analysis, answering questions such as

- What kinds of services have been produced?
- What does the productivity trend look like?
- Who are the users of the services?

The project has sofar mainly covered productivity estimations, but it has also included calculations of distribution profiles for public services, as well as discussions of effectiveness indicators. The aim has been to develop methods and make tentative calculations in order to

- replace the arbitrary assumption of a non-changing productivity rate by more realistic estimates
- obtain more realistic data on growth and on the distribution of the public services by various purposes
- obtain information about the distribution of the private consumption generated by the public sector.

Estimating productivity trends

An attempt has been made to calculate the productivity trends in some fields (sub-sectors) in the public sector, viz.

Public health and medical care
Social welfare
Education
Public roads
National defence (parts)
Housing and community planning (simple calculations)
Twelve selected fields of central government administration
Public libraries

Our ambition has been to include the entire final output in the form of services produced by the public sector. In terms of costs, the studies have covered some 70 per cent of the sector. The working title has been the 'macro project'. The word macro in this context implies an approach towards large integrated areas for broad socio-economic analyses[1)].

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1) Another approach would be to attempt to get micro estimates for various government agencies and for various levels of public administration, similar to those used for management and control purposes. Such estimates have been made and published by the Expert Group concerning e.g. the courts of justice and the National Patent and Registration Office.

The productivity concept most frequently used is associated with the capacity to transform invested resources into produced services. This capacity is a function of the entire production process, including e.g. organizational and technical solutions. The productivity concept illustrates that 'things are done the right way', while effectiveness symbolizes that 'the right things are done'.

Productivity is the ratio between output (services) and input (resources). Even if the productivity rate in a particular field can be measured without relating it to the rate in some other field, the measure has no significance in an absolute sense. It is of practical consequence only in comparisons. Productivity is often measured over time. In the macro project, calculations have been made for the period (1960) - 1970 - 1980. In some fields it is possible to make comparisons between different units engaged in the same type of production, e.g. in different geographical areas.

The macro project has been based on a rule-of-thumb, implying that wherever feasible, the public sector's production of services should be estimated in the same way as if the production had been private and thereby automatically classified in the industry sector in the national accounts. Similarly, the macro project uses the national accounts delimitation of the public sector and covers activities which in the national accounts are classified as belonging to that sector.

This means that the fundamental idea of the estimations is to measure services at the moment of transfer from the producer to the final consumer and in the shape in which they appear at that moment. What happens thereafter is of no interest in the measurement process.

It also means that the quantity trends are measured in various fields of the public sector and subsequently assigned weights. Finally the resources expended to attain the different results are measured. Often the resource expenditure measurement includes only labour (number of persons or number of man-hours), but it is also possible to use capital input, or both labour and capital input (production factor input), or the entire input of resources. It is the last approach that has been

used here in the macro project. If the ratio is inverted, i.e. if the measurements instead would pertain to the input of resources in relation to the quantity of output, the result would be what is usually termed unit cost.

Quantity indicators as a basis for the estimations

There is a fundamental difference between the calculations in the national accounts and those in our project. The national accounts refer to a market economy with price tags on the sold products. The quantity trend is obtained by dividing the sales value trend by the price trend. In our studies no market price data have been available, and our productivity trend calculations have instead been directly based on quantity indicators.

There are several aspects of these that should be noted. First, their variation over time should, at least approximately, reflect the trend(s) of the service(s) referred to by the indicator. We have not been able to study this question in detail.

Secondly, an indicator might include several types of services. If, for instance, the number of hospitalized patients is used as a quantity indicator for the entire in- patient medical-care system, changes in this indicator may be due to changes in the relative number of variously expensive treatments. The measure might then be broken down by quantity indicators that are more stable over the years. This has been done in the medical-care part of our project by breaking down the measure 'number of hospitalized patients' by department in the various hospitals. However, the indicators still refer to the actual transfer between production and consumption.

Sometimes the production process is instead broken down by a large number of functions with self-evident indicators for the output of each function. Items like clerical, library, messenger and similar functions can be treated separately, but inevitably this also means moving away from the final product of the whole process and a loss of the effects of integrating the various functions into one unit. We have not used this method in the macro project.

Generally speaking, we have managed to obtain quantity indicators for the studied fields. The indicators have of course been of various types, and with inherent limitations owing to the nature of the material.

Weights

In the matter of weights, it has not been possible to adhere to the rule-of-thumb. The weights assigned to the various items in the national accounts follow the consumers' valuations, as reflected in the prices. In the public sector there are charges on some services, but in the fields studied in our project, price formation is practically non-existent. For weights we have instead used the costs for producing a particular service. However, these are closely associated with the national accounts cost concept in aggregates of the GNP type ('at factor cost'). For some purposes this is an alternative to the more frequent market-price aggregates ('at market price'). Thus in this case too, the national accounts principles can be applied to obtain clear-cut productivity concepts.

The use of costs instead of prices as weights also has a bearing on the political evaluations governing the allocation of resources to various fields in the public sector.

Within reasonable limits, variations in the weights appear to be of minor importance in the measurement of output changes. This is verified in international literature.

Resource consumption as a proportionality factor

Generally speaking, there have been no difficulties in calculating the expended resources at current prices for the total activity in the studied fields. In most cases, the national accounts expenditure data (there termed 'public consumption') have been used.

Irrespective of whether the 'public consumption' data or more tailor-made estimates at current prices have been used, recalculations to fixed prices have been necessary to get the quantity trends of the utilized resources. In particular, the recalculation of man-hours at fixed prices has presented a substantial problem.

Some alternative calculations have demonstrated that in fixed-price calculations of expended resources, the choice of price indices is of major consequence in the estimation of productivity trends.

Quality problems

One of the key questions in the productivity calculations is related to changes in the quality of the services during the measurement period. Unchanged quality would obviously represent the simplest situation, but according to common national accounts practice, the quantity estimates should be adjusted for changes in quality, as judged by the consumers. As a general principle, all quality changes that cause changes in the market price (if such a price does exist) should be considered. Changes can be both positive and negative. It should be emphasized that in this case quality does not refer to the effects from the use of the service, but to the quality of the service proper.

The studies in the project include tentative discussions on quality changes. In some cases specific quality factors have been calculated, particularly in the studies of the medical services and of various administrative fields. In most other fields there is no evidence that quality changes would have had any significant effect on the findings.

Result of the tentative estimations

Table 0.1 summarizes the results of the tentative calculations for the various fields of the Swedish public sector. In some cases the available material has only permitted a study of the period 1970 - 1980, in others it has been possible to include the whole period 1960 - 1980.

For the entire period the studies indicate negative or unchanged productivity trends in all fields except public roads and some administrative agencies. Where calculations have been possible for both the 1960's and the 1970's, the trends have been more positive during the 1970's than during the 1960's.

An observation common to most of the studies is that the productivity falls when the resources increase strongly and rises when the resources decrease. This indicates that it is easier to maintain a certain level of output despite dwindling resources than to raise the level at a rate corresponding to an increase of resources. In other words, there is a lack of flexibility in the public sector, albeit explainable by overhead costs, personnel policies etc. This proposition is also substantiated by the Expert Group studies on productivity trends in the general courts of justice and in the National Patent and Registration Office. For education at the comprehensive and upper-secondary levels, the productivity trend is correlated to trends in the student population.

Thus, in most cases the studies indicate negative productivity trends during the years 1960 - 1980, with a relative improvement during the latter part of the period. It is often said that a negative inclination of the productivity curve is due to a disregard of quality changes. These may indeed be important, even if the studies fail to provide any clearcut examples. Further studies of the quality questions are needed.

Another question concerns personnel costs that can be classified as private consumption, consequent to e.g. the co-determination agreement for government employees. According to this agreement, effectiveness should be defined as the attainment of stated objectives 'with due regard to the employees' need of satisfaction in their work, good working conditions, employment security, co-determination and personal development'. If various real employment benefits are added to the list, it could be argued that some costs should be subtracted from the resource consumption, viz. the costs associated with this 'consumption' at the place of work. If these costs increase more than other costs, the productivity should be adjusted upwards, and vice versa. However, they are not likely to have any great impact on the productivity figures, even if in principle they should not be ignored.

Table 0.1 Tentative estimates of annual productivity changes. Per cent

		1960-65	1965-70	1970-75	1975-80
1	Public health and medical care	-4.6	-4.0	-1.4	-2.4
2	Social welfare	---	---	-2.5	- .9
3	Education	---	-7.2	+ .3	-2.7
4	Public roads [1]	- .5	+3.5	+4.8	+2.1
5	Parts of the national defence[2]	---	---	-1.6 +4.7	+1.6 -4.9
6	Housing and community planning[3]	---	---	+ .2	-3.3
7	Twelve fields of central government administration	-2.0	-3.3	-5.2	+2.5

1)
The report on public roads does not include a breakdown by five-year periods. It confines itself to the observation that the annual average productivity change during the whole period has been between 3.4 and 4.5 per cent. The figures presented here for the five-year intervals have been calculated in connection with the estimations for the entire public sector made in Appendix 3, where also an alternative calculation method has been used for the public-road investments, giving lower productivity figures than those presented above.

2)
Only Army and Air Force training is included. The calculations refer to 1972/73 - 1977/78 and to 1977/78 - 1981/82.

3)
Summary calculations only.

The findings might also be related to the expanding administrative superstructure of the government sector. The productivity trends presented here are not only a function of the actual production processes, but also of the administrative measures taken at various levels, from Parliament downwards.

The heavy expansion of the public sector may have had a delaying effect on the productivity trends. It takes time to make innovations work smoothly. This might explain the change to a positive productivity trend that has been observed for some fields of public administration.

A tentative estimate for the entire public sector

A tentative estimate has also been made for the whole public sector on the basis of data for about 70 per cent of the public service production. Some adjustments of the estimates in the specific reports have been made, in order to make them mutually comparable. The figures below show the productivity trend (annual percentage average):

	1970-75	1975-80	1970-80
Annual productivity change	-1.4	-1.6	-1.5

If these figures are applied to the estimates of the GNP at 1980 fixed prices, the following figures are obtained (1970 = 100):

	1970	1975	1980
Present GNP	100	114	121
GNP with revised public sector data	100	111	117

The GNP increased by approximately 2 per cent annually during the 1970's, on the assumption that the productivity remained unchanged in the public sector. This should be compared with a 1.5 per cent annual increase, if the productivity of the public sector dropped by 1.5 per cent annually.

The significance of the calculated productivity rate in the public sector can also be illustrated in the following way: Public consumption increased by only 18 per cent between 1970 and 1980, instead of by the 37 per cent it would have increased if the productivity had remained unchanged.

We have also broken down the activities of the public sector by purpose which makes it possible to distinguish how the costs (the 'prices') of the various services have developed. This type of information can be valuable when allocating resources to various public services.

Distribution profiles of the public services

The project has also included a discussion of the use of various public services, and we have functionally defined four categories of services (sector breakdown).

In the first category, the services are used as input in production outside the sector, i.e. mainly in the private sector, where these services may have an impact on the productivity development. In the second category, the services are used as input in other government production and thus remain within the public sector. Services of these two types are production-oriented. In the present government accounts they are classified as final output in public consumption. This gives a GNP that is correspondingly too high.

A third type of services are directed towards the household sector and are consumed there. They have an effect on the level of living and influence the distribution profile in various regions as well as in the

whole country. These services are consumption-oriented and constitute a final output from the public sector.

The fourth category consists of services produced for society as a whole, no specific users being distinguishable. The national defence is one example. Public services of this type are actually the only ones that can appropriately be classified as collective or public consumption.

For these four categories, the input of resources (in the national accounts: Public consumption) has been calculated by Statistics Sweden. The result is shown in Table 0.2.

Table 0.2 'Public consumption' by type of use. Current prices (percentage distribution)

	1970	1975	1980
Production-oriented:			
Private sector	8.5	8.0	7.6
Public sector	3.0	2.5	2.2
Consumption-oriented:			
Individual consumption	61.6	63.7	68.0
Collective consumption	26.9	25.8	22.2

Even with a wide margin of error, these figures clearly indicate a production-oriented consumption of around 10 per cent. Services to individuals and households dominate and are of increasing importance, e.g. education, medical care and social welfare. The collective part constitutes around 25 per cent and is declining. It includes national defence, judiciary services and some general administration.

For the production-oriented services, there seems to be no point in attempting to adjust the national accounts in respect to services transferred to and from the private sector. It might, however, be of interest to continue the analysis of their practical importance by studies of how the enterprises use the general infra-structure provided by the government. Information on a continuous basis is hardly necessary.

Public services - an important welfare component

Statistics Sweden has made calculations of the total consumption of the Swedish population, including the part of the public services that is directed towards individuals and households, but not classified as private consumption in the national accounts. In 1980 the total consumption in Sweden was estimated to MSEK 370 000, of which, according to the national accounts, private consumption amounted to MSEK 270 000. The consumption-oriented public services thus represented MSEK 100 000, or 27 per cent of the total consumption. In the national accounts, this very large part is not transferred to the household sector, nor the previously mentioned costs of real employment benefits. The latter are probably comparatively small, though rising.

From the national accounts it is evidently difficult to derive a picture of the economy's total welfare aspects that can be used in structural and socio-economic analyses. This is noticeable in other contexts as well. The general wage and salary negotiations provide a simplified example, where the purchasing power on the private market seems to be the only significant item in the discussions. Yet the public services most certainly have contributed to the welfare increase in the 1960's and 1970's.

The considerable production of services in the public sector is strongly related to the Swedish welfare policy: Every citizen should be guaranteed access to the services without great economic sacrifices. It is therefore of interest to find out which consumer groups actually use the services, and the project has included a pilot study of the distribution of consumption-oriented services.

Some population groups utilize public services to a higher degree than others. Persons in metropolitan areas, persons with a higher education and senior salaried employees are more frequent users than others of services of a general nature, e.g. services related to cultural and leisure activities. A more even distribution is found for services granted on a means test, such as care of the old and disabled, as well as for a large part of the public health and medical care. Self-employed, particularly farmers, use public services less than others.

We have carried on a discussion with experts at Statistics Sweden about the possibilities to improve the knowledge about the services and their users by means of mail or interview surveys. In addition to the question of who use the services, the discussion has covered such topics as the users' opinion of the quality development, the users' opinion of the range of services available, and whether it is feasible to obtain data on demands and needs.

The conclusion was that mail surveys of the users can give valuable information as to how the public services are used and what the users think of their quality and availability. To some extent such data can be included in the present statistics on living conditions, while data on the demand for various services are more difficult to obtain.

Continued productivity studies?

It is a time-consuming task to compile information about sectors of society that are not covered by statistics. The findings presented here as a result of the productivity calculations for the public sector constitute a tentative approach. The model developed in connection with the national accounts has not been altogether applicable, and further efforts are required to obtain more (new) basic material. It is therefore not yet time to introduce the present findings in the annual national accounts on a regular basis, but they might serve as a supplement when the national accounts are used in structural and results analyses, e.g. in long-term planning.

It is our hope that the material will prove useful in serious debates on the problems associated with public service production. Such discussions have in fact already started in the wake of the reports from the separate studies. Thereby we have reached one goal of the project.

It should be kept in mind that the zero hypothesis about the productivity change in the public sector is only a recommendation by the UN to the countries which apply the UN System of National Accounts (SNA). Or as formulated in the following quotation from a discussion in the United States, about whether or not the annual productivity calculations for the federal sector should be included in the official national accounts [1]:

> 'In my opinion, it is not a question of the measures failing to meet an 'ideal' definition of direct output; rather, it is whether better estimates of productivity change for component parts of the federal government sector can be derived from the measures developed than the assumed zero productivity change currently being used for the entire government sector.'

The question of calculating quantity trends for public services has received some attention in the UN in a draft manual of public sector statistics. It is likely to be further discussed if the UN starts a new round of SNA revisions.

The macro project has yielded experiences applicable if and when the work continues. In such a case it is important not only to enlarge the basic information in several fields of the public service production, but also to obtain information about the resources required - a 'price tag' showing the cost of various services. Such efforts have been initiated by the Expert Group, the aim being to investigate whether it would be feasible to obtain a systematically designed material for the entire public sector. This could also be used in productivity calculations at the macro level, if comparable data for several years become available.

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1) Jerome Mark: Studies in Income and Wealth, Vol. 44, p.353, 1980.

More extensive data on the service production (the final products) and a further breakdown of these would facilitate the use of sampling procedures in the estimation of the productivity trends. This would also reduce the problem of making adjustments for quality changes.

The disregard of quality changes is often mentioned in the studies. Quality problems are inherent in the national accounts as well, and the national accounts principles have as far as possible been followed. However, the national accounts provide practically no examples of adjustments for quality variations in services. Nor is the private service production satisfactorily covered by statistics. This means that there is a general need to apply the national accounts 'principles' of dealing with quality changes in services.

Quality studies have therefore been initiated within the project in connection with the productivity studies. Special quality groups have been established for the two fields of child-care and care of old people. Quality questions in medical care are studied in cooperation with the Planning and Rationalization Institute for Health and Social Services, and a report is due in the spring of 1987. In addition, the Swedish Institute for Health Economics has agreed to carry out a comparative study on the quality of Finnish and Swedish medical services and on their similarities and differences.

Quality questions are also of interest in regional productivity studies, e.g. in cost comparisons made by municipalities and county councils in respect to various municipal units and hospitals. Some comparative productivity studies of this type have been initiated by the Expert Group, e.g. comparisons of cost and output in the comprehensive school and in child-care services in different municipalities. These studies include quality questions.

Quality and effects are two related aspects, but quality refers to the characteristics of the service and not to its results, while effects refer to an objective. The latter aspect is a question of management and control of operations rather than of general socio-economic analysis, and demands micro-level use of information on productivity, quality and effectiveness changes.

However, important parts of the productivity calculations are of interest in both the macro and micro aspects. The Swedish government administration has shown great interest in the micro approach towards new information on production and productivity trends. The studies in the various fields of public administration are based on data from individual government units, and e.g. the medical-care study has used data from various hospitals and hospital departments. Material from the micro level has been used at the macro level. The same basic data can often be used in both socio-economic analyses and analyses of operations, although the processing has to be done along slightly different lines.

There are numerous national and international indications that micro studies on resource consumption and output are becoming more and more frequent, particularly at the local level. If the macro project is to be further developed, we believe there is much to be gained in collaborating with micro-level projects.

In the development of productivity estimation methods for the public sector, the statistical work on services in the private sector should be considered as well. Some examples are definitions of service concepts and fixed-price calculations, which have been difficult to handle in the macro project.

To summarize, the future work might be facilitated by joint efforts in various constellations.

Effects and effectiveness trends

The national accounts do not make provisions for changes in the effects of the public services. This is often held against the GNP measure when it is used as an overall measure of welfare - a purpose it was never intended to serve.

Our project is based on the national accounts and its principles, and the effects of the services therefore fall outside the productivity calculations. For instance, the effects on the population's health of

the medical services are not taken into consideration. If some kind of health index were to be calculated, this index would also take into account such factors as eating and drinking habits, work patterns, leisure activities etc. The effect of each factor would be difficult to specify, not least in an analysis of changes over time.

Thus, the national accounts do not cover the direct or indirect effects of the services. The inclusion of these effects would have several consequences, and the system would have to be supplemented with data on a number of both positive and negative effects. Some examples are the pollution caused by production and consumption and the effects of alcoholic abuse, motor traffic and violence in TV-programmes. Only when data on these effects have been included, will it be possible to estimate welfare changes.

A fundamental principle in the project has been to treat all services as equally as possible from the measurement point of view. This means that the services are to be measured at the moment of their transfer to the user, and that no attention is paid to their effects.

For several reasons, therefore, effectiveness measurements pertaining to the public sector seem to belong primarily to a more detailed level, where the operations of the various government agencies take place and where the effects can be measured against more or less clearly formulated objectives.

No calculations of effectiveness trends have been made during this stage of the project. The observations just made are more in the nature of casual remarks. However, the development of methods to illustrate effectiveness trends ought to be included as an important part of a programme for further improvement of the knowledge about public services.

Suggestions for further work

Work on the following tasks should preferably be initiated and/or completed in respect to the measurement of the productivity, effectiveness and distribution profiles of the public services:

- To bring the calculations up to the year 1985 and to supplement them with calculations for the remaining fields of the public sector

- To improve the methods for measuring productivity trends

- To test the usefulness of the results already attained or expected by analyzing the trends in various fields (historical review)

- To intensify the research on quality changes and effects in order to supplement the productivity measures and take a first step towards effectiveness calculations

- To encourage Statistics Sweden to plan intermittent mail surveys of consumers about the use, quality and availability of public services

- To initiate research on the use of public services in private industries through mail surveys in some suitable municipality

- To continue the macro calculations for the public sector in connection with the intermittent economic long-term planning.

- To develop a structure for the future work, e.g. through collaboration with concerned authorities, organizations and research institutions.

APPENDIX 1

OUTLINE OF THE PROJECT - THE NATIONAL ACCOUNTS MODEL

1.1 The national accounts as a frame of reference

The definition of the public services used in this report corresponds on the whole to the public-sector concept in the national accounts system, and we have also found it suitable to relate our estimation model to this system. We have applied a rule-of-thumb, according to which measurements of the service production in the public sector *should be conducted in the same way, as if the activity had been carr*ied out in the private industry and, accordingly, included in the private sector in the national accounts. It should be emphasized that this rule is applied only 'when appropriate'. There exists a borderline between market and government economy, which is the very reason for our studies on the public services.

The association to the national accounts also agrees with our aim to extend the knowledge about of the public services and to use the findings in socio-economic analyses. It has become increasingly common in Sweden to look upon the national economy from the point of view of the national accounts and to let these form the basis of analyses, national budgets and long-term studies. However, in their treatment of the public sector, the national accounts are out of step with the development of the national economy and the heavy expansion of the public services. The traditional national accounts data need to be supplemented with a more informative description of the position and functions of the public sector.

The present studies form an important link in the efforts towards such a supplementation, especially as regards the use of the national accounts in socio-economic and structural analyses. For short-term economic analyses, the work is of less importance.

Transactions in the national accounts

A great number of economic transactions are recorded in the national accounts, where they appear in an aggregated form. As in other bookkeeping systems, the transactions are entered on various accounts, with one incoming and one outgoing side. Most important in the discussion below are the accounts of production, income redistribution and expenditure, which cover transactions between various entities in the national economy. These entities are variously grouped according to the problems to be illustrated or solved. Traditional groups are general government, enterprises and households. These three principal sectors may also be further divided into sub-sectors, e.g. central and local government, various industries etc.

The transactions taking place between the entities may be real or monetary. Real transactions mean that real objects change owners. These objects can be commodities, services or real property. Monetary transactions are made by means of financial objects, e.g. money or negotiable instruments.

How are the real transactions evaluated?

The real transactions are entered into the national accounts in the aggregated form Σpq, where q represents various amounts of goods and services expressed in some quantitative measure, and p denotes the unit value of each quantity.

The market economy offers two alternative ways of obtaining unit values in the national accounts. One is to use the market prices, which reflect the marginal interchangeability of goods and services. The use of market prices set according to consumer preferences leads to a consumption-oriented system of weights.

The second alternative is to use the costs. As the market prices have often been reduced by subsidies or increased by indirect taxation, they do not reflect the true production cost. Against a background of

welfare policies or a need to retain some production capacity as a contingency reserve in certain key areas, the government aims to influence the consumption of goods and services by affecting the prices.

The national accounts therefore contain an alternative set of aggregates valued at factor cost. The problems are approached from the cost side instead of from the user side, and the calculations of input and output at fixed prices over a period of time give a more clearcut picture of the production process and its capacity, as well as of the economic potential.

Quality changes - a complication

There are some specific valuation and index problems in the measurement of changes in real transactions in the national accounts. As a general principle, the changes in a particular field are obtained by dividing the nominal values (turnover etc.) of the aggregated real transactions by a price index series pertaining to the same field. For example, private consumption is recalculated by means of the consumer price index.

Price index series are customarily based on the price trends for a number of representative commodities (real objects). In these series, on which in turn the calculation of changes in real transactions between two occasions are based, there are two inherent problems.

The first is related to the requirement that the quality of the representative commodities ought to remain unchanged between the measurement occasions. If it is not, the values in the index series should be adjusted in respect to the quality change. In the national accounts this change should be valued from the consumer point of view. A frequently mentioned example are the changes from one year's model to the next in the cars selected as representative commodities in the consumer price index. In that case the quality changes are evaluated by an expert panel on behalf of the consumers. A raised price should then be reduced by the value of a quality rise, or increased by the value of a quality deterioration.

The second index problem is related to the complexity of some of the real objects included in the measurements. One example is the great amount of sophisticated machinery and equipment produced by the engineering industry. In this field it is not possible to find standardized quantity indicators, which can be followed and measured over a period of time. Instead, a number of less complicated characteristic commodities are selected, which are more easily measurable from the quality point of view. A necessary condition then is that the trends for the representative commodity and the items it represents can be reasonably assumed to co-variate.

It should be noted that sofar no provisions have been made in the Swedish national accounts for changes in the quality of services. It is difficult enough to fit the production of services into the present national accounts system. For services produced in the private sector, there are several methods of calculating the trends at fixed prices. When the services are directly associated with receipts, these can often be recalculated by means of a price index. Sometimes a fixed relationship is assumed between the services and some other measurable item, e.g. the turnover for services associated with the sale of goods. The service can also be directly measured in quantitative terms, e.g. in number of ton-kilometres for the conveyance of goods, or number of passed driving-licence tests for driving schools etc. In some instances the calculations are based on hypothetical assumptions, e.g. in banking and insurance, where the estimations are based on the costs, and the productivity is assumed to increase by two per cent annually.

1.2 The public sector in the national accounts - a consumer of resources

How then, is the public sector treated in the national accounts? Table 2.1 shows the accounts for this sector, i.e. production, income redistribution, expenditure and fixed capital formation. To facilitate understanding, some simplifications have been made. The figures of the capital account are therefore not quite correct.

Table 2.1 The accounts of the public sector in the Swedish national accounts. SEK 1 000 millions, 1984. Current prices

PRODUCTION ACCOUNT

Outgoings		Incomings	
I Intermediate consumption	64.9	5 Sales of goods and services	9.2
2 Compensation of employees	151.7	I Consumption (residually calculated)	221.5
3 Consumption of fixed capital	8.5		
4 Indirect taxes	5.6		
	230.7		230.7

INCOME REDISTRIBUTION ACCOUNT

Outgoings		Incomings	
6 Subsidies	39.9	10 Operating surplus of public enterprises	13.9
7 Interests, net	18.7	11 Indirect taxes	127.5
8 Social insurance benefits	112.3	12 Direct taxes	169.4
9 Other current transfers	89.4	13 Social insurance contributions	103.7
II Disposable income (residual item)	219.0	14 Other current transfers	63.9
	478.4		478.4

EXPENDITURE ACCOUNT

Outgoings		Incomings	
I Public consumption	221.5	II Disposable income	219.0
III Saving (residual item)	-2.5		
	219.0		219.0

CAPITAL ACCOUNT

Outgoings		Incomings	
15 Gross capital formation	21.8	III Saving	-2.5
16 Increase in stocks	- .8	17 Consumption of fixed capital (= item 3)	8.5
IV Financial saving (residual item)	-15.0		
	6.0		6.0

1) Gross capital formation does not include investments in public utility services, nor certain investment expenditures, which are entered as public consumption.

The production account does not illustrate a production process. On the outgoing side are found purchases of goods and services from the private sector (1), factor input in the form of labour (2) and capital (3), and finally indirect taxes (4). On the incoming side, there is in addition to the sales of goods and services (5), a residual item to balance the outgoing side. There is no surplus or deficit in the account.

The residual item is subsequently transferred to the expenditure account and classified there as public consumption (I). This account also covers the funding of consumption and saving (III) by a disposable income item (II).

The disposable income has in turn been obtained by a redistribution of income as shown in the income redistribution account. The state collects taxes and other types of income (10 - 14) and pays transfers to enterprises and households (6 - 9). The residual item becomes the disposable income (II).

The information provided by the national accounts in respect to the production of the public sector can be described as follows:

> The production in the sector is measured as
> A CONSUMPTION OF RESOURCES.
> This is termed
> PUBLIC CONSUMPTION.
> It is assumed that
> THE PRODUCTIVITY DOES NOT CHANGE OVER TIME.

Thus, the public sector is regarded as a consumer of resources. There is no follow-through to the further production process leading to the final consumers of the public services. This treatment of the public sector derives from the fact that the national accounts were originally intended as a basis for economic short-term analyses of market economies governed by a system of prices. The discussion of the public sector then became expenditure-focused, and the planning in various fields also became a question more of resources than of results.

A different growth rate?

The national accounts principle of assuming that the public service productivity remains 'unchanged', affects the measurement of the GNP trends at fixed prices. Two numerical examples will illustrate the implications in an analysis of growth and structural changes in the total national economy.

According to the national accounts the GNP increased during the period 1960 - 1980 by more than 90 per cent at fixed prices, on the assumption that the productivity change in the public sector had been zero. If, however, we assume the productivity in the public sector to have increased by 2 per cent annually (an increase equal to the one assumed for the bank and insurance services in the private sector), the GNP would have increased by 120 instead of by 90 per cent. The public sector share of the GNP would then have amounted to 40 instead of 30 per cent.

If, on the other hand, the productivity in the public sector had dropped by 2 per cent annually, the GNP would only have increased by 75 per cent, and the public sector would have represented 22 per cent of the total GNP.

The second example illustrates the effect of productivity changes on the knowledge of how the public sector's real resources are distributed. Suppose that two fields, requiring approximately equal resources, e.g. medical services and education, according to the national accounts had the same increase in resources between 1960 and 1980 (in 1980 prices). If the productivity were to rise by 2 per cent annually in one field and fall by 2 per cent in the other, then the output in 1980 in the first field would be twice as high as in the second.

There is another productivity aspect to note as well. Public services, for instance infra-structure items, are utilized by private enterprises. Public services are also used e.g. to counter-act pollution from private industries. Thus the public sector contributes to the production and its development in the private sector.

Who use the services?

Public consumption in the national accounts can be broken down by various purposes (education, various types of care etc.). This is done according to international standard classifications, which are also available in national Swedish versions. There is, however, no way of finding out from the national accounts who use the various services produced in the public sector. In principle, the services can be classified according to user in one of the following four categories:

1) The private sector (production)
2) The public sector (intermediate consumption)
3) The household sector (final consumption)
4) The society (collective consumption).

The services can be regarded as one-way real transactions to the receivers. They are not paid for directly, except in some cases by modest fees, but are financed collectively through taxes and other public revenues.

In the national accounts, the services associated with 1) and 3) are not entered under their external users, although this would be possible by classifying the services as real subsidies. Such a re-arrangement could be implemented in the present system and would then subsequently affect some of the various aggregates (GNP etc.) used in socio-economic and structural analyses.

An extended recording in the national accounts of services produced in the public sector would affect the input-output tables. The public sector would then, in principle, be treated in the tables in the same way as the other industries.

The discussion above can be summarized as follows:

- The rule-of-thumb of the project is that the estimation of the public services should be made in the same way as it would have been made in the national accounts, if the services had been produced in the private sector.

- As a supplement to the national accounts, the services produced in the public sector are to be calculated directly instead of being estimated on the basis of the resource input.
- This is to be accomplished through productivity calculations in order to replace the zero principle in the present national accounts.
- This would also facilitate the calculation of more differentiated distribution profiles for the public services.

Below we shall first discuss the productivity concept as used in the national accounts and in our project, and then go on to the question of how to value the services in the absence of market prices.

1.3 Productivity and valuation of services

The productivity concept is often used in connection with or as an alternative to the effectiveness concept in the production of public services. Both imply a valuation, and it is therefore necessary to give a definition of them in the specific contexts where they appear. There are numerous alternatives, depending on the situation. They are usually regarded as different concepts, a frequent distinction being that productivity concerns 'doing things the right way', while effectiveness pertains to 'getting the right things done'. This has been our main principle as well.

Thus the productivity concept is related to the actual production process, in other words to the capacity of transforming the input of resources into an output of products, usually in the form of services. The entire production process is involved, including organizational and technical solutions. This view has formed the background of our macro-project studies on productivity trends, where the productivity has been calculated as the ratio between the services (output) and the consumption of resources (input).

Even if the productivity in one field can be measured without being related to that of another, the measure has no significance in an absolute sense. It is of practical consequence only in comparative studies. For some types of activities it is possible to make

comparisons between different units engaged in the same type of production, which often means between different geographical areas - a comparison over space. Frequently, however, it is the productivity trend that is measured - a comparison over time. The latter type of comparisons have been the ones most often made in our studies.

Effectiveness as a concept goes one step further in the process. It also involves the effects of the production, e.g. the attainment of the desired objectives. In the national accounts it is the satisfaction of the consumers that is the governing factor by means of the prices to which the consumers have adjusted their demands - 'the product mix is adjusted to the wishes of the consumers'. Therefore, if our studies were to include an effectiveness measure conforming to the national accounts, we would in principle have to record the consumers' valuations.

The national accounts measure the effectiveness trends primarily by means of consumer valuations. Accordingly, if subsidies and indirect taxation did not exist, and the national economy were at an equilibrium, the national accounts would directly illustrate the trends in the market sector in respect to both productivity and effectiveness.

How should the services be valued?

Theoretically, a market economy is governed by consumer valuations. The question then is whether such valuations are applicable to the public sector.

The public services are sometimes associated with prices in the form of fees for the consumers of the service. Such fees may cover more or less of the costs for producing the service. To use these fees in a market-economy model would in principle be possible, within certain limits. We have here, in fact, a sort of no-man's land between the market economy and the government economy. Within the domain of the national accounts, i.e. the market economy, the government often provides subsidies or adds indirect taxes on goods and services. The consumers adjust their demands and their purchases to the consequent prices. In Sweden,

agricultural products and housing constitute two areas where the prices have become far removed from the conditions of a pure market economy, a fact that is now generally accepted in the national accounts. At the same time there are fees, i.e. a kind of prices, for more or less subsidized public services.

An interesting observation is that in the price indices and estimates of private consumption used in the national accounts, the purchases of medical services are entered at prices corresponding to the patients' fees at the hospitals. It would be patently absurd to enter only these data for the medical services, and their other costs - after the fees have been deducted - have accordingly been entered as public consumption. Dental services are similarly treated.

The above discussion serves to underline that there exists a common zone between the private and the public sectors. The question then is whether the fees should be more frequently used as a measure of valuation of public services. This would give us a system copied on the market economy in the national accounts. We have not penetrated the question of how far this approach would carry us, nor have we studied the consequences in various applications.

Another method closely related to the market-economy model is to try to set 'shadow prices' to be used in the calculations. These would in some sense represent the willingness of the consumers to pay for the public services. Some economists have experimented with simulated or real situations, where a realized willingness to pay has been assumed in a hypothetical or real market situation. We have not spent much time on this method; it would be extremely complicated and difficult to interprete with the wide range of services involved.

Consumer valuations would therefore hardly seem to constitute a practical way of valuing public services, neither directly nor indirectly. Here the national accounts cannot provide any guidelines.

On the other hand the national accounts offer another set of valuations in the form of production costs. In this set, as already mentioned, the prices have been reduced for indirect taxes and increased for subsidies. These data are mainly used in analyses from the production side.

We can establish a connection with the national accounts in our productivity calculations by the use of costs as unit values. This also associates to political evaluations, as it is the cost (the intermediate consumption) that guides the allocation of resources to various purposes in the public sector. In Swedish political evaluations, the equal distribution of welfare forms an important element.

This section can be summarized as follows:

- A comparatively narrow productivity measure is used at this stage of the project - output in relation to the consumption of resources.
- The measurements refer to productivity changes over time.
- In the weighted estimate of the quantity trends of various services, the price component in the national accounts is replaced by the cost for producing a certain service
- Costs which measure the intermediate consumption are closely related to the national accounts aggregated cost concept (factor cost)
- The use of the cost as a price unit is to some extent associated with the political evaluations behind the allocation of resources to various activities in the public sector.
- Due to our present inability to obtain relative consumer valuations of the services, our calculations do not conform with the principal concept of the national accounts, which can be said to give a measure of the effectiveness trends from the consumers' viewpoint.

1.4 Estimation methods

The services

The fundamental entity in the calculation of productivity trends in the public sector is the service produced in the process. This should be

measured when transferred from the producer to the consumer (the final product), in the form and with the characteristics it has at that moment.

A distinction has to be made between production (in the economic sense) and non-economic activity. Economic production is considered to have been completed, when the service is sold or delivered to another subject. It is also necessary to specify what the user has received when the service becomes available to him. This must not be confused with his motives for using the service, nor with the benefits he hopes to get out of it. In other words, we are to measure the service, not its effects, which are of importance in effectiveness estimations.

The measurement of the services is made by means of one or several quantity indicators. In many cases the indicator is simple and self-evident, e.g. the number of passports issued. In other instances, the matter may be more complex and the indicator refer to a service consisting of a great number of components, as when the number of admitted patients is used as a quantity indicator for medical services.

The quantity indicators can be discussed from two points of view. First, an indicator may cover several types of services. To use the same example as above, the services of the entire in-patient medical-care system might be measured by the number of admitted patients. Changes in the indicator values may then be due to changes in the composition of treatments at different costs. If the indicator is instead broken down into component indicators, each of these may remain more stable in composition over time. Such a breakdown has been made in our project, where the measure 'admitted patients' has been split up by a great number of departments at various hospitals. However, the indicators still pertain to the transfer from production to consumption, and the breakdown of the services can therefore be said to be 'horizontal'.

Sometimes the production process is instead broken down by the functions involved, which may permit the identification of self-evident indicators for the produced services.

Clerical, messenger, library and similar services can be treated separately. This gives a 'vertical' breakdown of the services by subproducts. In this alternative, the output of the entire process is more or less obscured, and the productivity effects of combining the various functions are lost.

A breakdown by component indicators calls for an extensive data collection, and poses the question of whether it would be feasible to draw a sample from these indicators. As with complicated products in the national accounts, the idea would be to select a number of representative services that are technically easy to handle. In such a case, we must be able to assume a correlation between the quantity indicators for the selected services on the one hand, and the entire group of services they represent on the other. From the cost point of view it would be an advantage to find indicator material sufficiently extensive to permit a random sampling procedure.

If only one type of service in a particular field is of interest, and it can be represented by a quantity indicator, then the calculation of output and trends presents no great problem. Data for management and control purposes are sometimes of this type. In socio-economic analyses it is usually necessary to aggregate the trends in several fields. This implies the use of weights.

The use of weights calculated from the cost side emphasizes the production nature of the measure. As previously mentioned, this corresponds rather well to such alternative measures as GNP at factor cost in the traditional national accounts.

Estimates and experiments described in the available literature indicate that the system of weights can vary substantially without having any noticeable effect on the analysis.

The consumption of resources - the second part of the productivity calculations

The second entity in the productivity calculations are the resources expended to attain the result. In comparisons over time, the consumption of resources (the input) should be calculated in real terms or at fixed prices. In the production of public services, the input consists of labour, real capital (capital services), materials etc.

A number of technical questions arise in the calculation of output in relation to the intermediate consumption. The wage/ salary indices necessary to recalculate the labour input are difficult to obtain. The *problem cannot be by-passed by letting the resource input be repres*ented by the number of hours worked, for these have to be broken down by occupational and other characteristics.

Consumption of capital represents a problem also encountered elsewhere in the national accounts. The large public investments in public utility services are included in the private sector. The public sector covers roads, bridges, ports, real estate and other infra-structure items used in public services. Some types of capital goods are directly classified as consumption (public consumption).

Productivity calculations involve a choice as to which intermediate consumption items to include. If the output is related to all the resources consumed, we get a 'total productivity' measure. This is the national accounts measure of the final output and is termed public consumption. If instead the output is related only to the labour input, we get 'labour productivity'. A third concept is 'capital productivity'.

In the total productivity measure, the output is related to the entire expenditure of resources and describes what society gets in exchange for some specific input. A declining productivity rate means that the resource expenditure - in respect to staff, premises, electricity, stationery, machinery etc. - becomes higher for a specific output, i.e. it becomes more expensive for society to provide. A rising productivity rate, correspondingly, means a lower resource expenditure for each produced unit, which then becomes less expensive.

Quality changes affect the productivity calculations

There remains a third group of problems, which concern quality changes during the measurement period, both in respect to the produced services and to the input of resources. Persons who view productivity calculations with a certain scepticism, often raise the question of the quality of the object to be measured. This is indeed an important matter, especially in the estimation of quantitative trends for complex services. However, it is not the absolute quality, but the changes during the period that are of interest. These can be both positive and negative.

In Sweden, quality changes in representative commodities have long been considered in price index calculations. A previously mentioned example are the changes in the different years' models of cars included among the representative commodities in the consumer price index. The calculations are adjusted for changes in the quality of the cars. The valuation of these changes, which in principle should be made from the consumers' point of view, is made by an expert panel. The subsequent adjustment of the prices affects the fixed-price calculations made by means of the price series.

For quality as well as for productivity questions generally, the calculations conform to the common practice of the national accounts. Changes in the quality of the measured services between two points in time should be taken into consideration to the same extent as they are in the national accounts. One difficulty is that sofar quality changes in services have not been given the same attention as in commodities. However, similar principles should be applied.

This means that the productivity calculations should be modified according to the quality changes in the produced service during the period. This in turn makes it necessary to develop and define a number of quality indicators. Ideally, the consumers' valuations of the quality change - their willingness to pay - should be recorded, and the change subsequently included in the productivity estimations. The simplest way to do this is to balance the change against the associated costs, and

assume that the consumers are willing to pay at least the price of that cost to get the quality improvement. However, this would be against the principles of independent productivity estimations, for it would mean that the output again would be measured by means of the cost, and that the productivity change would become zero.

The adjustment for quality changes has two aspects. The first is to find the change of the quality indicator, and the second to decide how this change is to be included in the basic calculations of output trends, which are made without regard to quality changes. As a general principle, the change of the quality indicator should be calculated independently of the cost. For example, if a service with the value 100 in 1970 were to increase in quantity by 10 per cent up to 1980, while the quality (by independent estimations) were found to have improved by 3 per cent during the same period, then the quantity indicator in 1980 would be 113.

It should be emphasized once again that the measurements do not pertain to the consumers' use of the services. An example will illustrate this:

In the educational system, the main principle for the measurement of the services is that the measure should reflect the quantity of education made available to and used by the consumers, i.e. the students. The ultimate goal, 'to educate the population', is a function of many variables, one of which is the performance of the educational sector. Some others are - in addition to the students' perseverance and dedication - opportunities to study outside the educational system, on-the-job training, working experience, mass media etc.

It should be remembered that although the educational establishments can be regarded as places where teachers and students work together towards a common end, only the teaching staff is to be included among the production factors in accordance with the guidelines of e.g. the national accounts. To classify the students as labour would be inappropriate to many of the analytical purposes for which the national accounts system is designed. In this context, the students have to be regarded as consumers of educational services, not as contributing factors in the production.

Accordingly, the most pertinent measure of the educational services would be the number of 'student-hours'. The number of teachers or teaching-hours would be less appropriate, for the same reason that 'car-kilometres' is a less suitable quantity indicator than 'passenger-kilometres' in the measurement of passenger transport. A factor that should be taken into account is overcrowding, for the educational results might well be of lower quality in a big than in a small class.

Quality changes should be considered not only in the produced services. Similar problems are encountered in the input, where the quantitative trends also might be affected by changes in the quality of the utilized commodities and services.

A change in the quality of the input resources is not equivalent to a change in the quality of the output. For example, an increased relative number of staff is no criterion of a better quality of the final product. The input of resources may have increased, but whether and how much this affects the quality of the produced service is a matter of consumer opinion. The valuation of changes in the quality of the input, on the other hand, should rather be made by the producer.

The whole question of quality changes is very important in productivity calculations, and in our project some special studies have been initiated to penetrate the methodological problems of quality measurements. Medical services and social welfare are being studied, the latter by one working group for child-care and one for the care of old people.

The discussion of productivity calculation methods can be summarized as follows:

- The service should be measured when transferred from producer to consumer and with the characteristics it has at that moment
- The service should constitute the final output from the producing sector
- The output trend should be measured by one or several quantity indicators, which ought to covariate with the service

- Qualitity changes (positive or negative) in the service (in the quantity indicator) should as far as possible be included in the quantity calculations
- The relative costs during a base year should be used as weights in the weighted estimate of the output trend in a particular field
- A breakdown of complex services by sub-services (at the final output level) is desirable
- The changes in the consumption of resources over time should be calculated at base-year prices (fixed-price calculations)
- The resources should, if possible, be broken down by the various services
- The consumption of resources at fixed prices might also have to be adjusted in respect to quality changes
- The calculations include traditional index and sampling problems.

APPENDIX 2

PRODUCTIVITY STUDIES

The first stage of our project has included a number of studies of the productivity trends in the various parts of the public sector. The studies have consisted of descriptions of the operations and tentative calculations of the productivity rate in the following fields: public health and medical care, social welfare, education, public roads, public libraries, the national defence, and an aggregate of twelve fields of central government administration. On the instruction of the Expert Group, studies have previously been made on private and public dental care, the general courts of justice, and the National Patent and Registration Office. This appendix gives a brief presentation of the pilot studies now completed and describes the methodological problems and the findings. Some common tendencies have been noted that tentatively might provide a basis for further discussions as well as guidelines for more detailed calculations.

The concept on which the studies have been focused is the average total productivity, or rather its changes, during the period 1960 - 1980. This means that the changes in the output are related to the changes in the total consumption of resources. In some cases the material has only permitted the period 1970 - 1980 to be studied. The emphasis has been on estimation and calculation methods. Some analyses of the findings have been made, but these have not covered all the material and have been rather superficial.

In principle, the studies also ought to include supervisory and co-ordinating agencies without final products of their own. However, these kind of agencies have been treated somewhat differently in the studies completed sofar.

In the matter of productivity changes over time, we have previously noted three main points:

- The output of services is to be measured by means of one or more quantity indicators. If there are more than one, weights are required for their aggregation

- The input of resources is to be given by a total measure. The difficulties mainly consist of obtaining measures of the real changes. If costs at current prices are used, re-calculations with relevant price index numbers are required

- If significant quality changes have occurred in the measured services, adjustments should as far as possible be made. As a general principle, consideration should be given to all quality improvements/ /deteriorations, which would have been reflected in higher/lower market prices, had such prices existed.

Thus the objective of the studies has been to try to measure the output and productivity trends in the public sector, in a manner that as far as possible conforms with that of the national accounts for the private sector. The feasibility of this objective depends on the availability of pertinent data on output and costs.

2.1 Public health and medical care

The aim of the study on public health and medical care has been to calculate the changes in the average total productivity during the period 1960 - 1980[1)].

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1) Produktions- kostnads- och produktivitetsutveckling inom offentligt bedriven hälso- och sjukvård 1960 - 1980. Rapport till expertgruppen för studier i offentlig ekonomi (Output, Cost and Productivity Trends in Public Health and Medical Care 1960 - 1980. Report to the Expert Group on Public Finance). Ds Fi 1985:3. The report has been prepared by Professor Björn Lindgren and Mr Pontus Roos, both of the Swedish Institute for Health Economics, Lund.

In regard to the coverage of the studied field, it should be pointed out that the study refers to the public health and medical care system as defined in the Swedish national accounts. It does not include health and medical services at places of work, at schools or in the national defence. Some medical services (usually long-term medical care) are the responsibility of the social welfare authorities and are classified as social services and not as medical care. Agencies with general overall responsibilities are not included.

The calculations have centered on hospital-related medical care, both in-patient and out-patient, and including psychiatric departments. It has not been possible to include all hospitals, and those selected constitute approximately one-third of the total number of hospitals in Sweden. The selection has not been made by random sampling, but with regard to geographical location and hospital category; regional hospitals, county hospitals, and hospitals serving smaller administrative areas. The regional hospitals, where the most comprehensive and most specialized care is found, are overrepresented.

The hospital-related medical services represent 56 per cent of the total cost of the Swedish public health and medical care system, and for these services the available data are far more detailed and reliable than for the remaining 44 per cent. The latter cannot a priori be assumed to have developed in a similar way. An attempt has been made to study the productivity and cost trends in these other services as well, although with less precise measures. Thus, studies have been made of the special psychiatric hospitals, the care of the mentally retarded, the non-hospital out-patient care, the long-term care at public nursing homes, and the national dental service.

Output

As already mentioned, the indicator chosen for measuring the quantitative trend of the services should represent the service at the moment when this is transferred from the producer to the patient. The indicator should be as homogeneous as possible, so as to prevent the

quantitative trends from being too much affected by shifts in the content of the service.

For in-patient medical care, the number of admitted patients has been used as the quantity indicator. The data have been drawn from the hospitals' annual reports. The reason for not chosing the number of bed-days is mainly that the treatment given during a specific hospitalization period might vary strongly from one day to the next.

However, the number of patients admitted at the hospitals is a very inadequate measure of the total output. It takes for granted that each patient at each department or type of hospital requires the same amount of resources. A breakdown by various types of diagnoses would obviously be the best approach, but at present this is not practicable. Instead, the output of each department has been calculated separately. To obtain a total estimate, the 1980 average cost per patient at each department has been used as a weight. For all the hospitals included in the sample, a total of 312 departments have had their output valued in 1980 prices. In addition to this main alternative, a couple of other weighting principles have been tested with similar results.

In the matter of long-term medical care, the number of bed-days has been considered a more adequate measure than the number of admissions, as the treatment changes very little from day to day, while the total time required in each case varies considerably for different patients.

For out-patient medical services at the hospitals, the number of visits to a physician has been used as the quantity indicator. The number of visits to each department has been aggregated by means of weights in 1980 prices. This, however, does not provide a trend markedly different from the one obtained, if the total number of visits to a hospital physician is used in the calculations.

For out-patient medical services outside the hospitals, the indicator has been the number of visits to a physician (for 1960 and 1965 the number has been estimated by means of the number of established physician's posts), and in the national dental service it has been the

number of patients with completed treatments. For the care of the mentally retarded, the indicator has been the average number of admitted patients at hospitals and nursing homes and the number of mentally retarded registered at sheltered workshops. Quantity indicators for the services of psychiatric hospitals has been the number of admissions. For the various types of nursing homes, the number of bed-days has been chosen.

Cost

The current expenditure of the hospitals is reported in their reports and balance-sheets. Regrettably, there is no breakdown in-patient and out-patient costs by department until the beginning of the 1970's. The breakdown of the costs by type of care has therefore been based on the production costs of 1980.

The current expenditure calculated in this manner for various hospitals and medical services has been recalculated into real terms by dividing the cost by the price recalculation factor for public consumption in the national accounts. This is a measure of the price development, since in the national accounts the public sector estimates are always made from the cost side.

Data on costs for non-hospital medical care are more uncertain. They have been drawn from various sources.

Productivity trends

To get a measure of the productivity changes during the period 1960 - 1980, the output and cost changes of the various types of hospitals and medical services have been calculated. The annual percentage change in respect to output and cost has been calculated for each five-year period (1960 - 65, 1965 - 70, 1970 - 75, 1975 - 80). The productivity trend has been calculated as the difference between the figures obtained. In the calculation of the measure pertaining to all public medical services, the proportions of the total current expenditure that

correspond to the various types of medical services have been used as weights. An example of the results is shown in Table 2.1.

Table 2.1 Productivity trends for public medical services 1960 - 1980. Annual percentage changes

	1960-65	1965-70	1970-75	1975-80	1960-80
Total productivity change for public medical services	-4.6	-4.0	-1.4	-2.4	-3.0
Thereof:					
In-patient short-term medical care	-7.0	-4.4	-2.3	-2.0	-3.9
Hospital out-patient medical care	-7.4	-4.9	-2.2	-2.1	-4.0
Out-patient medical care outside hospitals	-6.1	-9.5	- .9	-2.4	-4.7
Long-term medical care at nursing homes	-8.1	-5.0	-4.6	- .4	-4.5
Psychiatric care	+5.0	- .7	+3.7	-2.9	+1.3

The table indicates an average productivity drop of 3 per cent a year for the whole period. It also shows that this drop usually was larger during the period of heavy expansion in the 1960's than during the 1970's. The one exception are the psychiatric hospitals, which also lost in relative importance during the period. A result yielded by the more detailed material is that there is a great variation in productivity trends, even within the various hospital categories.

Quality changes

Adjustments should be made for such quality changes that are not covered by the chosen output measures, but which result in an increased consumption of resources and lowered productivity figures, or vice versa.

Direct measurements of such quality changes are difficult to make, but some attempts are described in the study. They are to be regarded primarily as numerical examples. A distinction is made between changes pertaining to 'service' to the patients and changes in respect to improved /reduced results of a specific treatment. An example of the former type are changes in room-size and ward-space per patient. If the value of such a change is to be estimated by the cost, the numerical example shows that the productivity trend would have to be adjusted upwards by .1 per cent annually. Some examples of improved methods of treatment are also given. A new method of hip-joint surgery would give a quality improvement corresponding to a productivity increase of .05 per cent annually for the entire medical-care system.

On the other hand, the importance of quality changes should not be exaggerated. If the entire 3 per cent annual decrease in the productivity rate for the period 1960 - 1980 were to be compensated for, the quality of an average service in 1980 would have to be valued twice as high as in 1960.

2.2 Social welfare

The study on productivity trends in the field of social welfare [1] has only covered the 1970's, owing to the difficulties in obtaining comparable data for earlier periods. It has also been difficult to find material for the 1970's that can be adapted to the chosen structure. On 1 January, 1982, the previous social welfare legislation was replaced by the present Social Welfare Act. To facilitate future work the study

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1) Produktions-, kostnads- och produktivitetsutveckling inom den sociala sektorn 1970 - 1980. Rapport till expertgruppen för studier i offentlig ekonomi (Output, Cost and Productivity Trends in Social Welfare 1970 - 1980. Report to the Expert Group on Public Finance). Ds Fi 1985:4. The report has been prepared by Mr Jan Eklöf, Ms Cathrina Ferrmark-Hanno and Mr Hans Pettersson, all of Statistics Sweden, Stockholm.

has adhered to the classification principles of the new Act, with a breakdown by

- general measures for children and youths,
- general measures for old and disabled persons, and
- special measures pertaining to individuals.

The responsibility for the different activities in the social welfare sector is mostly held by local government authorities.

The calculations of the study pertain to the total productivity, i.e. the output is related to the entire input of resources. The years chosen are 1970, 1975 and 1980, but to minimize the effects of temporary fluctuations, the estimates have been made as three-year averages for 1969-71, 1974-76 and 1979-81. The areas covered by the calculations correspond to 90 per cent of the whole social welfare sector. Central government agencies and research institutions have not been included.

Output

Quantity indicators for the services have been obtained without difficulties. The statistics are well established since many years, and the data collection is made according to the same rules in all the municipalities. Non-random errors, if any, are assumed to be constant over time. The indicators chosen are e.g. the number of children in daycare centres, nursery schools etc., the number of bed-days in service houses for old and disabled persons and in children's homes and reformatory schools, the number of hours worked in domestic-help services, the number of transports in the municipal transport service, the number of persons requiring social assistance etc. A measure of the total output in each section has been obtained by using the unit costs in 1980 prices as weights in the summation of the various quantity indicators.

Cost

The cost trend calculations have presented a more difficult problem. The data have been drawn from the accounting records submitted annually to Statistics Sweden by the municipalities. Book-keeping practices vary, which affects the precision of the aggregated data. Nevertheless, it can be assumed that the differences have remained reasonably constant during the period of observation, which reduces the uncertainty in the change estimates.

The costs at fixed prices have been obtained by means of a transformation factor calculated on the basis of the national accounts data on total costs for social welfare. Alternative calculations have been made to find out how the results are affected by various assumptions.

Productivity trends

Some productivity trends in the field of social welfare are shown in Table 2.2. During the 1970's there was an annual decrease in the productivity rate by 1.6 per cent. The decline was strongest during the first half of the decade. The results are similar, whether or not the general administrative units are included. The alternative calculations mentioned above give a stronger decrease, 4 and 3 per cent per year, respectively.

The findings differ for different sections of the social welfare system. General measures for children and youths show a positive productivity trend during the entire period, despite an increase in the relative number of personnel. This might be due to the reduction in the relative number of infants at daycare centres (the cost for infants at daycare centres are higher than for older children), which in turn might be a result of improved terms in the national family insurance scheme. Some other factors that might have contributed to the productivity increase are deliveries of meals from central kitchens and cheaper premises (daycare centres in converted flats).

Table 2.2 Productivity trends for social welfare 1970 - 1980. Annual percentage changes according to the main alternative

	1970-75	1975-80	1970-80
General measures for children and youths	+1.3	+ .5	+ .9
General measures for old and disabled persons	-2.9	-1.7	-2.3
Special measures pertaining to individuals	-3.1	-1.1	-2.1
Total, incl. general administrative units	-2.5	- .9	-1.6

General measures for old and disabled persons is a section which shows rather a strong productivity decrease during the first half of the 1970's. This is entirely due to the very considerable rise in the costs for domestic help and municipal transport service during the period, while the increase in the service volume remains much smaller.

The content of the special measures pertaining to individuals have changed a great deal during the period, which makes the findings difficult to interprete. However, as the volume of these measures is much smaller than that of the general measures, the effect on the total result is rather limited.

Quality changes

In the social welfare sector too, there have been changes in the quality of the services, but it has not been possible to make any numerical estimates. It is noted in the study that the quality changes are unlikely to have had any decisive effect on the findings.

2.3 Education

The productivity study in the educational field[1] covers the period 1960 - 1980. During these years the Swedish educational system changed radically. The comprehensive school and the integrated upper secondary school were established, older types of secondary schools ceased to exist, and the higher-education system was reorganized. The greatest changes took place in the 1960's, and the calculations can therefore be considered more reliable for the time after 1970.

Nevertheless, estimates have been made for the years 1960, 1965, 1970, 1975 and 1980, and have covered output and input of resources in the comprehensive school, the upper secondary school and the post-secondary educational system.

Output

During the period a number of new activities have been introduced in the school work in addition to the regular curricula. For the sake of comparability, these new items have not been included in the output estimate. The ambition in the study has been to use the concept 'learning hours' as the principal quantity indicator.

For the comprehensive school and the upper secondary school, the average number of hours per week according to the curricula of the various stages has been multiplied by the number of pupils in the corresponding stages at the time of the measurement. In addition, the number of 'pupil-hours' per week has been calculated. Both alternatives have been reported.

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1) Produktions-, kostnads- och produktivitetsutvecklingen inom den offentligt finansierade utbildningssektorn 1960 - 1980. Rapport till expertgruppen för studier i offentlig ekonomi (Output, Cost and Productivity Trends in Public Education 1960 - 1980. Report to the Expert Group on Public Finance). Ds Fi 1986:17. The report has been prepared by Dr. Peter Stenkula of the University of Lund.

The measurement of the output in the post-secondary educational system has presented one of the most difficult problems in the studies. Lacking any better quantity indicator, the number of students has been used as a measure of the output. In order to prevent double-counting, only students who commenced new subjects during the year have been included.

As part-time studies have increased greatly during the period, the number of part-time students has been recalculated to the equivalent number of full-time students, which gives a better comparability between the years. Students taking courses that have been newly introduced during the period have been excluded. An alternative output measure has been the number of degrees awarded.

Cost

The national accounts include data on the expenditure of resources in the educational system, at fixed prices. These data have been utilized in the study, broken down by comprehensive school and upper secondary school on the basis of the relative number of pupils in each type of school. For post-secondary education, separate calculations of the current expenditure have been made for undergraduate education, postgraduate education and research. A recalculation at fixed prices has been made according to the national accounts.

Productivity trends

The ratio between output and cost trends gives a measure of the productivity trend in the educational sector. Table 2.3 shows some results for the comprehensive and upper secondary schools (the data are based on the number of 'pupil-hours' per week).

The results pertaining to the first period in the table must be considered very uncertain. The national accounts do not cover the years 1960 - 63, and in addition there were great changes in the structure of

Table 2.3 Productivity trends for education 1960 - 1980. Annual percentage changes

	1960-65	1965-70	1970-75	1975-80	1965-80
Comprehensive school	-5.8	-6.5	+1.5	-4.8	-2.8
Integrated upper secondary school	-8.5	-6.5	-5.5	+2.2	-3.3
Total	-6.3	-6.5	+ .5	-3.8	-3.2

the educational system during those years. Thus the comprehensive-school data include the then lower secondary school and girls' secondary school as well.

For the five-year periods after 1965, there is a covariation between the number of pupils and the productivity trend. In the comprehensive school the increase in the number of pupils was concentrated to 1970 - 75, and in the upper secondary school to 1975 - 80. The covariation suggests an overcapacity which could be drawn upon at a temporary increase in the number of pupils, as well as a slowness in adapting the resources to a shrinking number of pupils.

For the comprehensive school the study includes some alternative productivity calculations. In addition to the output/cost ratio per pupil, corresponding comparisons have been made per form. This gives the following productivity trend (annual percentage changes):

	1960-65	1965-70	1970-75	1975-80	1965-80
Comprehensive school	-2.5	-5.3	- .4	- .9	-1.7

Compared with the pupil-ratio data, these figures indicate that the rising number of pupils were admitted without an equivalent increase in the number of forms. This improves the productivity trend but might have affected the quality of the education.

For the post-secondary education the first five-year period has been omitted, owing to the estimation difficulties. For the subsequent periods the following productivity trend has been found (annual percentage changes):

	1965-70	1970-75	1975-80	1965-80
Post-secondary education	-13.0	-2.1	+ .7	-4.5

The exceptional productivity decrease in 1965 - 70 was due to an expansion of the resources, e.g. the new system of branch institutions affiliated to the universities set up in non-university towns.

Entirely different trends are obtained if the output is instead measured by the number of degrees awarded. For example, during 1975 - 80 the productivity rose in respect to the number of basic degrees, but fell in regard to the number of doctoral degrees.

The study has also included an estimation of the productivity trend in the entire educational sector. The consumption of resources has been used as weights. The following figures were obtained (annual percentage changes):

	1965-70	1970-75	1975-80	1965-80
Total educational sector	-7.2	+ .3	-2.7	-3.8

Quality changes

No measurements of quality changes have been made in this study. The educational methods have altered considerably during the period of observation, but the effects on the services per se have not been possible to estimate. Some novel activities have been excluded and reported separately. Whether the number of pupils per form has an effect on the quality of the education is to some extent illustrated in the alternative calculations reported above.

2.4 Public roads

Productivity calculations for public roads[1] are complicated by the difficulties to define the field to be covered by the study. Several alternatives have been considered. The concept could cover the activities of the National Road Administration, or include the entire public-roads field. It could even include the production of certain road services from the private sector. In the study, the calculations have largely covered the services and cost of the public-roads field, as well as more detailed material on the activities of the National Road Administration.

Output

The quantity indicator chosen for public roads totally has been the traffic volume, alternatively the transport volume. The traffic volume is measured by the number of vehicle-kilometres or axle-pair-kilometres per average annual 24 hours. The transport volume concerns the number of passenger-kilometres and, for goods, the number of ton-kilometres. The measurements primarily refer to the state road network, for which data on the traffic volume are regularly collected. Estimations of changes can, however, be made for the remaining part of the public-road system as well. For technical reasons the study goes back only to 1963.

It has not been possible to study the traffic volume in detail by various categories of vehicles for long periods of time. The major part of the vehicles in Sweden are passenger cars (88 per cent in 1980), and the study gives no indication that an estimate weighted by vehicle category would differ significantly from an unweighted average. The transport volume, on the other hand, has been broken down by passenger-kilometres and ton-kilometres.

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1) Produktions-, kostnads- och produktivitetsutveckling inom vägsektorn. Rapport till expertgruppen för studier i offentlig ekonomi (Output, Cost and Productivity Trends in Public Roads. Report to the Expert Group on Public Finance). Ds Fi 1985:9. The report has been prepared by Mr Jan-Erik Nilsson, of the National Road Administration.

Cost

Data on public-road costs have been drawn from various sources: The national accounts, the National Road Administration accounts, statistics submitted to Statistics Sweden by municipalities etc. The principal items cover investments and intermediate consumption pertaining to the state, municipal and private road network, i.e. the domain of the National Road Administration and relevant parts of the operations of the police and the National Road Safety Office.

In addition to the resource consumption in the public sector, the total national costs for traffic and transportation also include the private consumption of resources. No numerical calculations have been made in the study, but there is some discussion of the private costs, both those that pertain to the vehicles themselves and those that depend on the distance of travel, including the travellers' input of resources in the form of time and exposure to the hazards of traffic.

The recalculations of the cost series to real resource consumption have been made by means of the consumer price index and the National Road Administration road index. The latter refers to road construction costs, but probably underestimates the price trends.

Productivity trends

The most reliable output measure is related to the traffic volume on the state road network, for which the trend is shown below (average annual changes):

	1963-70	1970-73	1973-78	1978-81	1963-81
Traffic volume	+6.5	+5.2	+3.4	- .6	+4.5

Available measurements for the municipal road network are more uncertain but indicate a similar trend.

In regard to transport volume, the number of passenger-kilometres shows a slightly smaller increase, with an average rise for the whole period of 3.3 per cent for passenger-cars and 3.6 per cent for buses. Thus the relative number of passengers in the cars has dropped. For goods, the ton-kilometre increase has been stronger, with an average rise of about 5 per cent. In the 1970's, the growth rate was markedly lower than in the 1960's.

The data on real resource consumption vary somewhat, depending on the source from which they are drawn and the price recalculation method employed. For public roads, the calculations show an average growth rate for the whole period of between 0 and +1.1 per cent. The 1960's brought a real increase of resource consumption, while the 1970's saw a decrease. For the whole period, .6 per cent has been chosen as the best estimate of the average annual increase of the resource consumption.

The productivity increase for public roads falls in the interval 3.4 - 4.5 per cent, where 4 per cent has been chosen as the best estimate of the average annual change. The discussions on the private costs have failed to yield any definite conclusions [1].

Quality changes

The study includes a discussion on quality changes during the period. Some factors that might be experienced as negative by the road-users are the restrictions imposed by the authorities to improve traffic safety, while the positive factors include shorter average travelling times, reduced traffic hazards and a general improvement of the road quality. No quantitative conclusions have been drawn, but the main view seems to be that no downwards adjustment for the identified quality changes seems justified.

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1) Nor should these costs, in principle, be included in the productivity measures of the public sector.

2.5 Twelve selected fields of central government administration

The productivity trend in the central government during 1960 - 1980 has been studied by the Swedish Agency for Administrative Development[1]. The study has covered a selection of government authorities[2] which together represent some 30 per cent of the entire central government administration. It does not include activities covered by the other project studies. The chosen authorities are not necessarily representative, as they have developed considerably faster than the central government as a whole.

Calculations have been made for the five-year periods 1960 - 65, 1965 - 70, 1970 - 75 and 1975 - 80. In some cases the first period has not been included. The calculations primarily refer to the total productivity (cost productivity) but the study has also yielded some productivity data pertaining to labour and to value added.

Output

The quantity indicators chosen to measure the output obviously have to be different for the different authorities, but the principle adhered to throughout has been to measure only the final output. Generally

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1) Statlig tjänsteproduktion. Produktivitetsutvecklingen 1960 - 1980. Huvudrapport (Central Government Service Production. Productivity Trends 1960 - 1980. Main report). Swedish Agency for Admistrative Development, Report No 1985:15. The report has been prepared by a project group headed by Dr Richard Murray.

2) The labour market administration, the housing administration, the judiciary service, the correctional service, the enforcement service, the agricultural administration, the land survey administration, the police service, the social insurance service, the tax administration, the Swedish Meteorological and Hydrological Institute, and the customs service.

speaking, the measures refer to such entities as the number of proceedings or cases, or in some instances the number of utilized places in care or education. Other examples are the number of duty hours in the customs and police services. In one case only - the employment exchange service - has it been necessary to resort to work-load instead of output as a measure.

In each field of administration, estimates have been made for several types of services. These have been aggregated in slightly different ways, depending on the available material. A sensitivity analysis indicates that the productivity trend estimates remain rather unaffected even by large changes in the weights. The aggregation of the output volumes from the various authorities to a total measure has been made by means of cost per service unit in 1980 prices. A similar procedure has been used within each authority.

Cost

For the years 1970/71 - 1980/81, cost data at current prices have been collected from the central government computerized accounting system. For the preceding years, manual compilations made by the National Audit Bureau have been used. Some adjustments have been necessary to make the costs compatible with the services used as quantity indicators.

In the recalculation at fixed prices, the national accounts include an implicit price index series for the average consumption of resources in the central government administration. However, the authorities selected in the study differ from the average in respect to the relative size of various cost items. For instance, the payroll of these authorities form a larger part of the total cost than in the central administration as a whole. Separate recalculations have therefore been made in the study for the various types of costs - wages/salaries, payroll increments, current consumption, capital consumption and rents.

Productivity trends

The table below shows the trends in respect to output, resource consumption and productivity for the selected authorities (annual percentage changes):

	1960-65	1965-70	1970-75	1975-80
Output	+2.4	+3.4	+1.1	+4.4
Consumption of resources	+4.5	+7.0	+6.5	+1.8
Productivity	-2.0	-3.3	-5.2	+2.5

Both output and consumption of resources increased during the period as a whole. Up until 1975 output increased slower than resource consumption, which meant a decrease in the productivity rate. During the last five years, output instead grew faster, and the productivity trend became positive.

A comparison of the authorities yields very similar productivity trends (Table 2.4). The change from a negative to a positive development which took place around 1975 can be noted practically throughout. The only exception is the housing administration, which boasts the strongest productivity increase of all (+3.2 per cent as an average for the whole twenty-year period).

As previously mentioned, estimations have been made not only of the total productivity change, but also of the changes in respect to labour and value added. The differences are insignificant if the whole period is considered. The pattern over the years is also similar. The annual percentage changes during 1960 - 1980 are shown below:

Total productivity	-2.1
Labour productivity	-1.8
Value-added productivity	-2.0

Table 2.4 Productivity trends for some central government authorities 1960 - 1980. Annual percentage changes

	1960-65	1965-70	1970-75	1975-80	1960-80
Labour market administration [1]	-1.9	-7.4	-3.5	+1.9	-2.8
Housing administration	+5.0	- .6	+6.6	+2.0	+3.2
Judiciary service	-5.4	- .9	+1.3	+2.8	- .6
Correctional service	-5.6	-6.0	-11.0	+ .3	-5.6
Enforcement service	--	-4.1	-4.9	+3.1	-2.0 [2]
Agricultural administration	-5.0	-1.6	+ .6	+1.1	-1.3
Land survey administration	-4.0	+ .3	-2.9	+2.5	-1.1
Police service	--	-1.8	-6.2	+3.6	-1.5 [2]
Social insurance service	-1.0 [3]	-2.6	-4.8	- .2	-2.4
Tax administration	-2.9	-7.1	-6.4	+5.1	-2.9
Customs administration	+5.0	+5.2	-4.3	+4.1	+2.4
The Swedish Meteorological and Hydrological Institute	-3.1	+4.2	-3.7	+4.7	+ .5
The Patent and Registration Office [4]	--	--	-4.3	-3.2	-3.7 [5]
Total (excl. the last two bodies)	-2.0	-3.3	-5.2	+2.5	-2.0

1) Including labour exchanges, labour market institutes and labour market training facilities
2) 1965 - 80
3) 1963 - 65
4) Ds Fi 1983:18
5) 1970 - 80

Quality changes

In the study, attempts have been made to consider certain quality changes by

- adjusting the service indicators on the basis of the higher or lower costs associated with certain qualities
- separating services of different qualities and assigning them weights according to their relative cost
- making quality controls in the form of analyses of attained goals/ effects.

A general observation is that if the services are broken down to a sufficiently detailed level, the quality changes of the individual services often prove to be minor.

2.6 Public libraries

A special study has been made of the productivity of the public libraries[1]. The quantity indicator for the output has been the number of lent books, periodicals, cassettes etc. During the period other activities at the libraries have grown considerably, but in the study these are classified as ancillary services or support for the final product - the lending service. No weights for different types of lending have been applied in the estimation process.

The consumption of resources has been measured by the total current expenditure of the public libraries according to their balance-sheets. The expenditure has been broken down by book purchases, payrolls, rents and incidentals. Recalculation at fixed prices for the media costs has been made by means of the corresponding index series in the consumer price index, and for payrolls and incidentals by the corresponding

1) To be published in 1987 by the Expert Group on Public Finance.

index series for government consumption. For rents, a weighted index series for housing, fuel and electricity from the consumer price index has been used.

Both total and labour productivity trends have been calculated, and the annual percentage changes are given below:

	1960-65	1965-70	1970-75	1975-80	1960-80
Total productivity	-5.4	+6.4	+ .7	-5.5	-1.1
Labour productivity	-3.5	+3.3	-1.3	-2.8	-1.1

The calculations do not cover the many newly introduced activities at the libraries which are not directly associated with lending. A sensitivity study was made to find out how these activities affect the productivity estimates. The study was based on two assumptions: 1) The new activities did not exist before 1960. 2) In 1980 the costs of these activities amounted to 3 per cent of the total resource consumption of the public libraries (the percentage figure obtained at one library where these costs had been specifically calculated). On these assumptions, the productivity decrease during 1960 - 80 becomes .92 per cent instead of 1.07 in the main alternative, i.e. the difference is insignificant.

2.7 The national defence

Productivity rates for the armed forces have been estimated for each budget year during the period 1972/73 - 1982/83 by the Swedish National Defence Research Institute[1]. Owing to the introduction of a new

1) Produktions-, kostnads- och produktivitetsutveckling inom armén och flygvapnet 1972 - 1982. Rapport till expertgruppen för studier i offentlig ekonomi (Output, Cost and Productivity Trends in the Army and the Air Force 1972 - 1982. Report to the Expert Group on Public Finance). Ds Fi 1986:1. The report has been prepared at the National Defence Research Institute under the direction of Mr Jan Foghelin.

accounting system in 1972/73, it did not seem feasible to carry the study further back than that year. Also, as the data for the Navy proved difficult to handle, the study was confined to the Army and the Air Force.

The Army

Among all the activities of the Army, the quantity indicator chosen refers to the national service training. The output measure has been the number of days of basic training and refresher courses, alternatively the total number of conscripts trained during the year. The trend seems about the same in both alternatives. Changes in the quality of the training have not been possible to record.

Data on resource consumption have been drawn from the Army annual accounts, with a breakdown by various types of costs. Recalculations at fixed prices have been made by means of a special factor for each type of cost.

The results for the whole period of observation indicate similar output and cost situations during the first and the last years, with variations in the middle of the period. When the number of conscripts has been unusually high, the average costs have been low, which illustrates that the Army has very high overhead costs. The productivity, as defined in the studies, has therefore first dropped with the lower number of conscripts, and then risen as the number of conscripts has increased. Estimates of the annual percentage changes in productivity for the Army are given below:

Quantity indicator	1972/73 - 77/78	1977/78 - 82/83
Number of training days	-1.6	+1.6
Number of conscripts	-1.2	+2.3

The Air Force

The output measure for the Air Force has been the number of flying hours. The vast difference between various types of aircraft has made it necessary to assign weights to these hours, and according to the main estimate the flying hours have become fewer in number during the period. The costs as recalculated by means of a specific Air Force index have gone up and down. The cost per flying hour - and inversely the productivity rate - has varied during the period but is roughly the same during the first and the last years.The annual percentage productivity changes for the Air Force are shown below:

1972/73 - 77/78	+4.7
1977/78 - 81/82	-4.9

2.8 Housing and community planning

Together, the studies described in the previous sections cover a major part of the Swedish public service production. To extend the coverage even further, summary calculations based on the national accounts have been made by Statistics Sweden in the fields of housing and community planning for the period 1970 - 1980[1)].

In the national accounts, housing at the central government level includes the administrative costs of the Ministry of Housing, the National Housing Board and the regional housing boards. At the local government level, it covers construction and clearance of housing estates, as well as other housing measures. Community planning in the central government corresponds mainly to the costs of the National Board of Physical Planning and Building, while in local government it includes costs related to physical planning and land utilization.

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1)

PM med överslagsmässiga beräkningar över produktionsvolym och kostnader för bostadspolitik och samhällsplanering (Memorandum with summary estimates of output and costs in the fields of housing and community planning). Prepared by Statistics Sweden, NR-PM 1984:29.

The output in the housing field has been assumed to co-vary with the housing construction volume as estimated in the national accounts. This means that certain quality characteristics have been taken into consideration. In community planning, correlation with the total volume of construction has been assumed. The quantity indicator has been new investments in buildings and installations according to the national accounts estimates.

Cost data have been drawn directly from the national accounts tables at fixed prices, subsequent to certain adjustments due to a restructuring of the municipal accounts.

The results of the summary calculations for the two fields taken together are shown below (annual percentage changes):

	1970-75	1975-80	1970-80
Output	-1.6	- .7	-1.2
Cost	-1.8	+2.7	+ .5
Productivity	+ .2	-3.3	-1.7

Contrary to most of the twelve selected fields studied in section 2.5, these two fields display considerably more negative productivity trends during the second half of the 1970's than during the first. One explanation might be that construction was curtailed during that period.

2.9 Conclusions of the pilot studies

The studies briefly described in the previous sections should be regarded as a first attempt to make a systematic review of the various fields of the Swedish public sector in order to illustrate current productivity trends. Although the studies have been governed by the same terms of reference, they have been conducted along rather different lines, due to the specific features of the various fields and the constraints of the available material.

The aim of the studies has been both result- and method-oriented. By providing data on the productivity trends - though tentative - the studies offer a basis for a critical evaluation of the implicit assumption of the national accounts, viz. that the productivity of the public sector does not change over time. They also provide material for further and more detailed discussions.

As the estimation problems have been tackled in various ways, the studies also provide a collection of conceivable methods and measures. The different approaches might be useful in appraisals of the statistical materials used and lead to suggestions for improvements.

In a couple of fields (medical services and education), the Expert Group has had summary estimates of the productivity trends made to see how well these agree with the findings of the studies. The material has mainly been drawn from the national accounts for the period 1970 - 1980.

For medical services the estimates indicate an unchanged productivity during 1970 - 1975 (as compared with a decrease by 1.4 per cent in the study), and an annual decrease by 3 per cent during 1975 - 1980 (2.4 per cent in the study). In the educational field the results show a productivity decrease by 1.6 per cent during 1970 - 1975 (as compared with an increase by .3 per cent in the study), and a decrease by 1.5 per cent during 1975 - 1980 (2.7 per cent in the study). For the whole period 1970 - 1980, the summary estimates therefore agree reasonably well with the findings of the studies.

Findings

The findings of most of the studies have some features in common.

For the whole period of observation, the studies indicate a negative productivity trend or no change at all for all fields except public roads and some of the twelve selected central government authorities in section 2.5. In those cases where estimations have been made for both the 1960's and the 1970's, the development has proved somewhat better during the latter period.

Another general observation is that the productivity goes down when the resources increase strongly, and rises when the resources decrease. This indicates that it is easier to keep up the production in spite of diminishing resources than to improve it at the same rate as the resources increase. There is, in other words, a lack of flexibility in the public sector, although at least partly explainable by such factors as overhead costs, personnel policy etc. The special study made of the National Patent and Registration Office is a point in case. When the number of submitted applications for forming a limited company dropped radically due to stricter rules (minimum capital raised from SEK 5 000 to 50 000), a productivity decrease by 4 per cent annually was noted. An example in the other direction is given by the study of the general courts of justice, which experienced an annual productivity increase by almost 4 per cent from 1975 to 1981. A probable explanation is that the greater workload of the courts was countered by a more flexible distribution of the tasks, both in respect to type of duties and category of staff. The increased amount of work did not necessitate an equivalent increase of resources.

The findings might also be related to the growing administrative superstructure of the public sector. The productivity trends reported are due not only to the production process itself, but also to various administrative measures taken at all levels, from Parliament and downwards in the hierarchy.

The heavy expansion of the Swedish public sector may have had a delaying effect on the productivity development. It has taken some time to get all innovations neatly fitted into the system. This hypothesis would accord with the lower rate of decline in productivity towards the end of the 1970's, and the change towards a positive trend in some fields of the public administration.

Definitions and sampling principles

The principles for estimating the productivity in the public sector have been described in Appendix 1, section 4. In the practical applications these principles have been followed as far as possible, although with different emphasis in the different studies.

The estimates were as far as possible to apply to the entire studied field. This has been feasible in some cases, particularly where the production was measured by a single, relatively simple and homogeneous quantity indicator. Some examples are education (number of learning hours), public roads (traffic volume, transport volume), and the national defence (number of training days, number of flying hours).

In other instances it has been necessary to resort to a sampling procedure. When the services cannot be adequately represented by one simple indicator but have to be measured by more detailed component indicators to get meaningful estimates, it may become too complicated or too expensive to cover the entire field. Public health and medical care form one example. The emphasis was placed on hospital-related medical care, particularly in-patient care. The chosen quantity indicator was indeed quite simple - the number of patients admitted - but its content was considered to differ so much between various departments that the estimates were made per department. This made it necessary to confine the study to a sample, covering slightly less than one-third of all hospitals with emergency departments and structured so as to make it as representative as possible. The sample included hospitals from both densely populated and rural areas, as well as hospitals of various sizes. There is no evidence of bias due to the sampling method, but other types of samples are of course conceivable.

A different type of sampling was made in the study of the twelve selected fields presented in section 2.5. This study was not to include authorities covered by the other studies in the project, i.e. aproximately 50 per cent of the central government sector. The selection made among the remaining authorities represents some 70 per cent of their resource consumption, and focuses on administrative fields in which the final output can be easily measured. It is uncertain whether the productivity trends of the sample are characteristic of the remaining fields as well, since the resource development in the sample was more rapid than in the central government as a whole. Owing to the tendency previously mentioned, viz. that increasing resources lead to a decline in productivity, it is not unlikely that the findings exaggerate the productivity decrease in the central government.

Output measures

The fundamental concept in the productivity estimations is the output measure. To cover all activities in the public services is of course impossible, and it is therefore necessary to find quantity indicators which can represent the various services. This problem was solved in various ways in the studies. In several fields simple and homogeneous indicators were available, which is an obvious advantage provided the development of these indicators really is characteristic of the whole field during the entire period of observation.

The educational field can be taken as an example. The study used 'learning hours' as a simple quantity indicator, measured by the number of 'pupil hours per week'. However, during the observation period a number of innovations were introduced, such as special tuition, home language tuition for immigrants, free meals, and various social-welfare measures for students. A special study should be made of these activities.

Public libraries is also a field where a simple quantity indicator was used, viz. the number of lent publications and cassettes. However, particularly during the 1970's there was an increase in other cultural activities, such as exhibitions, lectures, concerts and special arrangements for children and youths. These are not covered by the output measure, but special estimations indicate that their effect on the productivity rate is insignificant.

Examples of the opposite type are the study of the twelve central government fields and, to some extent, the studies of medical services and social welfare. In these studies a great number of output measures were used, which gives better estimates for each component field but instead involves the problem of constructing a weighted estimate for the whole field.

Weights

As mentioned in Appendix 1, section 4, the weights used to aggregate various types of services should ideally be based on the users' valuations, as in the private sector where they are reflected by the prices. Due to the absence of price formation in the public sector, cost data had to be used instead, most frequently the unit cost of the chosen quantity indicator in 1980 prices. To get a total estimate of the medical services, the percentages of the total current expenditure attributable to the various types of care at the time of the measurement were used as weights. Within each separate type of care, on the other hand, 1980 prices were used. To get an idea of the significance of the weights for the results, estimates were made using first the average cost of each department, secondly an average of departments of the same type, and thirdly the lowest/highest average cost. The conclusion is that the various types of weights affect the total productivity growth by only one or two per mille.

A similar conclusion can be drawn from the study of the twelve selected central government authorities. There the weights were calculated in various ways, depending on the available material. In addition to the average cost in 1980, such measures were used as time expenditure, workload points etc. In a sensitivity analysis the weights were considerably modified, but the effects on the final result proved surprisingly small.

Capacity

In many public services there is a capacity aspect to consider. The production costs are hardly affected by an increase in the production up to capacity. In such cases the quantity indicator should reflect the extent to which the capacity is used, and in fact this aspect was considered in some of the studies. In education an alternative output measure per form was estimated in addition to the measure per pupil, which had a noticeable effect on the productivity rate. Capacity is also discussed in some other studies, e.g. the one about correctional services, but there it is rather considered as a quality aspect. This will be further discussed below.

Cost

To estimate the resource consumption at current prices for all the activities in the studied fields did not normally cause any great difficulties. In some cases it was possible to utilize data from the national accounts, in others material was drawn from annual reports, balance-sheets, municipal accounts etc. Sometimes, however, it was difficult to get data on resource consumption comparable with the output measures. The finer the breakdown, the more difficult to obtain the corresponding costs. There are two alternative types of approximations. In the first, the trends for the whole resource consumption are studied (in which case the resources for the specific services included in the estimations are assumed to follow the same trend). In the second, attempts are made to isolate the costs associated with the services covered by the estimations. The assumption in this case is that the productivity trends for the included services are representative of the whole field. The second alternative was the one most frequently chosen in the studies. This made it possible to avoid errors originating from including newly introduced activities in the resource consumption data but not in the output data.

Price recalculations

As the output is measured in real terms, the resource consumption has to be recalculated at fixed prices. This is a considerable problem, which is parallelled in the national accounts estimations of the services in the private sector. The previous sections present a variety of solutions. In the fields of medical services, social welfare and education, the national accounts recalculation factor was used, at least as a first alternative. For public roads two alternative estimates were made, one based on the Statistics Sweden consumer price index and the other on the National Road Administration road index. Other studies attempted to recalculate separate types of costs by separate index series, in order to get maximum accommodation in the fixed-price calculations. Particularly interesting is that some studies, in addition to their main findings, report the effects of alternative recalculation

principles. In the social welfare study, the national accounts fixed-price calculations were supplemented by calculations based on an alternative index composed of the consumer price index and a wage/salary index for each section of the study. The productivity trends according to this alternative are noticeably more negative than those obtained in the main calculations.

Alternative price recalculations made in the public-roads and national-defence studies also confirm that the choice of price index is very important in the estimation of productivity trends, in fact considerably more important than the allocation of weights to the real services.

Productivity rates

As pointed out in the first section of this appendix, the productivity estimates of the studies primarily concern the total productivity, i.e. the ratio between the output and the total consumption of resources. In some of the studies, other types of productivity measures were calculated as well. For the public libraries and the twelve selected central government authorities, labour productivity measures were calculated too. For the public libraries the results do not differ much from those pertaining to the total productivity, if the whole period of observation is included. For the twelve authorities, the findings indicate a smaller productivity decrease in respect to labour than to all resources. One explanation is that in the total cost the share pertaining to labour has become smaller, while the share pertaining to premises has grown larger during the period. For these authorities the productivity in respect to value added was calculated as well, but in that case the trends were very similar to those of the total productivity.

Generally speaking, the estimates in the studies pertain to changes in productivity. Wherever possible, separate calculations were made for the five-year periods 1960 - 65, 1965 - 70, 1970 - 75 and 1975 - 80. The 1960's data, however, are often inferior in quality and are difficult to compare with data from the 1970's. It is therefore recommended not to draw too far-reaching conclusions from the differences found between these two decades.

Different estimation methods were employed in the different studies, but common to all is that the final result is the annual productivity change during the various periods. In some of the studies the output trend during a five-year period is represented by index numbers, with corresponding index numbers for the resource consumption. When the first-mentioned series of index numbers is divided by the second, the result is the productivity trend during the period. The annual change is then calculated by a 'compound interest' method. Examples of this procedure are found in the studies of the social welfare and the twelve authorities. In the medical services and education, the annual change was first calculated separately for the output and for the resource consumption, and then the second change was subtracted from the first. The results derived by the two methods differ by a few tenths of a per cent.

Quality changes

When output and resource consumption rates are calculated and compared during a period of some length, one condition is rarely satisfied, viz. that the quality of the services and the input remain unchanged. However, the more detailed the breakdown of the quantity indicators and costs, the more likely that this requirement is fulfilled. When the work involves complex indicators, it might be necessary to estimate or at least give an opinion of the quality changes that have occurred during the period of observation.

Quality questions have been discussed in all the studies, but quantitative estimates of specific quality factors are made in only a few. In the others, the observation generally made is that there is no evidence that the quality changes have affected the findings to any noticeable extent.

The studies in which some specific quality estimations are attempted concern the medical services and some of the twelve central government authorities. For the medical services, the question is discussed in section 2.1. For the twelve authorities various types of estimations

were made. One was an attempt to compare the length of time required for processing a case at the beginning and at the end of the period. In the enforcement service there are reasons to believe that the number of time-consuming cases have increased. If the proportion of such cases were to have doubled from 1965 to 1980 - an extreme contingency - the annual productivity change would have been -1.4 instead of -2.0 per cent. For the correctional service, a quality adjustment was made in respect to the capacity utilized. According to a Government statement the best correctional effects are obtained when the available places are used to 85 per cent of capacity. To the extent that this optimum was exceeded, the output volume was reduced by the additional costs that would have been required to keep an occupancy rate of 85 per cent.

Another example of quality estimations are the sensitivity calculations made for labour market training, in which changes in the contents of the courses were taken into account. The effect was a more negative productivity trend. Yet another example concerns the increased number of times per hour that the police were called out - which resulted in a slightly improved productivity rate.

An interesting quality aspect is related to the changes caused by the introduction of computers in the public sector. In addition to internal rationalizations, this has resulted in new and improved services, such as preprinted forms for the tax returns, automatic notifications of payments due, and daily lists of vacant situations at the employment exchange offices. Such service improvements ought to be, but are not, covered by the measures used. If the productivity estimates are to be adjusted for these new or improved products, their valuation becomes an important question. The reason that the new services were not produced previously is of course that, with the old technology, they would have been too expensive, i.e. the cost would have been much higher than the value. They are now produced, because the cost has become reasonable - the value has become equal to or higher than the cost. Still, the users might feel that the quality has changed for the worse, owing to the increased difficulties they encounter in their dialogue with the authorities.

Another quality aspect is associated with the users' opportunities to avail themselves of the public services. For instance, the output measures are not affected by changes in the time of waiting or queuing for a certain service. Still, such aspects are certainly important to the users of e.g. child care or medical care, and they should therefore lead to adjustments of the productivity estimates.

General comments

To summarize, the pilot studies described here should be seen as a first step towards an extension of our knowledge about the productivity in the Swedish public sector. They indicate opportunities as well as problems to be considered in the future work. Some strategic points are listed below:

- The consistency between output and resource data. It s particularly important that the contents of either series is not changed to any great extent without corresponding changes in the other.

- The capability of making relevant fixed-price calculations. The findings have proved to be strongly dependent on the type of recalculation method used.

- The capability to consider quality changes in the services. To some extent this is equivalent to a further breakdown of the output (and the resource consumption).

APPENDIX 3

THE TOTAL PUBLIC SECTOR

In this appendix the findings of the separate productivity studies have been aggregated and used to estimate the productivity trend for the entire public sector. For the period between 1970 and 1980 the studies are fairly comprehensive, but further back a few of the most important sub-sectors are not covered. The estimates have therefore been confined to the period 1970 - 1980.

3.1 Adjustments

Some adjustments of the results of the various studies have been necessary to achieve uniformity of the various estimates. Even if the estimates in the studies were made in accordance with national accounts principles, some discrepancies have appeared in the material. The most considerable adjustments have been made in the public-roads study, where instead of including the investment expenditure, a capital cost was calculated. The result thus obtained indicates a very moderate rather than a strong productivity increase in this field.

3.2 Aggregation

The aggregation of the study results has been done in two different ways. The first consists of calculating a weighted total of the results from all the studies, using the studies' percentage costs in 1980 as weights. This total has been termed the sample productivity trend. Together, the activities included in the studies represent some 70 per cent of the cost of the entire public sector in 1970 and 1980.

The second method is based on the national accounts breakdown of the public consumption by purpose. The studies are classified according to purpose. The coverage is obviously varying. Two of the purposes -

'general research' and 'outlays n.e.c.' - are not included in any of our studies, while some other purposes are almost completely covered. Regardless of the coverage rate, a study is considered to represent the entire area of the purpose in question. The two purposes not represented by any study correspond to 1.2 per cent of the public consumption in 1980 and 1.3 per cent in 1970. The productivity trends of these two purposes have been assumed to be the same as for the rest of the public sector. The subsequent aggregation has been made with the cost percentages of the purposes as weights. This estimate has been termed the representative productivity trend.

A comparison has been made of the weighted estimates obtained by the two methods. In the first case, the results of the various studies are simply added, with no regard to the purposes they represent and the relative sizes of the purposes. The volume of the activities covered by the studies is the only factor taken into account. As the studies cover as much as 70 per cent of the public sector, it is a reasonable assumption that the entire sector is well represented, even if it cannot be said with certainty that the remaining 30 per cent would not show some differences.

In the second case the estimate is made with regard to the purposes represented by the studies and their respective magnitudes. If a certain study covers e.g. 25 per cent of all the activities serving a particular purpose, the weight assigned to that purpose is still equivalent to the purpose's share of the total cost of the public services.

The second method is more appropriate if the studies are representative of the various purposes, but it necessitates some further assumptions and manipulations of the material.

It is therefore of great interest to compare the two weighted estimates. As the sample covers such a large proportion of the public sector, no great difference should be expected, and as it turns out, the two estimates for the whole public sector come out virtually identical. In this appendix we have therefore chosen to present only the representative productivity trends.

3.3 Productivity trends by purpose and for the entire public sector

Table 3.1 shows the representative productivity trend for each purpose and for the entire public sector. According to this method the average productivity change for the whole sector during the 1970's is -1.5 per cent annually. This is almost the same result as that obtained by the first method, which gives a very slightly more negative trend. The difference is only noticeable in the second decimal and is mainly due to the medical services, for which the productivity trend appears a little less negative by the second method.

Obviously the introduction of two purposes assumed to follow the same productivity trend as the rest of the public sector does not affect the results. If we instead assume that the productivity in 'general research' and 'outlays n.e.c.' has not changed at all, the trend for the entire sector is slightly improved - here too in the second decimal.

As to the validity of the findings for the entire public sector, we can only state that the measurements have covered a substantial part of the sector. The reliablity therefore primarily depends on the quality of the individual studies. The 30 per cent of the public sector not covered by the measurements may of course be subject to discussion. Of these activities, some might very well have been included in the studies, while others would have presented measurement problems of a principal nature. Does the non-included group differ from the measured part of the sector in a way that would affect the findings?

There are no clear indications either way. The individual studies all show similar trends for the period 1970 - 1980. We might say that if the findings for the 70 per cent included in the studies are due to similar factors, it is reasonable to assume that the same trends would hold true for the remaining part of the public sector as well.

Table 3.1 Productivity trends in the public sector 1970 - 1980. Annual percentage averages

	1970-75	1975-80	1970-80
	%	%	%
General administration and external affairs	-5.5	+4.5	- .6
Public order and safety	-6.3	+3.1	-1.6
Defence	- .1	-1.0	- .6
Education	+ .3	-3.2	-1.5
Health	-1.4	-2.2	-1.8
Social insurance	-4.8	- .2	-2.5
Social welfare	-2.8	- .4	-1.6
Housing and community planning	+ .2	-8.9	-4.5
Recreational and cultural services	+ .7	-5.5	-2.4
Support to private industries	+ .1	+ .4	+ .2
Entire public sector	-1.4	-1.6	-1.5

3.4 Aggregation problems

The summation of the results of the various studies presents what might be termed an aggregation problem. The question is to what extent the output and cost of two or more government agencies can be aggregated to obtain a joint productivity trend.

There is no difficulty in adding the costs to get the total consumption of resources. The problem is to aggregate the services.

If the services of one government agency are utilized by another, it is the services of the second agency only that are to be classified as final output. According to our principles, the final output of the public sector are only those services which can in some sense be regarded as consumed, invested or used as input by some other sector, e.g. the private industries. Services used as input by other government agencies are to be excluded. The question then is to what extent the services included in the studies are utilized by other government bodies.

Obviously the more aggregated the individual studies, the less the risk of the services being double-counted. Education, medical care and social welfare are cases in point. The services identified in each of these studies are definitely final. For several of the selected agencies in section 2.5 on the other hand, there is a risk that their services will be regarded as final products, despite the fact that they should rightly be considered as an input in the production of some other agency. For instance, the enforcement agencies serve the taxation authorities, who serve the national insurance offices. Another example is whether the total output of the courts, the police force, the public prosecutors and the correctional system equals the sum of the services of each body, or whether it would be possible to identify a joint final product for the field of public order and safety, which would more clearly illustrate the total output, e.g. general obedience to the law.

The aggregation problem concerns the distribution of the public services on various categories of users. The services classified as input of resources in the public sector should be eliminated from the calculations of the productivity rates. This remains to be done in the integrated productivity calculations for the entire public sector. However, the comparatively small proportion of the services classified as input in the public sector indicates that the problem is a minor one.

Another aggregation problem arises when the gross national product is to be adjusted in respect to the productivity development in the public sector. The problem is due to the fact that some of the public services are used as an input of resources in the private sector. Therefore, when the GNP is calculated as the sum total of the private and the public sector outputs, another double-counting might occur. Let us assume that the entire output associated with the purpose 'support to private industries' constitutes an input of resources in the private sector. The output is a service from the public sector and should be included in this sector's total output. Yet it is not classified as final consumption in the GNP.

3.5 Effects of assumptions about public-sector productivity

Without further speculations about the validity of the findings, we shall use them to illustrate the consequences of the productivity development rate in the public sector.

The first question is how the GNP is affected. With 1980 as the base year, it is logical to start from the official estimate of the GNP for that year. The valuation of the public consumption in the GNP is based on its costs in 1980. In the present national accounts it is assumed that the productivity in the public sector is unchanged. The value of the public consumption in 1970 can then be considered equal to its costs for that year in the prices of 1980. If, however, the productivity has decreased by 1.5 per cent annually during the whole of the 1970's, every unit of money would have yielded 16 per cent more output in 1970 than in 1980, and the public consumption in 1970 would have to be recalculated accordingly. Table 3.2 shows the result:

Table 3.2 Public consumption and gross national product according to two sets of premises. MSEK in 1980 prices

	1970	1975	1980
Private consumption	230 892	259 903	270 049
Investments	113 590	121 556	111 891
Exports, less imports	-23 429	-19 827	- 9 997
Public consumption			
a) at unchanged productivity	111 594	129 914	153 156
b) at an annual 1.5 % productivity drop	129 368	140 560	153 156
Total GNP			
a) at unchanged productivity	432 647	491 546	525 099
b) at an annual 1.5 % productivity drop	450 421	502 192	525 099

The calculations indicate that the GNP in 1970 should be recalculated upwards by 4.4 per cent, if the public-sector productivity in 1970 was 16 per cent higher than in 1980. If the productivity instead is assumed to be the same in 1980 as in 1970, the GNP would have increased by 2.0

per cent annually during the 1970's. If, on the other hand, the productivity is assumed to have fallen by 1.5 per cent, the GNP would have risen by only 1.5 per cent annually. This would mean a reduction of the GNP trend by 25 per cent.

Another way of describing the consequences of a productivity change is to say that the public consumption would have increased by only 18 per cent between 1970 and 1980, instead of by the 37 per cent resulting from the assumption of unchanged productivity in the present national accounts.

Counted in terms of money, the value of the public consumption between 1970 and 1980 increased by MSEK 18 000 less than it would have done at unchanged productivity. Or, if the productivity in 1980 had been the same as in 1970, the services of the public sector could have been produced at a cost of MSEK 21 000 less.

The effect of a changing productivity rate in the various parts of the public sector can be illustrated by medical services and education. If the productivity had not dropped, the health services could have been provided at a MSEK 6 400 lower cost, and the educational services at a MSEK 5 500 lower cost.

In a numerical example we can see how the GNP development is affected if the 'support to private industries' is classified not as public consumption but as input of resources in the private sector. If the estimated GNPs for 1970 and 1980 are reduced by the services associated with this purpose, the GNP for 1970 would become MSEK 444 496 and for 1980, MSEK 517 629 in 1980 prices. The GNP trend would become slightly more negative, but the difference would fall on the second decimal (1.53 as against 1.54 per cent annually).

3.6 What do the findings tell us?

The calculations presented above may easily lead to erroneous conclusions. Even if they give a reasonably correct illustration of the productivity development in the public sector, the only question they can

answer with any certainty is whether and by how much the productivity has increased or decreased. In other words, the calculations tell us whether and by how much the costs of the services, as measured by the public consumption, have changed in the entire sector or for a specific purpose, but they tell us nothing about the causes.

For the services associated with the purpose 'general administration and external affairs' the costs have become 6.4 per cent higher during a ten-year period, i.e. these services require 6.4 per cent more resources - staff, premises, expendables etc. The reason is not apparent from the findings and may range from more complex legislation and more complicated social conditions to less efficient administration.

Let us take an example. Shorter working hours have no effect per se, nor have additional days of leave. The resource consumption includes only hours worked, and the costs of these are in 1980 prices and are therefore unchanged. On the other hand, shorter hours might entail a need for larger premises (more employees), which of course makes the production more expensive.

Another example is that the public sector has expanded heavily during the period, which means that the staff often is young and inexperienced. Given time, both the staff and the organization will mature and overcome the initial problems. A slower rate of expansion might lead to a more positive productivity development.

In many fields, society has changed in a way that is likely to make the work more complicated, which in turn may have entailed an increasingly complex legislation, making the work still more difficult etc. An example is the examination of income-tax returns, which has grown more difficult as the income situation of many taxpayers has become more intricate, calling forth even more complex tax legislation.

What purpose, then, is served by studying the productivity trends? First, of course, the findings may serve as an alarm bell and induce investigations as to the causes of the development, which in turn may result in less complicated rules and regulations, new methods of work or simply more smoothly-working organizations.

Secondly, the findings may serve as a guide to the development of the prices/costs of the public services. This is valuable information when resources are to be allocated to the various fields of the public sector. For instance, the services associated with housing and commununity planning have become considerably more expensive, while support to private industries has become cheaper.

The relative 'price' changes of the services associated with various purposes are shown in Table 3.3, where the average price of the services has been used as the mean value. The changes indicate how much more or less expensive the services have become, as compared with the average price.

Table 3.3 Relative price changes between 1970 and 1980 for services associated with various purposes in the public sector. Mean value = 1.0

General administration and external affairs	.92
Public order and safety	1.02
General research	1.00
Defence	.91
Education	1.01
Health	1.03
Social insurance	1.11
Social welfare	1.02
Housing and community planning	1.36
Recreational and cultural services	1.10
Support to private industries	.84
Outlays n.e.c.	1.00

The services associated with general administration and external affairs have become cheaper. Every unit of input has yielded 10 per cent more than ten years before. The same applies to the national defence, and even more so to the support to private industries. Education on the other hand, has become more expensive and yields 1 per cent less in 1980 than in 1970. Medical services yield 3 per cent less, social insurances 10 per cent less, and housing and community planning 26 per cent less, all percentages in comparison with the average for the public services.

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Lately the Swedish Agency for Administrative Development has brought its calculations for government administration up to 1985, and these indicate a positive productivity trend. In a forthcoming government publication, some calculations point to a positive trend in social welfare and a negative trend in education and in health and medical care.

The Expert Group on Public Finance is an independent body attached to the Ministry of Finance. Its main function is to commission studies of relevance to budgetary and economic policy-making. Its inquiries cover local as well as central government activities. One special task is to study questions concerning productivity and effectiveness in the public domain. The reports are published in the Government Office Report series or in some other appropriate way.