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INFORMATION AS TECHNOLOGY CHANGE - THE PRODUCTIVITY PARADOX AND A CRY FOR IMPROVED SERVICE STATISTICS

by

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SESSION 3

Abstract

The paper takes the macroeconomic approach and deals with three related issues: (a) Macroeconomic measures to monitor ICT development, (b) ICT development and labour productivity growth: the productivity paradox, and (c) Statistical work for improving service statistics. All three issues are discussed with a basis in experience with the revised Norwegian national accounts (SNA93 and ESA95 been implemented). Improving national accounts estimates in the area of services have been the real concern behind this paper, pointing to various kinds of improvements to be made. When substantive progress has been made for a number of service industries, it is also likely that estimates of production, employment and labour productivity growth would have positive shifts. The paper also points to the fact that conceptual basis matters in evidencing the productivity paradox; in Norway total labour productivity growth has not dipped in the recent decades and shows that productivity growth in the service sector is far above the "zero-sized" contribution from the service sector indicated by American critics.

INFORMATION AS TECHNOLOGY CHANGE - THE PRODUCTIVITY PARADOX AND A CRY FOR IMPROVED SERVICE STATISTICS

The paper takes the macroeconomic approach of national accounts and deals with three related issues:

A. Macroeconomic measures to monitor ICT development
B. ICT development and labour productivity growth: the productivity paradox
C. Statistical work for improving service statistics

All three issues are discussed with a basis in experience gained with the Norwegian national accounts (NNA). Norway was the first European country to implement the new international standards of national accounts (SNA93 and ESA95) already in 1995, and since then having extended the revised time series back to 1978. Through the former and in particular the revised NNA, Norway should be in a good position to explore various questions related to the title of this paper.

The paper is organised in three parts. First, there is a presentation on macroeconomic measures of ICT emerged from the changing industrial structure, taking a long term perspective and including the recent attempts by the OECD in defining a ICT sector. Link to the second issue of labour productivity growth is established by looking into the productivity growth of the ICT sector, as an introduction to a wider analysis of labour productivity growth in the main industries and total economy. This is to be viewed in relation to the strongly debated issue of the productivity paradox. Link to the third part is then drawn from the productivity paradox issue to the general issue of improving service statistics. By using the labour productivity measure as a yardstick variable, it is recalled - at least by statisticians - that various statistical issues and obstacles must be addressed throughout the chain from obtaining the basic statistics at current prices to arriving at adequate productivity estimates. In the paper, I have reviewed various dimensions and alternatives from Norwegian national accounts data, i.e. alternative concepts of labour productivity (output and value added measures), alternative valuations of production measures (basic price and producer's price), alternative employment measures (hours worked and full-time equivalent persons and persons employed), alternative international national accounts systems (new and former system of NNA), and not the least, reviewing development over time (by separating out two subsequent sub-periods: 1978-1986 and 1986-1995).

A. Macroeconomic measures to monitor ICT development

A.1 Long trends of main activities

The emergence of the information society could be traced by studying the changing industrial structure throughout the 20th century. Table 1 gives a summary picture of the industrial structure of Norway since 1930 based on GDP data. The rising trend for service activities and the reverse for goods producing activities are well-known structural changes, although we see in Norway a rising trend for industrial activities partly due to oil activities developed over the latest decades. The falling GDP share for agriculture, forestry and fishing has been quite dramatic, however.

Table 1. - ***Gross domestic product (GDP) by kind of activity. 1930-1990. Per cent. Former system***

		1930	1960	1990
1	Agriculture, forestry and fishing	16,7	9	3,1
2	Oil production and mining	0,9	0,8	13,4
3	Manufacturing	23	21,3	13,7
4	Electricity,gas and water supply, construction	6,5	10,3	8,5
5	Wholesale and retail trade, hotels and restaurants, transport and communications	27,8	35,4	21,1
6	Other services	25,1	23,2	40,2
1	Agriculture, forestry and fishing	16,7	9	3,1
2-4	Industrial activities	30,4	32,4	35,6
5-6	Service activities	52,9	58,6	61,3
1-4	Goods producing activities	47,1	41,4	38,7
5-6	Service activities	52,9	58,6	61,3

Countries are now in a process to implement the new international guidelines of national accounts (SNA93 and ESA95). Norway was the first European country to make this implementation, in the context of the first general revision of the Norwegian national accounts since the early 1970s when SNA68 was implemented. The new NNA data shown in table 2 do not contradict the results of table 1 which is based on the former national accounts estimates. In the revised regime, true, the share of service activities became higher, now approaching a 2/3 share of the total economy, but development over time was not much affected by this late revision.

Table 2. - ***Value added by kind of activity. 1978-1995. Per cent. Revised system***

		1978	1990	1995
1	Agriculture, forestry and fishing	4,8	3,4	2,8
2	Oil production and mining	6,9	13,5	13,4
3	Manufacturing	17,6	12,5	13,4
4	Electricity,gas and water supply, construction	9,9	8	7
5	Wholesale and retail trade, hotels and restaurants, transport and communications	25,2	22,9	22,5
6	Other services	35,6	39,7	40,9
1	Agriculture, forestry and fishing	4,8	3,4	2,8
2-4	Industrial activities	34,4	34,1	33,7
5-6	Service activities	60,8	62,5	63,5
1-4	Goods producing activities	39,2	37,5	36,5
5-6	Service activities	60,8	62,5	63,5

Most interesting in a ICT perspective, other services had an increased share of the Norwegian GDP by 17 percentage points from 23 per cent in 1960 to 40 per cent in 1990 (table 1) and a value added share rising from 35.6 per cent to 40.9 per cent over the period 1978 to 1995 with revised data. For service activities as a whole, the rising trend was less steep, 2.7 percentage points in both instances. It should be recalled, however, that oil activities became very important in Norway in the latter period. This mainly explains the relatively low share for service activities in recent years (between 60 and 65 per cent) compared to most industrialised countries.

In a scheme used by the OECD in late 1980s, a similar increasing share was found for so-called new services (with considerable contributions from financial services, business services and communications), i.e. a 15 percentage points increased share of total value added of service activities in Norway from 1960 to 1985 (see Statistics Norway 1997, table 3). Further analysis revealed that the rising trend for new services was even higher when combined with office-environmental services (part of the goods producing-related services). The summary aggregates constructed by OECD at that time - the primary information sector and the secondary information sector - suggested that the total information sector took up approximately 30 per cent of the total economy. In particular, the primary information sector part, which was the easiest to associate with the expression as such, was under attention for international comparisons and counted typically between 15 and 20 per cent, in Norway 17.2 per cent in terms of output in 1985 (see Statistics Norway 1997, table 4).

A.2 Defining the ICT sector

There is no such group as "the information industry" according to the Standard Industrial Classification. It may however be a prerequisite for producing supply side statistics comparable with other industries of the economy. North-American countries have adopted a broad definition of the information industry already. In Europe, this issue is being discussed in Eurostat, in the OECD and at a national level. Certain basis for agreement seems to emerge, at least a number of core information industries could be easily agreed upon.

Let me emphasise the work by the OECD in this respect. Quite recently, in June 1998, there was in fact agreement in the ICCP Statistical Panel on a definition of a ICT (Information and Communication Technology) sector, to serve as a statistical basis for monitoring the information society in general and the information technology and communication activities especially. That definition was based on ISIC Rev.3 (and taking into account industry groups in full despite parts not considered relevant). Principles behind the selection of industries were three-fold: their products should (i) be intended to fulfil the function of information processing and communication, including transmission and display, or (ii) use electronic processing to detect, measure and /or record physical phenomena, or to control a physical process. For service industries, their products should (iii) be intended to enable the function of information processing and communication by electronic means.

The OECD ad hoc group thus made the following proposal for defining the ICT sector:

Manufacturing
3000 Manufacture of office machinery and computers
3130 Manufacture of insulated wire and cable
3210 Manufacture of electronic valves and tubes and other electronic components
3220 Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
3230 Manufacture of television receivers, sound or video recording or reproducing apparatus and associated goods
3312 Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment (NACE Rev.1: 33.20)
3313 Manufacture of industrial process control equipment (NACE Rev.1: 33.30)

Services : Goods-relating
5150 Wholesale of machinery, equipment and supplies (NACE Rev.1 should include 51.43, 51.64 and 51.65 only).
7123 Renting of office machinery and equipment including computers (NACE Rev.1: 71.33)

Services : Intangibles

6420 Telecommunications (also 92.2 in NACE Rev.1) in countries where telecommunication activities are included in radio and television activities) 7200 Computer and related activities

Two groups under consideration (2230 Reproduction of recorded media and 5233 Retail sale of electrical household appliances, radio and television goods) - respectively 22.3 and 52.45 in NACE Rev.1 - were excluded.

Norwegian data suggest that this definition is a narrow one: value added of the listed industries, excluding the wholesale item, just counted for approximately 2.4 per cent of GDP in 1995 (revised system). When including an estimate of the listed wholesale item based on sales data, the GDP share might seem like 3.5 per cent (a revised estimate to be published later this year). The share of services in this ICT sector is quite dominating, around 87 per cent, while just 13 per cent goods. The OECD group, however, has adopted a plan to incorporate a list of content industries for a wider industry based definition of the "information economy" (IE) or termed "information and communication sector" (ICS), and then for a still wider definition of the "information society" (IS) to also incorporate socio-economic impacts of the ICS.

A.3 ICT-sector labour productivity growth

We have seen attempts to define an ICT-sector. In approaching this aggregate and looking into its labour productivity growth performance, it may be noted at first that the communication industries (post and telecommunications) - have had an extraordinary high labour productivity growth in Norway, i.e. 7.2 per cent over the longer period 1978-1994, and even 10.4 per cent on annual average from 1986 to 1994 using the value added measure, and slightly less (9.7 per cent) using the output measure. Excluding post activities, Norwegian estimates give an extraordinary productivity performance for telecommunications at a high 13.4

growth in the telecommunication industry influenced the ICT service aggregate vigorously. Computer services had a similar productivity growth as telecommunications in the first period, approximately 7 per cent annual growth, while lagging far behind telecommunications in the second period (partly statistical problems, see later). The positive difference between the ICT service aggregate and the total economy was somewhat bigger when using the output measure of labour productivity growth, around 2 percentage points in both periods (measured per hour worked and output valued at basic prices), and in both periods the growth itself was stronger in the second period in both cases.

B. ICT development and labour productivity growth: the productivity paradox

B.1 The productivity paradox

The productivity paradox is a much debated issue these days. It is known as one of the puzzled feature of economic developments of the last decades, i.e. productivity gains have slowed sharply despite huge spending on ICT. Labour productivity growth has dropped, at least in some of the big industrial economies. Robert Solow once remarked that you can see computers everywhere but in the productivity statistics. Various explanations have been given to this paradox, among which it is suggested that standard economic statistics are failing to capture them. And more discouraging, the notoriously hard measurement problems in the service sector and the structural change in the economy towards an increasing weight to services, would make the paradox more of an increasing serious problem as time elapses.

One possibility, that would be favourable for the statistician, is that there are delays in realising potential productivity gains because of organisational, social and institutional factors. Former technological breakthroughs show that there is often a delay of several decades before it deliver economywide productivity gains. Producers take time to apply new technology and to make organisational changes. This means that we need to follow the development for a longer period before making any conclusions. But is this acceptable and how long do we have to wait to capture the results in the statistics ?

We are now looking at productivity from a broader perspective point of view, searching for ICT effects throughout industries in general. While last section put attention at the direct influence on output and productivity of the ICT sector, attention is now indirectly at the economy at large to see how ICT has influenced output and productivity in the various industries through more efficient use of inputs.

B.2 National accounting productivity measurement

The approach taken in the following is that of macroeconomic through national accounts data.
It involves a fairly long way all through conceptual, measuremental and methodological issues before reaching adequate productivity measures, even when confining productivity to labour productivity alone. Main classes of issues include (i) choice of labour productivity concept, (ii) basic measurement of output or value added at current prices and of employment, and (iii) choice of deflation methods and price measures.

Norwegian national accounts provide a good basis for analysing some of the effects concerning the factors related to the productivity paradox. Norway has long compiled supply and use tables on a current (annual) basis at current and constant prices. This kind of framework has involved the standard use of double deflation method in constructing constant-price estimates. Norway was the first European country to implement the new international standards of SNA93 and ESA95, and the revised series now span from 1978 to 1997, i.e. 20

years. The last general revision has had the effect that services now have a more significant weight in total economy compared with the situation before the revision.

The following analysis is meant to throw some light on statistical aspects which the productivity paradox raises. Indirectly, it questions its unambiguous validity, or at least questions the universal validity of the productivity paradox. Norwegian data suggest that it does not apply in Norway at the aggregate level.

B.2.1 Productivity development over time

In studies carried out with NNA data, the period that contains revised data has been split into two sub-periods (1978-1986 and 1986-1995, and alternatively two similar but shorter periods). In this way, the questions concerning the productivity paradox might be approached by the Norwegian data. Solow did not trace evidence of ICT development in the US productivity statistics. The main conclusion from analysis of the Norwegian data is a more positive one, although deficiencies occur also after the recent general revision of the national accounts in Norway.

In table 4, main results from the 17 year period are presented, with two sub-periods to look for development trends. For total industries, there is no dramatic negative trend; labour productivity estimates of the two subsequent periods are remarkably stable when using the output measure, and when using the more common value added measure, increased weights for the service sector in the revised estimates have given the opposite effect in Norway than stated as the American productivity paradox. Thus, labour productivity growth (value added measure) was 2.7 per cent on average in the first period (1978-1986), while rising to 3.1 per cent in the second and subsequent period (1986-1995). For the other aggregated series presented, mostly for service industries, the general impression is one of stability, or a slight decreasing trend from first to second period. That also applies to the total economy when using the output measure. But still, this is far from the cited labour productivity growth in the big seven economies having dropped from an average of 4.5 per cent a year in 1960-1973 to a mere 1.5 per cent since then (and US data from some 2.5 per cent to a less than 1 per cent).

Revised Norwegian estimates still do not cover the pre-1973 period. None the less, by looking at the GDP per employed persons in the former system, there was no downward trend, rather an upward productivity trend in Norway, from 2.4 per cent on average in 1962-1973 to average 3.3 per cent in 1973-1991.

Table 4. - ***Labour productivity development over time. Two subsequent periods 1978-1986 and 1986-1995***

	1978-1986	**1986-1995**
	Annual average	
Output at basic price per hour worked		
Total industries	3	2,9
Total service industries	2,1	1,7
General government	1,1	1
Services, excluding government	2,4	2,2
Value added at basic price per hour worked		
Total industries	2,7	3,1
Total service industries	1,5	1,3
General government	0,7	0,6
Services, excluding government	1,8	1,8

B.2.2 New versus former system of national accounts

Let us take a closer look at possible effects on the labour productivity from switching from the former to the new system of NNA.

As mentioned, Norway has already implemented the new international standard of national accounts (SNA93 / ESA95) as part of a general revision of the Norwegian national accounts. Main revision results included 9 - 12 per cent higher GDP (revised upwards by 9.3 per cent in 1990) and 20 per cent higher output and value added of services industries combined. Most of the increase in GDP level was non-definitional (new definitions raised GDP by some 1 per cent only). New and better utilisation of sources and methods caused upward revision in most service industries. The three most important service industries in which large-scale revision took place were wholesale and retail trade, real estate (dwelling services in particular) and business services. Service industries combined increased their share of GDP from 53 to 58 per cent in 1990.

Revision effects on labour productivity growth is illustrated in table 5 when using the most accessible concept for this purpose, which proved to be value added at producers'prices per hour worked.

Table 5. - ***Former and revised data(based on SNA68 versus SNA93 / ESA95)***
Value added at producers'prices per hour worked

	Former data	**Revised data**
1981-1993. Annual average		
Total industries	3	3
Manufacturing and mining	2,9	2,4
Non-manufacturing	2,9	2,9

While value added per hour worked in total industries (and GDP per hour worked) were unaffected, total output per hour worked would have remained 0.3 percentage point lower as an average over the 1981-1993 period if the recent revision had not occurred. Thus, the overall revision effect on productivity growth was small, as was the case for the underlying GDP volume growth as well.

Both in the former data and even more in the revised data, NNA records a considerable growth of labour productivity in the service sector as a whole. Productivity growth of 2 - 3 per cent in the service sector is far above the "zero-sized" contribution from the service sector as indicated by American critics.

B.2.3 The conceptual choice

Let us now take a further look at some conceptual issues and examine whether there are effects on labour productivity from using different labour productivity measures. It is seen from Norwegian data that the level of labour productivity growth is far from invariant upon choice of concept. For reasons of international comparison at least, making a standard choice (or e few) may prove fruitful and should be aimed at. However, before SNA93 / ESA95 has been implemented in a good number of countries, we should not expect too much standardisation. When this implementation has been accomplished, it should be easier to apply output besides value added to represent production, valued at basic prices rather than producers' prices or factor cost, and using labour input or employment in terms of hours worked rather than the more common measure of numbers employed. Need for standardising labour productivity concepts is justified from the fact that two basic measures of production (output and value added), valued at three alternative prices (basic prices, producers'

prices and factor cost) and related to three alternative measures of labour (hours worked, employed persons and full-time equivalent persons FTEP) make as many as 18 different concepts of labour productivity.

In making a choice among these, availability and the SNA/ESA principles should have a prominent role. Regarding criteria of availability and SNA recommendation, the situation - presently and into the future - may be summarised in table 6 as follows:

Table 6. - ***Criteria considerations for choice of labour productivity concept***

	Availability		**SNA recommendation**	
	Presently	**Future**	**Presently**	**Revised**
Production				
Output	Fair	Increased	Yes	Increased
Value added	Wide	Wide	Yes	Yes
Valuation				
Basic price	Limited	Increased	Yes	Increased
Producer's price	Wide	Less	Yes	Second choice
Factor cost	Wide	Fair	Yes	No
Labour input				
Hours worked	Limited	Increased	Yes	First choice
FTEP	Limited	Increased	Yes/man-year	Second choice
Employed persons	Wide	Wide	Yes	Third choice

It is suggested that the following order of priority may be followed in a search for international standards on labour productivity measures in the years to come. Output and value added are kept on equal footing in the general recommendations. For manufacturing industries - due to the relatively small value added margin in manufacturing - it may be noted that many users and analysts are tempted to use output rather than value added already.

1.priority Output at basic price per hour worked
Value added at basic price per hour worked

2.priority Output at producer's price per hour worked
Value added at producer's price per hour worked

3.priority Output at basic price per FTEP
Value added at basic price per FTEP

4.priority Output at producer's price per FTEP
Value added at basic price per FTEP

May be resorted to: Output at basic price per employed person
Value added at basic price per employed person

B.2.4 Effects on labour productivity growth using output respectively value added for production

Several times already, there has been referred to two parallel measures of labour productivity growth, using the output measure respectively the value added measure, i.e. using output or value added for production. In table 7, NNA data reveal that this choice of labour productivity concept is not imperative as far as total economy is concerned, in fact invariant. The average labour productivity growth for total industries was close to 3 per cent (2.9 per cent) in both cases. However, a sizeable difference is found in manufacturing (including mining and quarrying) where the average span between output (high) and value added (low) has been as much as 1,4 percentage point. Moreover, over the longest time span, it is noted that output measure in services is 0.5 percentage point higher on average than using the value added measure.

Table 7. - ***Output versus value added measure of labour productivity***
Output and value added, both at basic price per hour worked

1978-1995. Annual average

	Output	**Value added**
Total industries	2,9	2,9
Total service industries	1,9	1,4
General government	1,1	0,7
Services, excluding government	2,3	1,8

1981-1993. Annual average

	Output	**Value added**
Total industries	2,9	2,9
Manufacturing and mining	3,6	2,2
Non-manufacturing	3	2,9

B.2.5 Effects on labour productivity growth using basic price versus producer's price for production valuation

Output is to be valued at basic prices in the new international system of national accounts. It follows that also value added is valued at basic prices in the sense that this concept is derived from output at basic prices less intermediate consumption at purchasers'prices. Producers'prices is only resorted to as a second alternative price standard to basic price in SNA93, not even so in ESA95.

In Norway, valuation at producers'prices was the principal one in the former system. Both in the former and the new system, a flexible solution to this issue is established which means both valuation principles could be followed. It gives the opportunity to analyse the difference between the two set of results, illustrated in table 8 below. For total industries and main groups of aggregated industries, such as manufacturing and non-manufacturing industries, valuation differences between basic price and producer's price seem to present small problems in productivity analysis. Just small decimal differences are found over the whole period and at the highly aggregated level. That actually apply to both value added per hour worked (see table 8), to value added per FTEP, and even less for the corresponding measures when using output instead of value added.

Table 8. - ***Basic price versus producer's price for labour productivity***
Value added per hour worked

1981-1993.Annual average

	Basic price	**Producer's price**
Total industries	2,9	3
Manufacturing and mining	2,2	2,4
Non-manufacturing	2,9	2,9

B.2.6 Effects on labour productivity growth using different measures of labour input

Hours worked and FTEP (Full-time equivalent persons) are two variables of employment that refer to labour input flows, among which the first (hours worked) is considered the best (FTEP may be seen as more rudimentary). Less relevant is the variable persons employed since this variable refers to stock situation. In practice, there may be refinements inasmuch as several stock observations are taken and average number employed of the actual period is arrived at. It might also be mentioned that SNA93 asks for number of jobs rather than for persons employed in order to comply to relevant flows and to avoid stock observations (one or many) of the same period.

Theoretical and practical solutions may conflict here, as in practice it is easier to access persons employed than hours worked, FTEP or number of jobs. Especially, hours worked for self-employed are a difficult part of the hours worked estimate, usually not accessible and needs assumptions of some kind. SNA93/ ESA95 nevertheless emphasise the development of hours worked data strongly.

Table 9 illustrates from NNA data differences from using hours worked instead of FTEP or persons employed for employment or labour input in productivity measures.

Table 9. - ***Hours worked, FTEP and persons employed for labour productivity***
Output at basic prices per alternative measures of labour input

	Hours worked	**FTEP**	**Persons employed**
1978-1995. Annual average.			
Total industries	2,9		2,4
Total service industries	1,9		1,4
General government	1,1		0,5
Services, excluding government	2,3		2,0
	Hours worked ***Annual average***	**FTEP**	**Persons employed**
1981-1993.			
Total industries	2,9	2,5	2,5
Manufacturing and mining	3,6	3,5	3,6
Non-manufacturing	3,0	2,5	2,5

Choice of labour input concept seems to be rather important for labour productivity results. For total industries and for services as a whole (and government and non-government separately), average labour productivity growth over the period was higher when using hours worked than using FTEP and persons

employed, approximately 0.5 per cent higher than in both the two alternative cases. It is worth noticing, since persons employed in particular is more available and used than the preferred hours worked measure. From the Norwegian data, however, the three measures seem to produce same labour productivity growth in the case of manufacturing and mining.

C. Statistical work for improving service statistics

C.1 The productivity paradox and the statistical issue

The productivity paradox in part has been explained by difficult measurement problems in service activities, reinforced by the increasing economic importance for these activities over time (cf. Griliches (1994)). The Norwegian estimates to some extent are also hit by this criticism, although we have seen that the effect is definitely milder than in the case of the US data and other cited data.

In section B.2 , it was referred to the chain of challenges statisticians face on the way from collecting basic statistics to arriving at the productivity estimates in the other end of the chain. Admittingly, the greatest concerns and worries are related to difficult statistical problems in the services area. They are in part related to current-price estimations and in part related to constant-price estimations, the latter because productivity estimates involve volume measures or constant-price estimates. Therefore, statisticians meet challenges on the price side and how to utilise methods in order to arrive at best possible constant-price estimates. No doubt, it is likely that considerable margins of error may occur when compiling productivity measures in several of the service activities. In addition, it is assumed that productivity growth is underestimated for service activities as a whole.

C.1.1 Current-price estimations

The quality of production estimates at current prices in most countries tends to vary a great deal by item and industry. Most characteristically, output estimates usually has a better quality than intermediate consumption estimates, and there are more unsolved problems in service industries than in goods producing industries. The productivity paradox discussion in the United States involved using a rough dividing line between “reasonably measurable” sectors, and “unmeasurable sectors”, the latter for which the situation is not much better today than it was at the beginning of national accounts. The measurable sectors, according to Griliches, are defined to include agriculture, mining, manufacturing, and transportation and utilities, in the US amounting to just 30 per cent of GNP in 1990, and down from nearly 45 per cent in 1959. Thus, the US measurement problems have indeed become worse.

C.1.2 Constant-price estimations

Two important aspects are involved here: choice of deflation methods and price measures. The first aspect points to the design of appropriate framework, while the latter points to the choice of direct or indirect price indices, and not the least, to refining the price or volume indices.

The framework of detailed supply and use tables and using the double deflation method is in general considered the most ideal vehicle available to constant-price estimation, although modifications might seem

appropriate in special cases. Choice of price indices is a question of choice between direct or indirect use of price indices, the latter to be applied when direct volume indicators are preferred in terms of overall better quality. Refining the price or volume (whatever the choice) indices should challenge the fundamental problems of delimiting the quality aspect from the genuine price part, and furthermore find the relevant price indices for the particular uses. Countries should seek improvements towards all these three aspects. For example, hedonic price indices are a new development to the latter aspect, into which the search for appropriate price indices on computers has gained much attention these days.

C.2 Labour productivity growth in service industries

In referring again to the Norwegian national accounts data, labour productivity growth in service industries was 1.9 per cent on annual average over the period 1978-1995 when using the output measure and 1.4 per cent when using the value added measure (se table 7 above). These productivity growth rates for service industries was considerable lower than for total industries, the difference being 1 percentage point and 1.5 percentage point for the output respectively value added measures. The negative differences were lowered to 0.6 and 1.1 percentage point when excluding general government from the service industries.

Introducing statistical work needed for improving service statistics as motivated from the productivity paradox problem, it is necessary to show more details on labour productivity growth in the service sector. This is illustrated by NNA data in table 10. The lower part of the table suggests there are considerable measurement problems facing the statisticians in the service sector. The Norwegian data show for several service activities approximately zero, very low or even negative growth in labour productivity. In particular when using the value added per hour worked measure, there are several examples of such negative growth, even for the whole period. Not the least for these activities, challenges lie ahead to further evaluate the methods of estimation, in order to increase the quality of the estimates, if possible.

Table 10. - ***Labour productivity growth in service activities. 1978-1994. Annual average. Value added at basic prices per hour worked***

Service activities, excluding government	1,8
General government activities	0,7
Post and telecommunications	7,2
Wholesale and retail trade	3,6
Water transport	0,4
Other transport activities	1,9
Hotels and restaurants	-4,9
Financial intermediation, insurance	-0,7
Business services etc.	0,1
Personal services, miscellaneous	-0,3

What follows is a short review of the service industries that face the most serious statistical problems in this respect. Based on the experience gained in Norway, it is referred to which are the great obstacles in each of the problematic industries. Surely, some of these obstacles or problems are met in other countries as well (e.g. general government activities), while others are reflected from the availability and use of sources on the national scene.

C.2.1 Hotels and restaurants

NNA data reveals that the hotels and restaurants industry has had a particularly negative productivity performance over the 1978-1994 period. Nationally, the development has been exceptional in this industry with a strong expansion in the period over which total hours worked increased by 40 per cent. Problems also occur in measuring prices and volumes, in particular for the part of output which is not consumed by households, and for the intermediate consumption of hotels and restaurants. Internationally, this industry - along with wholesale and retail trade - was regarded by Eurostat as a problematic area subject to closer statistical co-operation in the European exhaustiveness project at current prices. Furthermore, the ESA project as concerns the principles for measuring prices and volumes seems to advocate the use of appropriate price indices of production (PPIs) for deflation in this industry.

C.2.2 Financial intermediation, insurance

Estimates for this industry show labour productivity growth in the area of plus minus 1 per cent. Like in probably most other countries, employment has been used as volume indicator for financial services. Surely, this may produce unreasonable results in view of the heavy use of information technology in this industry. Internationally - at least within the framework of Eurostat working programme on ESA95 - work is under way on a harmonised definition and measure of output at constant prices. New conventions to be applied relatively soon (probably in 2 -3 years time) might therefore provide a better platform for comparable and more reliable constant-price estimates for this industry in the future. Provisional results in Norway hold out expectations that the situation would improve quite substantially , i.e. a positive volume trend is envisaged in financial intermediation services to replace the present method that reflects the negative downsizing of employment in the financial institutions, a far from satisfactory solution. Eurostat states that accounting for quality change in finance and insurance is another issue needing further consideration.

C.2.3 Business services, etc.

Business services etc. in Norway (also including real estate and renting activities) indicate zero labour productivity growth when estimated according to the value added concept for the whole period, while 1 per cent annual growth when measured by output per hour worked. This industry has had very strong growth in output in Norway from 1978 to 1994 and a quadrupling of hours worked. Nationally and internationally, to find adequate price indicators for the deflation of current estimates is a main problem here, complicated by the fact that just a small fraction of these services is allocated to household consumption expenditure. So far, a good solution has not been found in Norway, and cost indices are resorted to. That has also affected computer and related activities which seem to pose serious problems in this respect (see section A.3 and table 3 above), particularly in the second sub-period when also nomenclature problems have arisen (introduction of new activity classification, against wholesale and retail trade). At the European level, great concern has been directed at a harmonised solution for estimating output of dwelling services at current prices (so-called stratification method), which at the same time would produce the output price information needed for deflation. Prospects for finding harmonised producer price data for business services are not the best, given the difficulties of collecting such information. Deflation of output of software - which at present is at the root of the problems faced with the computer services in Norway - should be given special attention in the Eurostat research programme. At this Voorburg meeting, it is noted that a paper from the UK addresses these problems of developing a price index for computer and related services.

C.2.4 Personal services, miscellaneous

For personal and miscellaneous services, the Norwegian results are similar to those of business services etc.: 1 per cent annual growth in labour productivity when using the output measure, and close to zero growth

(slightly negative growth) when using the value added measure. There are parallel problems here, but despite a larger share of services allocated to households in this case, the price deflation is still problematic, inter alia for using price indices of local government fees. It should be noted that this industry group also includes a substantial element of non-market production (non-profit institutions serving households) which complicates the measurement of labour productivity in the same way as for general government activities.

C.2.5 General government activities

The productivity measurement problem has not been solved for general government activities, since output (and subsequently value added) at current prices is estimated on the basis of production costs in the non-market sphere. Market prices and margins of operating surplus are lacking for this part. Nationally, by convention, labour productivity growth has been fixed at 0.5 per cent for all non-market industries within general government, with the exception of defence activities for which labour productivity is assumed to be constant. For market production (i.e. water supply and sewage and refuse disposal in local government), the current estimates have been deflated by price indices. In the new international guidelines, volume measures other than the traditional cost-based measures have been proposed, but this is most difficult to establish and to implement in the national accounts estimates in the near future. The project by Eurostat on principles for measuring prices and volumes may lead to some progress, using either output volume indicators or input methods. In specific areas, such as education and health , specific guidance on the methods to be used for estimating educational or health output will be developed as part of the research programme. Hopefully by the end of 1998 already, it should be possible to evaluate work in progress of this project, as Eurostat aims at establishing a legal act to clarify the principles for the measurement of prices and volumes of ESA95.

D. Main conclusions

Improving national accounts estimates in the area of services have been the real concern behind this paper. Norwegian data have the comparative preference over most other countries' data for discussing empirical effects around today's state of art in national accounting. This is because Norway has already switched to the new international standards, and has by all standards a very detailed system which opens up for flexible and alternative solutions to be studied.

Therefore, by taking the macroeconomic approach to labour productivity growth as a basis, ICT development has been looked into, provoked by actual issues of productivity paradox and defining the ICT sector. The US-initiated criticism to national accounts through the productivity paradox looks clearly overstated as judged from Norwegian national accounts data. To some extent, it matters from which conceptual basis the productivity paradox is evidenced, as in part there is no productivity paradox found at all in Norway. Total labour productivity growth has not dipped in the recent decades, rather climbed a bit when measured from the preferred productivity concept of total value added at basic price per hour worked. Furthermore, productivity growth of 2 - 3 per cent in the service sector is far above the "zero-sized" contribution from the service sector indicated by American critics. Results are rather invariant upon changing the full system (from former to new SNA), upon changing valuation (from producers' prices to basic prices), while higher productivity growth is associated with introducing the preferred labour input measure of hours worked and replacing the more traditional used measure of persons employed. Following up on the ICT sector definition (although somewhat modified data coverage), labour productivity growth in that sector is - not unexpectingly - substantially higher than for the economy as a whole.

But there are statistical problems, both to components like computer and related services and to various other service industries, particularly those evidenced with zero, very low or even negative growth in labour productivity. In that respect, the critics behind the productivity paradox have revived an old sorrow and a cry for improved service statistics. But the improvements should aim for a wide basis as there are many and quite

different aspects to the problems. The cry for better data in services is for improved data sources; for more exhaustive data at current prices; for developing a proper framework of supply and use tables for deflation and deflation methods; for developing best practice solutions to measuring prices and volumes in a properly and harmonised way (or at least movements significantly in the right direction); for substituting hours worked as labour input measure instead of the present use of persons employed, etc. When substantive progress has been made for a number of the service industries reviewed in the last part of the paper, it is also highly likely that estimates of production, employment and labour productivity growth would have positive shifts, if not necessarily increased rising trends over time. Structural macroeconomic data would surely need improvements of this kind in a time when structure and aggregate levels matters more and more in using national accounts data.

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