

PRODUCTIVITY IN THE SERVICE SECTOR*

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ABSTRACT

An observed phenomenon in practically all western countries has been the different evolution rhythm of the work productivity as well as of the total factor productivity in the service and manufacturing sectors. The view and measure problems, the lower potential of the services in incorporating new technologies and the greater protection of the services against international and national competition stand out as the main reasons, amongst others, assessed to the growth slowdown of the work productivity. The paper concentrates on the theoretical problems of measure posed by the adopted statistical conventions and the description of the fresher developments in the measure of the output. The main purpose of these developments is the measure of the changes in quality, either by means of the use of hedonic price indexes or measuring the changes in terms of their effect on the welfare making use of the characteristics demand theory. The paper finishes enumerating the pending problems which should take priority in the work agenda of the OECD researchers.

RESUMEN

Un fenómeno observado en la práctica totalidad de las economías occidentales ha sido el distinto ritmo de avance, tanto de la productividad de trabajo como de la productividad total de los factores, en el sector servicios y en el de las manufacturas. El crecimiento más lento del primero se ha explicado acudiendo a distintas razones, entre las cuáles caben destacar los siguientes: problemas conceptuales y de medida; el más bajo potencial de los servicios para incorporar nuevas tecnologías; y la mayor protección de los servicios frente a la competencia tanto internacional como nacional. El documento se centra en los problemas teóricos de medida que plantean las convenciones estadísticas adoptadas por los países y en la descripción de los desarrollos más recientes en la medida del output. Estos desarrollos tienen como objetivo prioritario la medición de los cambios en la calidad, bien a través de la utilización de índices hedónicos de precios (hedonic price indexes) ó bien midiendo los cambios en calidad en términos de sus efectos sobre el bienestar haciendo uso de la teoría de la demanda de características. El documento concluye con la enumeración de los problemas pendientes que deben figurar de forma prioritaria en la agenda de trabajo de la OCDE.

INTRODUCTION

In June 1989, the OECD organized a major conference to discuss issues related to productivity and growth, and their measurement, and to assess the reasons for the productivity slowdown as well as future prospects. The following overview draws on related work either by the OECD Secretariat or outside experts that attended the Conference. For virtually all OECD countries during the past three decades, productivity growth in the business sector as whole, which includes non tradeables like construction and private services, but excludes public services, has been lower than in manufacturing. In the 1960s and early 1970s, the average gain in OECD output per employed person in manufacturing exceeded that in the service sector by large margins (Table 1). After narrowing in the 1970s, this differential widened during the 1980s as measured efficiency gains increased in manufacturing, while they weakened further in private services and construction. This widening of the gap between rates of sectoral labour productivity growth appeared in about two-thirds of the countries for which data are available. One proximate cause for this is that the share of service employment in total employment has been rising in OECD countries (Table 2). Given the normal differential between growth rates of productivity in industry and services, this compositional effect has restrained the recovery of labour productivity growth, though by only a small margin (Englander and Mittelstädt, 1988).

Disaggregated data for 13 countries (Meyer-zu-Schlochtern 1988) show a further synchronized weakening of trends in total factor productivity (TFP) in most service sub-sectors after OPEC II, the only exception being the retail and wholesale trade sector where TFP began to rise again, albeit by a small amount. In three service sub-sectors (real estate and business services; community, social and personal services; and financial institutions and insurance) combined inputs grew more rapidly than output, reducing the level of TFP.

TABLE 1
LABOUR PRODUCTIVITY IN THE MANUFACTURING AND SERVICE SECTOR, 1960-1986
(Value added per employed person)

	USA	JAP	GER	FRA	UKM	ITA	CAN	BEL	DEN	FIN	NET	NOR	SWE													
1960-1973	3.3	2.2	10.5	7.4	5.0	3.6	4.8	4.0	3.6	2.3	6.5	4.5	4.1	2.0	7.0	2.8	5.0	3.3	4.2	3.0	9.6	2.4	3.9	1.2	5.2	2.4
1973-1979	1.0	0.1	5.4	2.1	3.4	3.2	3.7	1.4	0.6	0.7	4.4	1.3	1.0	1.1	4.9	1.0	3.8	1.5	2.7	2.7	4.3	2.7	0.6	2.8	1.1	1.3
1979-1986	3.6	0.3	5.4	2.6	1.7	2.1	2.0	1.8	3.8	1.1	4.2	-0.7	2.0	1.1	4.6	0.8	1.6	0.8	4.5	2.8	1.9	1.3	2.4	1.1	2.6	1.0
1960-1986	2.8	1.2	7.9	4.8	3.7	3.1	3.2	2.1	2.9	1.6	5.4	2.3	2.8	1.5	5.2	1.3	3.4	1.9	3.9	2.9	4.5	2.0	2.7	1.6	3.3	1.7

SOURCE: OECD

TABLE 2
EMPLOYMENT TRENDS IN SERVICES AND MANUFACTURING
(Annual growth rates of civilian employment)

	SERVICES							MANUFACTURING						
	Average							Average						
	1960- 1968	1968- 1973	1973- 1979	1979- 1984	1984	1985	1986	1960- 1968	1968- 1973	1973- 1979	1979- 1984	1984	1985	1986
United States	2.5	3.4	3.2	2.4	3.8	3.0	2.9	2.3	0.2	1.1	-1.0	5.3	-0.6	0.4
Japan	2.8	2.4	2.2	1.8	1.2	0.8	2.0	4.1	2.0	-1.3	1.1	2.3	1.0	-0.6
Germany	1.0	1.7	1.1	0.9	1.1	1.4	1.4	0.3	0.9	-1.4	-1.1	-0.9	1.0	1.4
France	2.5	2.6	2.1	1.4	0.9	1.4	1.9	0.5	2.1	-0.9	-2.2	-2.7	-2.9	-2.1
United Kingdom	1.3	1.5	1.4	1.3	3.5	2.7	1.9	-0.3	-0.9	-1.3	-4.5	-2.1	-0.5	-2.3
Italy	1.4	1.3	2.7	2.9	4.5	3.4	2.1	0.8	0.4	0.2	-1.8	-3.9	-2.4	-1.0
Canada	4.2	4.0	3.6	2.5	2.2	3.6	3.3	2.8	2.1	1.5	-0.3	4.6	1.0	1.3
Total of above countries	2.3	2.7	2.5	2.0	2.8	2.3	2.4	1.7	0.8	-0.3	-1.0	1.6	-0.3	-0.2
Austria	1.3	1.8	2.4	1.3	0.8	1.5	1.7	-0.7	1.8	-0.7	-1.4	-0.5	-0.4	-0.8
Belgium	1.9	2.9	1.8	1.0	1.1	1.8	2.1	0.6	0.2	-3.3	-2.6	-1.0	-1.6	-1.6
Denmark	2.9	-	-	2.4	6.5	0.7	5.5	0.1	1.5	-1.5	0.9	5.0	7.1	2.0
Finland	2.9	3.7	2.2	2.5	2.9	3.4	0.7	1.0	4.8	-0.1	-0.8	-1.2	-1.4	-3.4
Greece	2.2	2.1	2.2	2.7	3.5	3.2	-0.3	1.9	5.0	1.6	1.6	0.0	0.0	5.7
Iceland	2.1	4.1	3.1	3.0	1.3	1.3	1.8	1.0	4.9	3.1	1.4	0.7	0.7	1.4
Ireland	0.9	1.2	2.5	1.3	-0.2	-0.8	1.4	1.6	1.8	1.2	-1.9	-4.6	-2.4	3.0
Luxembourg	1.3	-	3.2	2.6	2.5	3.2	4.6	0.7	-	-2.2	-1.5	-1.3	-0.5	1.3
Netherlands	2.2	1.8	1.8	2.5	2.0	2.2	3.2	0.3	-0.9	-1.9	-1.1	1.3	0.9	0.4
Norway	2.0	-	4.0	2.7	1.5	2.7	3.8	1.0	-	-0.2	-1.0	2.1	0.9	2.9
Portugal	4.1	2.2	-	-	-3.3	1.2	5.1	0.6	0.9	-	-	-0.4	2.9	-3.4
Spain	2.7	2.3	0.9	1.2	-0.8	3.2	6.3	2.5	-	-	-3.0	-2.6	-3.7	1.9
Sweden	2.0	3.2	2.9	1.2	-	1.3	0.8	0.1	-1.3	-0.6	-0.7	-	1.8	1.2
Switzerland	2.9	3.1	0.9	1.2	0.2	0.9	1.8	1.4	0.1	-2.6	-0.4	-1.0	1.4	1.6
Turkey	4.5	3.3	4.0	3.0	3.8	3.3	5.4	3.6	3.4	1.7	2.8	3.7	3.1	5.7
Smaller European	2.6	2.7	2.0	2.0	1.2	1.9	3.5	1.3	1.0	-0.6	-0.7	-0.1	0.4	1.4
Australia	3.6	3.9	2.2	-	4.1	3.9	-	1.1	1.6	-1.7	-	1.7	-3.3	-
New Zealand	2.7	3.8	2.5	-	1.5	3.3	-	2.7	0.8	0.7	-	0.0	5.3	-
Total smaller	2.7	2.9	2.1	2.2	1.6	2.1	4.1	1.3	1.0	-0.7	-0.7	-0.1	0.0	1.4
Total EEC	1.7	1.9	1.7	1.6	2.1	2.1	2.3	0.5	0.6	-1.0	-2.2	-1.9	-0.9	-0.4
Total OECD Europe	1.9	2.1	1.9	1.7	2.0	2.1	2.4	0.6	0.7	-0.9	-1.8	-1.5	-0.5	0.0
Total OECD														
less United States	2.3	2.4	2.0	1.8	1.9	1.9	2.6	1.4	1.1	-0.9	-1.0	-0.2	-0.1	-0.1
Total OECD	2.3	2.7	2.5	2.0	2.0	2.3	2.7	1.6	0.8	-0.4	-1.0	1.3	-0.2	0.1

SOURCE: OECD, Historical Statistics, 1960-1986, (1988).

Looking at the data for individual countries reveals a few important exceptions to this generalization. In the **United States, Japan, the United Kingdom, Canada, Belgium, Denmark and Finland**, mostly countries with a significant recovery of manufacturing productivity, TFP performance after 1979 improved in at least two of the six main service sub-sectors. In the case of Japan, the United Kingdom and Belgium, the improvement was broadly based within the service sector. Even so, compared with the acceleration of TFP in industries such as basic metals and machinery and equipment, the revival in service efficiency was on the whole modest.

The reason for the difference lies in both the statistical conventions regarding the measurements of service productivity and in the lower potential of services absorb new technologies. Furthermore, the service sector has traditionally been sheltered against the full pressure of international and - in many instances - even domestic competitive forces. To some extent there simply did not exist the appropriate technology to overcome high information and transaction costs. This provided a "natural" shield against competition, but government regulation has also played a role in this context. With new technologies, trade in services is developing rapidly and - in several cases - contesting the sustainability and even the justification of regulations. From this it might follow that the scope for using modern technologies in the services sector has increased and that competition will compel the service sector firms to perform efficiently.

THE RELATIVE GROWTH OF THE SERVICE SECTOR

Since the start of the 1970s the OECD economies have been undergoing profound change, the pace of which has not been slackened in the course of the 1980s. The most visible of these changes has been the decline in the

manufacturing sector's share of GDP relative to that of services. For the OECD area as whole, this fall has accelerated, with the share amounting to less than 24 per cent during the first half of the 1980s, compared with averages of 26.1 per cent between 1974 and 1979 and 27.4 per cent between 1968 and 1973. This movement has been matched by a corresponding growth in market services and in the public sector. However, the trend has not been uniform across countries. As mentioned, the decline in the manufacturing share of value-added has been accompanied almost everywhere by a fall in manufacturing employment, especially in EC countries where it was down by a cumulative 20 per cent since 1973, compared with slightly under 10 per cent for the OECD area as a whole.

The factors underlying services' relative rise and manufacturing's corresponding relative decline are many and complex. Some form part of a normal trend in advanced economies. Given the differential in productivity gains (Table 3), relative prices of manufacturing industry are on an underlying downward trend. As a result, the decline in the weight of industry is less marked in "real" than in nominal terms. Higher real incomes also contribute to explaining the gradual shift in demand toward services. And with many traditional products approaching the end of their life cycle in the most advanced industrial countries, certain types of production have shifted - and technology transfers taken place - to lower-wage countries, in accordance with changes in patterns of comparative advantage.

In explaining the expansion of market services, a distinction may be made between services directly linked to goods production and "free-standing" services. An EC study (European Economy, September 1985) shows that, while in the major European countries the share of market services in households' final consumption rose between 1975 and 1982, the growth of services bought in by manufacturing clearly exceeded that of manufacturing value added. This seems to have been a major explanatory factor in the expansion of market services, reflecting partly industrial enterprises withdrawal from various service activities that had previously been supplied in-house. An OECD study (Blades, 1987) shows that services directly linked to goods production are

now of major importance, perhaps accounting for over 25 per cent of GDP during 1980-1984 in OECD countries for which data are available (Table 4). Another reason for the rise in relative importance of services is associated with the oil shocks. Various studies have confirmed that up to the early 1980s the rates of capital accumulation and output growth in manufacturing have suffered more from these supply shocks than elsewhere in the OECD economy.

TABLE 3

**LABOUR PRODUCTIVITY AND REAL GROWTH
IN MARKET SERVICES AND MANUFACTURING**
(Average annual growth rate)

A. LABOUR PRODUCTIVITY

	1960-1968		1968-1973		1974-1979		1980-1985	
	Services	Manufac- turing	Services	Manufac- turing	Services	Manufac- turing	Services	Manufac- turing
United States	2.1	3.2	1.4	4.0	0.8	2.0	0.7	4.5
Japan	8.2	9.0	6.8	9.8	2.9	5.9	2.2	6.0
OECD-Europe	3.1	5.4	2.7	5.4	1.7	3.2	1.0	3.2

B. REAL VALUE ADDED

	1960-1968		1968-1973		1974-1979		1980-1985	
	Services	Manufac- turing	Services	Manufac- turing	Services	Manufac- turing	Services	Manufac- turing
United States	4.6	5.5	4.4	3.8	3.9	3.3	3.2	3.5
Japan	11.2	13.5	9.8	11.8	5.3	4.4	3.9	7.6
OECD-Europe	4.7	5.8	4.9	5.5	3.6	2.0	2.5	0.8

SOURCES: OECD, Historical Statistics, 1960-1985 and National Accounts.

TABLE 4

NATURE OF SERVICE ACTIVITIES (1)
(Per cent, average 1980-1984)

	Directly linked to goods production	Freestanding	Total
Wholesale and retail trade	13	0	13
Hotels and restaurants (2)	0.5	1.5	2
Transport (3)	2.5	2.5	5
Communications (4)	1	1	2
Financial institutions (4)	2	2	4
Insurance (4)	0.5	0.5	1
Real estate, except dwellings (5)	3	0	3
Dwellings (5)	0	6	6
Business services	3	0	3
Social and community services	0	3	3
Recreational and cultural services	0	1	1
Personal and household services	0	2	2
Total	25.5	19.5	45

- (1) Share of market services in total GDP, broken down into services directly linked to goods production and "free-standing" services.
- (2) It is assumed that three-quarters of expenditure on restaurants and hotels is by households for leisure purposes, and the remaining quarter for business entertainment.
- (3) Information is not available on the relative shares of goods and passenger transport. Road transport is assumed to be mainly freight, air transport mainly passengers, and other transport evenly divided between merchandise and passengers.
- (4) Arbitrarily divided 50/50 in the absence of other information.
- (5) Partial data suggest that dwellings (including "ownership of dwelling") is generally the largest part of total real estate.

SOURCE: D. Blades: "Goods and services in OECD countries", OECD Economic Studies, Spring, No. 8, 1987.

MEASURING PROBLEMS

The broad description of productivity developments in services and their relative rise in the OECD economies is based on national account data compiled according to the UN-OECD System of National Accounts (SNA). To measure productivity of services activities, i.e. real value-added, requires

that one disposes of price indices or physical indicators of output, and if these are not available, of input indicators. Measures of real value added in services activities are generally regarded as being less reliable than for goods-producing industries. This is mainly because statistical offices have historically paid more attention to statistics on goods production, so that service statistics are relatively under-developed. But there are also conceptual difficulties in defining the output of certain types of services - most notably those provided by government agencies. If service output is underestimated, and/or inputs into services activities overestimated, also measured productivity will be underestimated and vice versa. Therefore, it is important to consider what type of measures are used generally in measuring services output, and to assess the nature of the possible mismeasurement.

Three different approaches to the measurement of services output at constant prices may be distinguished:

- a) Price or quantity indicators of outputs;
- b) Price or quantity indicators of inputs: i.e. volumes of employment, of machinery, of intermediate consumption or the corresponding prices; or
- c) Indicators linked to margins over current values.

Only the first type of indicator corresponds to a real volume measure of output. The second category relies on a set of assumptions on fixed proportions between prices (or quantities) of output and of one or several inputs, while the third category refers to a common practice of valuing services by a mark-up over cost, i.e. the purchasing value of merchandise. It thus assumes that volumes of services are linked to the volume of the product by the same margin rate (as is the case of distributive trades and housing activities).

Table 5 gives an estimation of the weight of each category at the beginning of the 1980s, i.e. for the average of OECD countries. 14 per cent

of GDP for services are without specific measurements problems, 22 per cent are based on mark-ups over current values and 6 per cent are derived by linked input characteristics. Adding to this the 15 per cent of the non-market services and 7 per cent of building activities (services according to Clark 1940), the measurement of which remains problematic, the conclusion is unavoidably that half of GDP measurement in real terms is affected by ill-measurement of services.

TABLE 5

SERVICES BY TYPES OF MEASURE
(Shares of market services in value added: average 1980-1984)

A		B		C	
Using price or quantity indicators of outputs		Using indicators related with inputs		Using margin rates	
Transport	5 (1) <u>0.95 (0.6)</u>	Financial Institutions	4 (1) <u>1.5 (0.6)</u>	Distribution	13 (2) <u>1.0 (0.2)</u>
Communications	2 (1) <u>2.2 (0.7)</u>	Insurance	1 (1) <u>0.7 (1.4)</u>	Housing	9 (4) <u>1.2 (0.5)</u>
Health	2 (1) <u>1.2 (0.5)</u>	Business Services(*)	- -		
Leisure Culture	1 (0) <u>1.7 (0.8)</u>	Education	1 -		
Other Household Services	2 (1) <u>0.5 (0.4)</u>				
Hotels and Restaurants	2 (1) <u>0.7 (0.7)</u>				
Total	14		6		22

- Shares in value added - average and standard error.

- growth rates of value added over 1960-1983 as compared with GDP.

(*) Non available data in the source; the corresponding activities are very likely mixed with financial and housing services. The whole group financial services, housing and business services amounts to 14% of total value added on average in OECD countries.

SOURCE: from BLADES, D. (1987), Table 2.

Two types of methods are used by OECD Member governments to estimate value added at constant prices of market services:

- One is called the "double deflation" method, extensively used for market services by 7 countries; it involves revaluing intermediate inputs and gross outputs of the prices of some base year;
- and the other one are "single-indicator" methods, used by a large majority of countries not employing "double deflation".

Without going into technical detail, I will illustrate the major weaknesses of these approaches.

The main problem with double deflation is that in many countries relatively little information is available on the composition of inputs. Often detailed statistics on inputs are collected only every five or ten years when input-output matrices or other bench-mark tables are compiled. In these circumstances it is usually necessary to assume that the composition of inputs does not alter in the years between bench-mark surveys, but this is a dangerous assumption because changes in relative prices will in general lead to substitution, especially when relative prices change rapidly as at the time of shocks. When producers substitute cheaper for more expensive inputs, the assumption of an unchanged input mix will tend to overstate the value of inputs at constant prices, and hence to understate real value added.

With single indicator methods, there are at least two problems. The first is that they assume, respectively, that prices and quantities of intermediate consumption change in the same way as those for gross output. This assumption is clearly questionable, although it should be noted that the errors arising from this source may be trivial in the case of services because for many of these activities intermediate consumption is small in relation to gross output. The second problem - which applies equally to double deflation - arises from the difficulties of measuring changes in the quality of service output. Quality improvements should be treated as increases in the volume

output and deteriorations in quality as decreases, but it is clear that many, perhaps most, of the indicators used to measure the volume of service output do not properly capture quality changes.

Some examples will serve to illustrate the problem. For retail and wholesale trade, most countries measure changes in the volume of output by reference to the quantity of goods traded. In the last two decades, however, there has been a marked trend for shops in most OECD countries to relocate in peri-urban commercial centers. The conveniences of free parking, longer shopping hours, and less congested surroundings represent a genuine improvement in the quality of the output of retail trade which is not reflected in an output measure based merely on the volume of merchandise sold. In the passenger transport industry, the introduction of computerized booking systems has greatly reduced the time and effort needed to reserve seats in trains and airplanes. This evident improvement in the quality of transport services will not be reflected in the measured volume of transport output if, as is almost universally the case, the real value added of these services is measured by reference to passenger-kilometers.

Of course, not all quality changes can be regarded as improvements. When the number of letters and parcels delivered is used to extrapolate the base-year value added of the postal services, the resulting volume measure will overstate real output if, as may be case in several countries, reliability and delivery times are deteriorating. The most plausible hypothesis, however, is that service quality has, on balance, tended to improve over the last two decades, and that many of these quality improvements are not properly reflected as quantity increases in the volume measures recorded in the national accounts. For those market services for which constant price value added is estimated by employment indices, five countries make productivity adjustments of around 1 or 2 per cent per annum. The countries concerned are Austria, Germany, Netherlands, Sweden, and the United Kingdom.

Despite difficulties in their application, double-deflation and the

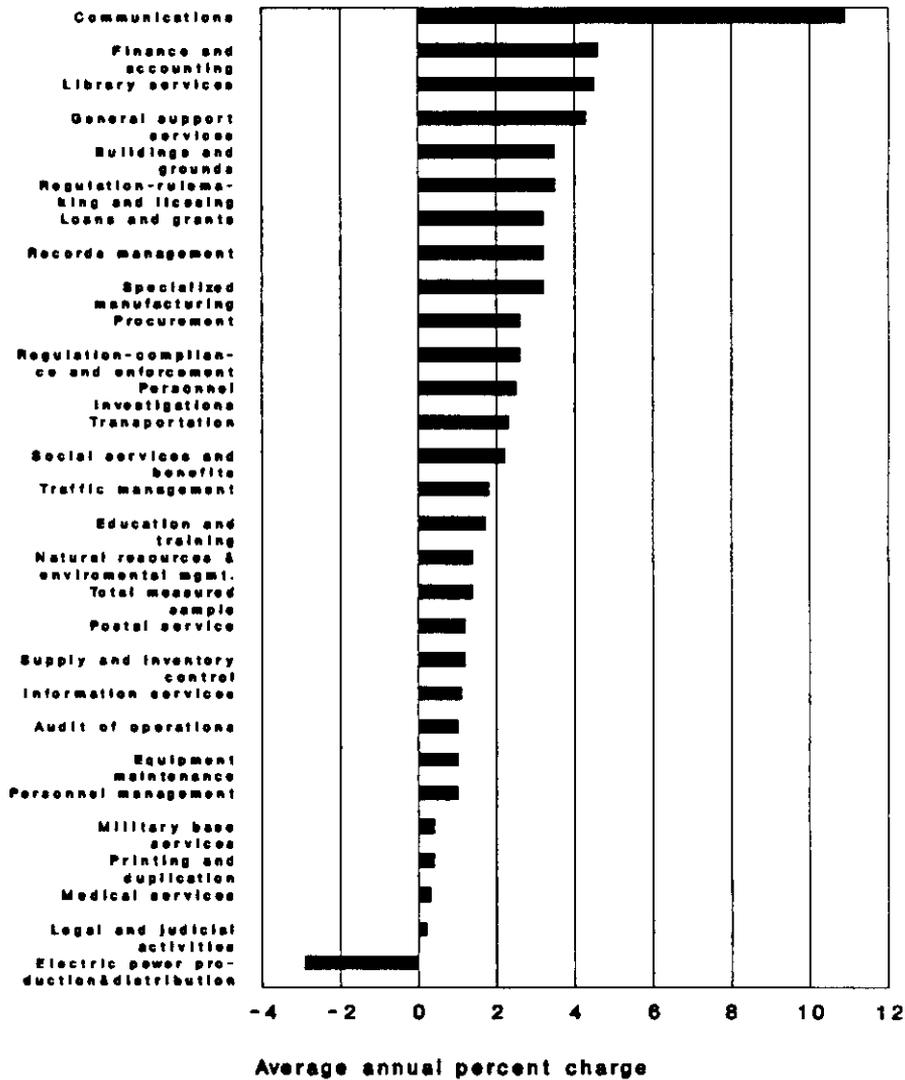
single indicator methods described above may both be described as acceptable on theoretical grounds. Another, and much less acceptable, type of single indicator method is almost universally used for government services . It is also quite widely used for financial services, real estate and business services, and social and community services. This method consists of extrapolating base year value added by an index of the number of employees. The problem here is that the indices do not properly take account of changes in labour productivity. For government services all countries take account of one composition of the labour force. Five countries make a further adjustment by assuming an additional productivity increase - Belgium, Germany, Italy and Luxembourg assume about 0.5 per cent per year and Australia 1 1/2 per cent. On the assumption that labour productivity in government services has been rising during the last two decades from such influences as office automation, computerization, or advances in management techniques, estimates of the growth of real value added in government services will be understated for most countries.

Aggregate productivity indicators are available for federal government activity in the United States (Diagram 1) and for general government activity in Sweden (Table 6). There appears to have been a striking difference in productivity developments in the two public sectors, although the methods used in arriving at the aggregate results differ somewhat between the two studies. In the United States output per employee year in federal government increased by an annual average of about 1.5 per cent in the 20 year period up to 1987, whereas productivity in the government sector in Sweden fell by 1.5 per cent on average in the 1970s. A fall in labour productivity was registered in almost all governments activities in Sweden, whereas the opposite was the case for federal government activity in the United States. A common feature in both cases is that there are large variations in productivity developments among the different activities.

DIAGRAM 1

PRODUCTIVITY GROWTH IN U.S. FEDERAL GOVERNMENT ACTIVITY

Output per employee year by functional grouping, and total measured sample, Federal Government, fiscal years 1967-86



SOURCE: Bureau of Labour Statistics, Productivity and the Economy, Bulletin 2798, Washington.

TABLE 6

PRODUCTIVITY GROWTH IN GENERAL GOVERNMENT IN SWEDEN (1)
(Annual average growth, per cent)

	1960-65	1965-70	1970-80
Foreign service		-3.7	-0.6
Law enforcement, police		-2.7	-1.6
Defence			-0.6
Education	-3.2	-6.3	-1.5
Health services	-3.6	-3.7	-1.8
Social securities	-0.4	-2.6	-2.5
Social services			-1.6
Housing and planning			-4.5
Culture and recreation	-5.4	+6.4	-2.4
Support to trade and industry	+1.5	+2.1	+0.2
Public sector as a whole			-1.5

(1) The figures are based on output performance indicators in a range of individual fields, e.g. pupil hours in schools, the number of children in day nurseries, the number of hours in domiciliary assistance. Generally, unit costs are used as weights when summing up these output performance indicators within or across authorities. Where it is possible, changes in quality are taken into account. To construct the productivity indicators, the figures for output performance are related to costs of providing output, measured at constant prices.

SOURCE: Survey of Sweden 1988/1989.

Quality measurement problems may explain part of this difference; also Swedish employment policies until the early 1980s may account for some of the difference.

It will be clear from the above that there are special problems in the measurement of value added in services activities. To a large extent these stem from statisticians' traditional neglect of activities that do not involve the production of goods; in most OECD countries relatively few basic data are available on the inputs into service production or on the different types and qualities of services produced. Lacking adequate information in these areas, statisticians inevitably fall back on simplistic assumptions such as no change in input mix, no change in output quality, and no change in

labour productivity. It can plausibly be argued that all three of these assumptions will tend to produce a downwards bias in estimates of the growth of value added at constant prices.

RECENT DEVELOPMENTS IN OUTPUT MEASUREMENTS

There is a consensus view in the profession that it is unlikely that much of the post-1973 slowdown in TFP growth can be explained by increased measurement error. However, the issue of whether uni-directional measurement errors have increased in importance was not resolved because of mixed evidence. In services, according to the experts, there is some evidence of increasing changes in quality in such activities as financial services and retailing, while a slowing down of changes in quality in capital goods, apart from computers, is noticeable.

Much of the source of the measurement problem concerning output is quality changes, brought about by new innovations and, as illustrated above, this problem is particularly serious in the case of service sectors. As the conventional price index approach fails to capture quality changes, the output and productivity growth rate of industries experiencing rapid technological changes (such as computers, telecommunications) is understated, as are the output and productivity growth rates of industries heavily adopting these technological advances (such as financial services, medical and health services).

One response to this issue, pioneered by the U.S. Bureau of Economic Analysis (BEA) and since adopted by Canada and Australia, has been to adjust computer prices explicitly for quality changes using a hedonic price index. Under this approach, prices of computers are linked to their characteristics

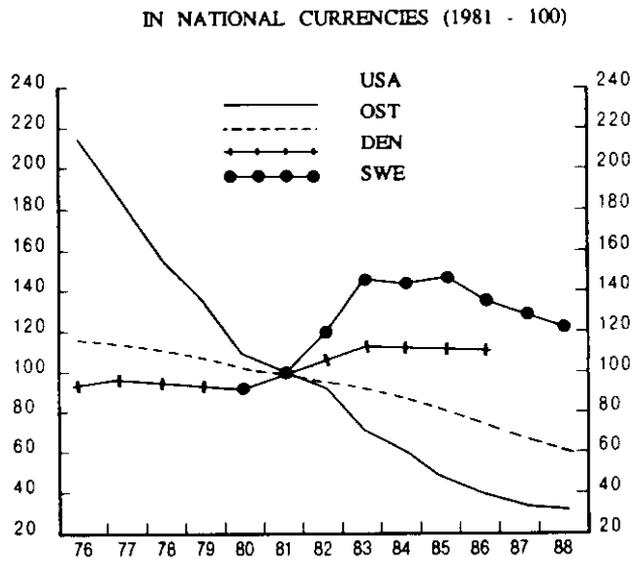
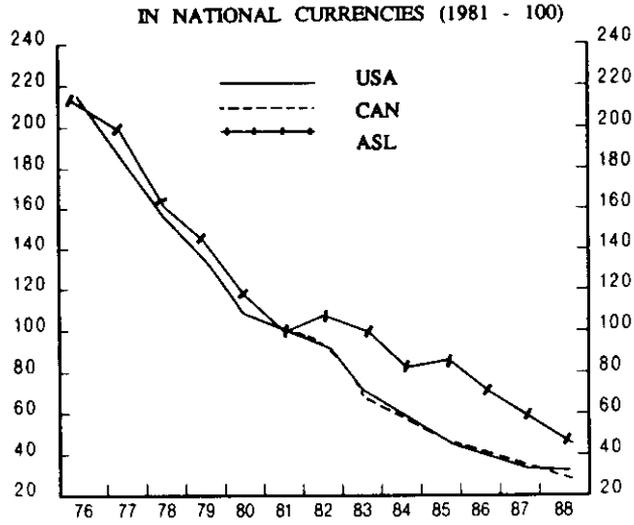
(processor speed, memory and so forth) by way of assigning values to each characteristic. Several other countries - **Japan, Denmark, France and Sweden**, for example - are likely to make similar adjustments in the future. What emerges from this adjustment is that quality-adjusted computer prices - those for the **United States, Canada and Australia** - have fallen much faster than prices in countries that use standard national accounting procedures (Diagram 2).

As a result, the BEA procedure yields much higher real investment figures, given nominal expenditures on computers. In the three countries that have already adopted the hedonic methodology, the real share of computers in total business fixed investment has risen much faster than the nominal share, reflecting the measured price decline. In contrast, in countries that have not adopted a BEA-type procedure, real and nominal investment shares for computers do not deviate very much from each other. The use of a BEA-type index also implies a significant rise in the share of total business fixed investment in total output. For the year 1987, the share was between 2 and 4 percentage points higher, with the effect growing over time, along with the share of computers in investment.

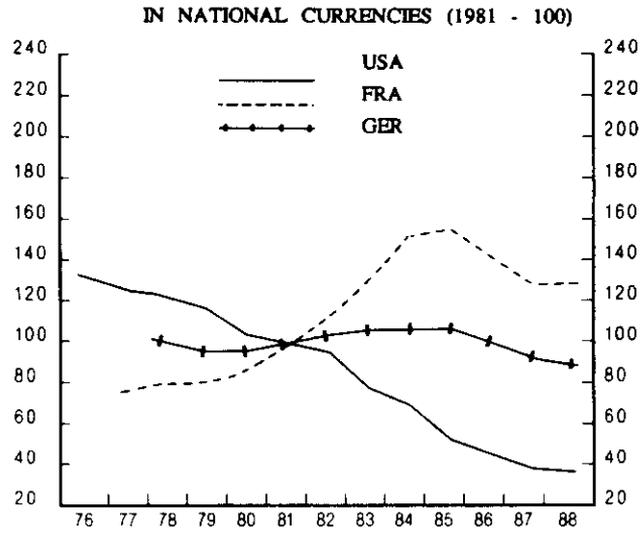
Though the overall implications of the BEA procedure for measured productivity are ambiguous, the different treatment by OECD countries of adjusting computer prices for quality changes may give rise to a new bias across countries, in the measures of productivity including for the service sectors. None of the European countries uses the hedonic technique, instead following a "matched-model" index approach which does not fully capture the relative decline in quality-adjusted computer prices. This means that the downward trend in the prices of computers and other electronic goods in European countries is likely to be understated. This, in turn means a potential understatement of the levels (and perhaps growth rates) of capital investment and manufacturing activity, and possibly an overstatement of productivity growth rates. This is because, in the later case, the corrected share of capital in output would be larger than before, quite likely more than offsetting the effects of the higher corrected output levels and growth

DIAGRAM 2

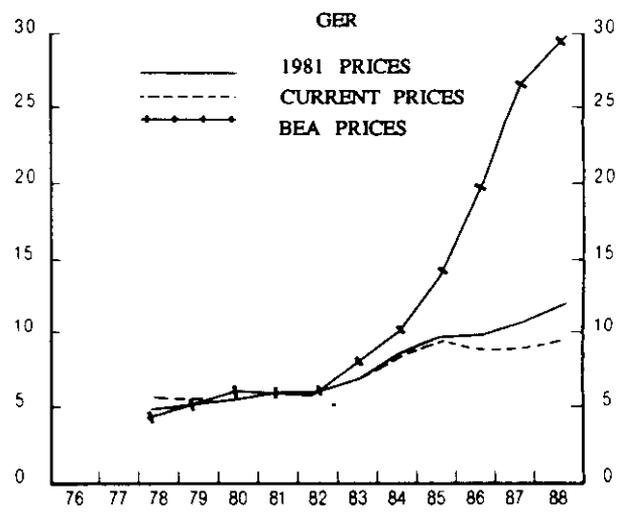
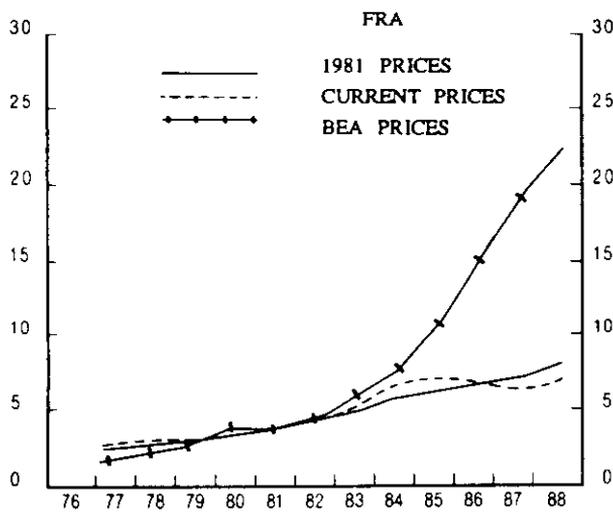
PRICES FOR COMPUTING MACHINERY



PRICES FOR OFFICE EQUIPMENT & COMPUTERS



SHARE OF OFFICE EQUIPMENT IN TOTAL BUSINESS INVESTMENT (%)



rates.

Another innovative approach to measuring quality changes seeks to quantify the full extent of these changes in terms of their welfare effects by making use of the "characteristics" approach in demand theory. Taking the example of Computer Tomography (CT), i.e. concerning health care services, under the conventional method CT scanners were 2 1/2 times more expensive in 1982 than a decade earlier at the time of their introduction, compared to a 13 per cent price decline on the basis of a quality adjusted hedonic price index similar to the BEA approach. However, on the progressive measure, the average annual rate of decline in the quality-adjusted price of CT scanners would be a staggering 55 per cent over the first nine years following its invention.

One important area where improvements in the measurement of public services may be expected in the future is the large health sector OECD countries which is plagued by substantial productive and allocative inefficiency. As a consequence, in many countries, the focus of health policy has shifted from access to healthcare to efficiency concerns. To encourage efficiency, productivity measures have become a major instrument in this sector as well as in other parts of the public domain. In the absence of a profit measure for government activity, output and quality indicators are essential for reorienting objectives, incentives and information systems so as to encourage increased efficiency. Moreover, they are necessary for monitoring, given the danger that a tighter budget restriction in a non-competitive environment may simply lead to a decline in output and quality rather than to an increase in productive efficiency. However, this latter point also makes clear that output and productivity measures are a necessary and not a sufficient condition for improved efficiency.

The difficulty of defining and measuring output and performance in the absence of markets has focused attention on intermediate or activity indicators. These are principally based on measures of workload or on the number of clients served, and a few OECD countries (New Zealand, France,

Ireland and the Netherlands) use them to estimate part of government output in national accounts. There will rarely be a unique way to quantify a given activity and different measures can give a very different picture of "output" developments. For example, "output" in the health care sector could be measured by the size of the whole population it is supposed to serve, the number of patients, or the number of cases treated. Each indicator has its own merit. The finer the definition, the closer it is to a pure activity measure. But the number of patients may be a dubious measure of output of a health sector, which seeks to prevent ill health as well as curing illness. In this case the population as a whole could serve as the appropriate client group, but such a global measure will conceal a number of factors which are relevant in assessing government output. In particular, it will fail to address the contribution from households.

Of course, both output and productivity indicators, whether aggregated or not, must be interpreted in the light of service or product quality. These aspects of public sector efficiency may be monitored by designing supplementary quality indicators, such as error rates and response times for administration and "success" rates for education, but the advantage of simple output objectives is thereby lost. In principle, intermediate output indicators and the associated productivity measures can be constructed for the bulk of government activity, but such data are rarely collected together in an aggregate indicator.

THE FUTURE RESEARCH AGENDA

Returning to the broader developments, the examples illustrate the systemic nature of the issues involved in measuring productivity in both services and goods production. Not surprisingly, the OECD productivity

conference arrived at the conclusion that the output measurement problem strongly called for a reform of the current system of national income accounts. Substantially improved and consistent measures of aggregate as well as sector-specific measures of performance are needed. Regarding services in particular, concern was expressed that the complex series of changes brought about by the introduction of information technologies in both producer and user industries, might to an increasing extent not be captured in output measures. These quality changes are rather widespread and generally quite product-specific as well as industry-specific. Also official R&D statistics in services notoriously seem to understate the actual effort. Moreover, the underestimation of actual industrial technological efforts has not remained constant but has increased, with the growth of services industries and the increasing importance of research activities in such areas as software development.

To tackle these problems a broad research program was suggested that should simultaneously address both the theoretical and analytical needs as well as the measurement issues. Otherwise, a vigorous data collection effort not well grounded conceptually would risk being wasted. Concerning service sectors, the definition and measurement of output was assigned top priority attention. Particular emphasis should be put on the development of new conceptual approaches for quantifying the effects of new technologies on output and productivity growth. Key areas of concern should include quality changes as well as developments, such as the changing boundaries of service industries; the participation of both consumers and producers in the production process; and the presence of output externalities such as those due to networking among firms (for example, credit card or electronic fund transfer systems); and joint consumption effects.

Related technical efforts should focus on capturing the effects of quality changes in the construction of price indices (particularly for new products), reorienting the measurement of output from double-deflated value added measures to those of gross industry output (value of shipments adjusted for inventory changes), and developing a full set of associated price

deflators for intermediate inputs are domestically supplied or imported. Comparability over time, as well as across countries, should be stressed, in the choice of weighting methods, price indices, and adjustments for quality changes. In this light, current national income account methods should be thoroughly reviewed and appropriately revised.

INTERNATIONAL CO-ORDINATION

Among the international agencies, the OECD together with EUROSTAT is one of the key institutions looking after the development of statistical methodologies and data collection methods. The OECD co-ordinates the statistical development work of its own sectoral committees concerned with services statistics vis-à-vis its Member countries and the other international organizations, with a view to ensuring compatibility of sectoral statistical systems with the broader aspects of national accounts, production and trade-in-services statistics. In the latter field, the OECD is playing a leading role in the development of the new classification for international trade in services. This forms part of the revision under way of the IMF Balance of Payments Manual, and also contributes to the ongoing GATT negotiation on the liberalization of service transactions in the Uruguay Round. At EUROSTAT, work is under way to prepare a manual of methodology for statistics on services with a view to eventually arrive at all-European recommendations on service statistics, based on common concepts and definitions. International co-ordination will be strengthened by the creation of an Inter-Secretariat Working Group on Service Statistics, to be convened by the UN Statistical Office, which will comprise the main organizations working in this field (UN Statistical Commission, EUROSTAT, OECD, IMF, World Bank and Voorburg Group).

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