THE USE OF DEFLATORS IN THE MEASUREMENT OF OUTPUT OF THE SERVICE SECTOR IN THE UNITED KINGDOM

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INTRODUCTION

1. In the United Kingdom (UK), Gross Domestic Product (GDP) is estimated from measures of expenditure, income and output. The output measure is compiled by projecting base year estimates of value added by indicators considered to approximate to movements in constant price value added. Such indicators are of three broad types - deflated values, physical quantities and employment.

2. This paper describes UK practice and looks at certain issues related to the deflation of current price value series within the service sector.

3. It should be recognised at the outset that the various approaches are proxies for the conceptually preferable double deflation. This is used in the UK solely for agriculture and energy production and not at all for the services sector. Double deflation does, as is well known, require extensive data on inputs and their prices as well as outputs. The data currently available in the UK are not regarded as sufficient for the wide use of double deflation.

4. At present around a half of service sector output is estimated on a quarterly basis by deflated value series. This proportion should rise to at least two-thirds over the next few years. The enhanced role of such indicators reflects the introduction of a new system of quarterly turnover inquiries within the services sector (QTI) to replace indicators which were considered not fully adequate. These inquiries were launched in two phases - Phase 1 in 1991 and Phase 2 this year. A list of the trades covered is given at Annex A. (The quarterly turnover inquiries were described in more detail in the UK paper

"Statistical surveys for selected non-financial service trades" presented at the sixth meeting of the Voorburg Group in Helsinki in October 1991.)

5. The Phase 1 inquiries generally covered areas presently estimated by employment or volume indicators. As a result new deflators were required. These have been developed over the last two years. In contrast, the Phase 2 inquiries cover industries where deflated values are already used. There are thus deflators available to the UK for most of Phase 2 industries although for some improved deflators are planned.

6. In paragraphs 8 to 17 of this paper, there is a description of the current UK approach to deflation in the service sector as applied to different industries and different types of indicator. The methods to be used for the first phase QTI indicators are included in this coverage. They do not differ in principle from the pre-QTI methodology although the deflation of some industries involved the development of new data sources.

7. Paragraphs 18 to 33 contain a brief discussion of the conceptual issues and the practical limitations to the application of these concepts. UK proposals for future work on deflators are outlined with particular reference to industries covered in the second phase of the QTIs.

CURRENT METHODOLOGY

Summary of deflation approaches

8. Annex B presents a summary of the different approaches to deflation within the services sector in the UK. The industries which use each method and the type of current price indicator are also shown.

9. The following broad types of deflator can be distinguished:-

a. Those based upon a direct measure of the output price for the service.

b. Those which use an output price which is not the output price for the relevant service but which is considered to act as a reasonable proxy for it.

c) Deflators based upon input costs.

In terms of coverage, the direct output approach dominates the deflation of services within the UK. The remaining indicators are split roughly equally between the latter two approaches.

Direct measurement of output prices

10. The use of a direct measure of output prices is clearly the most conceptually desirable of the three approaches. For example retail sales are deflated at a disaggregated level by the relevant components of the Retail Price Index (RPI), and combined by weights derived from gross margins of different types of trader. This seems broadly appropriate in the context of measuring the gross output of retailing (as a short term proxy for value added).

11. Other examples of the use of a directly relevant deflator are motor trades - wholesale, retail and repair - and catering. Motor trades output is deflated by a weighted combination of output price indices for new vehicles, second hand vehicles, parts and fuel. These commodities represent outputs by the motor trades industries - the weights reflect the proportion of each commodity in the output of an industry. In a similar manner, RPI components for meals and snacks, wines and spirits, cigarettes

and tobacco and a separate index of accomodation costs are weighted together to produce deflators for the different catering industries.

12. In 1991 a number of new service sector output price inquiries were launched. These are now all producing deflators for use with the first phase of the QTI. The industries covered by the new price inquiries were:- non local bus and coach hire, road haulage, private education, contract cleaning and waste disposal. For each of the above industries, the derived deflator is a weighted combination of price series for individual service "commodities" - e.g. private hire journeys of varying lengths in the case of bus and coaches. With the substitution of service "commodities" for manufactured products, the methodology used is generally analogous to that of the producer price indices (PPIs). Some new problems have arisen where a service is predominantly provided on a contract basis although so far these seem to have been tractable. In particular, changes of contract seem to have created fewer difficulties than anticipated.

Output price for closely related service

13. The second category of deflator involves using one type of output price as a proxy for another. Producer price indices (PPI), which relate to manufacturers' factory gate prices, are a major example of proxies for service sector prices. No system of price indexes at the wholesale stage exists within the UK and within wholesaling there is extensive use of PPI's to convert the gross output of the industry to constant prices. This practice has the clear weakness that no account is taken of changing margins. However it may be reasonable to expect a moderately good short term relationship between factory gate and wholesale prices.

14. The aggregate RPI itself is used as a means of deflating some current price proxies within the financial sector. An example would be domestic sterling deposits. This is used as one of a

number of proxies for the output of the banking sector. It is difficult to say what is the most appropriate deflator in this case. The RPI has been chosen as one reasonable approximation. The implied GDP(E) deflator would be an alternative.

Deflation by input costs

15. The third category of deflator is the furthest removed from the direct measurement of output prices. In this case input prices are used as a proxy deflator. This occurs for two different types of output proxy - those based on inputs and those based upon gross output.

16. In the case of the input proxy, an indicator such as deflated pay is used to proxy output. This is the case for two central government activities - the armed forces and the National [public] Health Service. In the UK by convention, public sector output is measured by employee inputs. The choice of deflator, pay per employee, is thus a natural one.

17. The second type of case applies to use in the deflation of a gross output proxy. It involves using input deflators, usually based upon a weighted combination of the RPI, for bought-in materials and services, and a specific earnings indicator for labour costs. This method is proposed for the deflation of a number of industries covered by the new QTIs. It was already used to a limited extent, for example for accountancy and computer services.

CONCEPTUAL ISSUES AND FUTURE DEVELOPMENT

Deflated values compared to alternative indicators

18. With the QTI initiative, the UK has clearly made a statement about its preference for deflated gross output indicators over the alternative of employment. To a lesser degree, deflated gross output might also appear to be favoured over physical

quantity indicators. It is of interest to examine the arguments on both counts.

19. The reason for replacing employment by deflated gross output is straightforward. There is evidence that significant productivity changes have occurred in at least some service sector industries in recent years. With employment indicators, the approach adopted is to impute productivity changes based on related industries for which measures of output not based upon productivity assumptions are available. These productivity data will not necessarily reflect changes in the industries for which employment is used. Provided that an adequate deflator is used, constant price gross output obtained by an output deflator avoids or minimises productivity distortions.

20. The relative merits of deflated gross output and physical quantity indicators are seen as more finely balanced. This is consistent with the widespread use of both - within the UK and within a number of other countries. Physical quantity indicators take full account of gross output productivity. They also do not require deflation. In the extreme case, where a service industry had only one unchanging "product", the physical quantity indicator would be preferred since, at best, the constant price gross output could only reproduce the same series as the physical indicator.

21. However in practice, the complexity of all industries means that a large number of physical indicators would be required to give adequate coverage. There are both conceptual and practical difficulties in defining, and collecting, a sufficiently wide range of indicators. Legal services, where a QTI is replacing mainly physical indicators, is a good example. Activities range from conveyancing through different types of court proceedings to commercial activity such as dealing with mergers and acquisitions etc. In addition to the wide range of activities there can be changes to the pattern of activity with time. For example, there is believed to have been a decline in the relative

importance of residential conveyancing as a source of UK lawyers' income which, given the partial coverage of the indicators used, creates difficulties.

22. The use of a value estimate of gross output avoids the main difficulties in both coverage and relative weighting. At current prices coverage should be complete with each activity effectively currently weighted. It may however be hard to achieve adequate coverage of activities within the overall deflator. However given reasonably representative coverage, deflation errors should be second order rather than first order. This is because common factors such as the cost of labour influence all the commodity output prices within an industry. An error of omission of an activity from a deflator may therefore be expected to be usually less serious than its omission from a set of physical quantity indicators.

23. A further important conceptual issue is, of course, the treatment of quality changes. In contrast to the situation with physical quantity indicators, there are at least procedures to attempt to allow for quality improvements in the compilation of output deflators, although the problems, not easy for goods, are severe for many services.

Output price measurement - the issues

24. As already implied, the direct measurement of an output price associated with the service activity is the conceptually desired approach to single indicator deflation. UK experience so far has been fairly limited and has not related to the more ambitious areas of business services where the problems of non-repetitive work are severe.

25. A well-known difficulty lies in defining a set of service activities, products or "units of output" for an industry. For much distribution activity, this task may be reasonably tractable although changes in the element of service associated with the

sale of goods creates difficulties which are currently ignored. Experience also exists of the treatment of many personal services in the retail price index.

26. Some attempt has been made in the UK over the last two years to extend this "units of output" approach. As examples, for advertising, it has been possible to categorise the different forms of media output - TV, newspaper, direct mail etc - and develop an output deflator based mainly on existing commercial sources. For the five further service sector industries mentioned in paragraph 12 above, progress has been made and specific output price inquiries have been set up. For a number of industries, such as research and development services or other business services (management consultants, market research, etc) the conceptual and practical difficulties in mounting an output price inquiry are of a higher order.

The rationale for input costs deflation

27. In the absence so far of an extensive range of deflators, particularly in the business services area, use has been made of an input costs deflator covering the two main components of input costs - labour costs and bought in materials and services. For the industries included, the two main components tend to be of broadly comparable importance. The deflator is compiled as a weighted combination of a specific earnings indicator for the industry and a usually non-specific measure of input costs such as the RPI.

28. The use of earnings in the deflator implies that labour productivity changes will tend to be inadequately reflected in the constant price series. A gain in total gross output resulting from an increase in output per head may be allocated either to employee wage increases or to additional profit. If wages are increased in proporation to the increase in gross output, deflation by an earnings indicator will, incorrectly, discount the productivity gain.

29. However non-labour input costs are included in the deflator and productivity gains may increase profits rather than wages. For both these reasons, productivity gains should not be fully discounted in the constant price series. To summarise, the likelihood is that gross output deflated by an input deflator, which includes bought in materials and services costs and labour costs, will show part but not all of any labour productivity gains. To that extent, while far from perfect, the deflated indicator is still preferable to employment.

Future Developments

30. Further work is envisaged to improve the range of deflators available. For a number of industries covered by the Phase 2 QTI's, there is thought to be some scope for improvements to existing deflator methodology. Examples are wholesaling, shipping agents, and computing services.

31. As shown in Annex B, wholesaling is currently deflated by PPIs. Logically the wholesale price is intermediate between the manufacturers' selling price and the retail price to the consumer. It should be quite strongly related to both prices. Some analytical and other work is planned to investigate the relationship, taking account of what is known on margins, between the RPI component and the PPI. This work might lead to modifying the current use of only PPIs to take some account of relevant RPI components.

32. The output of shipping agents is currently deflated by the consumers' expenditure deflator for travel agents and other miscellaneous travel. Since virtually none of shipping agents' output feeds directly into final consumption, this is inappropriate. A direct price inquiry seems not feasible. However, consideration is being given to the use of shipping charges as a proxy price indicator. The fact that shipping costs account for the bulk of shipping agents' turnover makes this a promising possibility.

33. A third area for possible further work is the exploration of an appropriate deflator for the computer services industry. The quarterly turnover inquiry for the trade makes a broad distinction between hardware related activity and other. Work is in hand in the UK to improve the measures of hardware prices and is anticipated for the service element of output.

CONCLUSIONS

34. This paper has described the deflators used for service industries in the UK in compiling the output measure of GDP. It has highlighted the increasing use of deflated output to replace less than adequate indicators such as employment. Difficulties with deflation procedures were discussed but it was concluded that, even allowing for such issues,deflated output is preferable to employment as an indicator. The relative merits of deflated output and physical quantity indicators are somewhat more finely balanced. Some current UK development work on deflators has been outlined.

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COVERAGE OF THE QUARTERLY TURNOVER INQUIRIES ANNEX A

PHASE 1

VTC		ACTIVITY
		WHOLESALE DISTRIBUTION AND DEALERS
8139		LEASING OF OFFICE FURNITURE, VENDING MACHINES,JUKE BOXES AND GAMING MACHINES
8312		BUILDERS' MERCHANTS
8324		LEASING OF INDUSTRIAL MACHINERY
8325		PLANT HIRE (WITHOUT OPERATIVES)
		TRANSPORT AND COMMUNICATION
7021	(2)	OMIBUS AND TRAMWAY SERVICES
7030		ROAD HAULAGE CONTRACTING FOR GENERAL HIRE OR REWARD
7040		OTHER ROAD HAULAGE
7080		POSTAL AND TELECOMMUNICATIONS
		BUSINESS SERVICES
8640	(3)	ADVERTISING AND MARKET RESEARCH
8651		VALUERS, AUCTIONEERS AND TRANSFER AGENTS
8652		CHARTERED COMPANY SECRETARIES
8654		CONTRACT CLEANING
8655		MANAGEMENT CONSULTANTS
8656		STAFF BUREAUX, EMPLOYMENT AGENCIES
8657		DUPLICATING, CALCULATING AND TYPEWRITING
8659		OTHER BUSINESS SERVICES
		PROFESSIONAL AND SCIENTIFIC SERVICES
8710		ACCOUNTANCY SERVICES
8720	(4)	EDUCATIONAL SERVICES
8730		LEGAL SERVICES
8747	(4)	PRIVATE HOSPITALS
8748	(4)	PRIVATE NURSING HOMES
8749	(4)	OTHER MEDICAL SERVICES
8760		RESEARCH AND DEVELOPMENT SERVICES
8791	(4)	VETERINARY SERVICES
8792		SURVEYING (VARIOUS KINDS)
8793		ARCHITECTS (PRIVATE PRACTICE)
8794		DRAUGHTSMEN (PRIVATE)
8795		CONSULTING ENGINEERS
8796		RESEARCH CHEMISTS, ANALYTICAL CHEMISTS, ASSAYERS, NON-MEDICAL BACTERIOLOGISTS,METALLURGISTS AND GEOLOGISTS (PRIVATE PRACTICE)
8799		OTHER PROFESSIONAL AND SCIENTIFIC SERVICES
		MISCELLANEOUS SERVICES
8891		MENS HAIRDRESSING AND MANICURE
8892		WOMENS HAIRDRESSING AND MANICURE
8991		FUNERAL DIRECTION, CEMETERIES AND CREMATORIA
8992		PHOTOGRAPHY AND PHOTOGRAPHIC PROCESSING
8998		SANITARY SERVICES OTHER THAN OFFICE CLEANING
8999		OTHER MISCELLANEOUS SERVICES (REFUGE DISPOSAL,CLEANING)
___	(5)	SEWERAGE SERVICES

TRANSPORT AND MISCELLANEOUS SERVICES

7010		URBAN RAILWAYS
7022		TAXIS AND PRIVATE-HIRE CARS
7023		CAR HIRE WITHOUT OPERATIVES
7031		COMMERCIAL VAN HIRE
7091		SHIPPING AND FORWARDING AGENTS
7092	(6)	TRAVEL AGENTS
7094		OPERATION OF CAR PARKS, TOLL ROADS AND TOLL BRIDGES
7099		OTHER MISELLANEOUS TRANSPORT SERVICES AND STORAGE
8798		ARTISTS, SCULPTORS, DESIGNERS, AUTHORS, JOURNALISTS (FREE-LANCE) AND COMPOSERS
8812		THEATRES, MUSIC HALLS, ETC; RADIO AND TELEVISION SERVICES (EXCLUDING RELAY SERVICES), FILM AND RECORDING STUDIOS ETC.
8813		PERFORMERS AND PERFORMING GROUPS (DRAMA, MUSIC, VARIETY, ETC)
8814		RADIO AND TELEVISION RELAY SERVICES
8921		LAUNDERETTES
8922		LAUNDRIES
8923		HIRE OF TOWELS, LINEN AND INDUSTRIAL CLOTHING
8930		DRY CLEANING, JOB DYEING, CARPET BEATING ETC.
8653	(7)	COMPUTER SERVICES

CATERING

8841	HOTELS AND OTHER RESIDENTIAL ESTABLISHMENTS
8842	HOLIDAY CAMPS, CAMPING AND HOLIDAY CARAVAN SITES
8851	RESTAURANTS, CAFES, SNACK BARS, ETC.,SELLING FOOD FOR CONSUMPTION ON THE PREMISES ONLY
8852	FISH AND CHIP SHOPS, SANDWICH AND SNACK BARS AND OTHER ESTABLISHMENTS SELLING FOOD PARTLY OR WHOLLY FOR CONSUMPTION OFF THE PREMISES
8860	PUBLIC HOUSES
8870	CLUBS (EXCLUDING SPORTS AND GAMING CLUBS)
8880	CATERING CONTRACTORS
8861	CATERING CARRY-IN

WHOLESALING

8101	FRESH MEAT, FISH, FRUIT AND VEGETABLES
8102	ALCOHOLIC DRINK (INCLUDING BOTTLING)
8109	OTHER FOOD AND DRINK
8110	PETROLEUM PRODUCTS
8121	CHEMISTS' SUNDRIES
8122	CLOCKS AND WATCHES
8123	CLOTHING
8124	FURS
8125	TEXTILES
8126	FOOTWEAR
8127	ELECTRICAL GOODS
8128	RADIOS,TV SETS, TAPE RECORDERS, TAPE RECORDINDS AND GRAMOPHONE RECORDS
8129	JEWELLERY
8131	IMITATION JEWELLERY
8132	MUSICAL INSTRUMENTS
8133	PHOTOGRAPHIC GOODS
8134	TOYS
8135	TRAVEL AND FANCY GOODS (INCLUDING SHOPPING BAGS)
8136	FURNITURE AND FLOOR COVERINGS
8137	CHINA, GLASSWARE, HARDWARE AND IRONMONGERY
8138	PAPER AND BOARD PRODUCTS, INCLUDING READING MATERIALS
8149	OTHER WHOLESALING
8311	COAL AND OIL MERCHANTS (NOT INCLUDING BULK OIL DISTRIBUTORS OR PETROL FILLING STATIONS)
8313	CORN, SEED AND AGRICULTURAL MERCHANTS; DEALERS IN LIVESTOCK
8321	DEALING IN INDUSTRIAL MATERIALS
8322	DEALING IN SCRAP AND OTHER WASTE MATERIALS
8323	DEALING IN INDUSTRIAL AND AGRICULTURAL MACHINERY

8941 (B) DISTRIBUTION, REPAIR AND SERVICING OF MOTOR VEHICLES ETC.
8942 (B) PETROL FILLING STATIONS

(1) The VAT Trade Code classification is used by HM Customs and Exercise for the admistration of VAT. It is aligned with the 1968 Standard Industrial Classification

(2) This inquiry collects local service and non-local service income as well as payments to other operators for sub-contracted non-local work.

(3) This inqury also collects cost of sales data.

(4) This inquiry also collects employment data.

(5) This is a special inquiry which covers only the ten privatised water companies in England and Wales. Turnover from sewerage services is divided into domestic and non-domestic.

(6) This inquiry collects turnover data generated by sales on a commision basis as well as sales on own account.

(7) This inquiry collects data for the sale, lease or rental of hardware as well as employment.

(8) This inquiry also collects data on sales of new and used vehicles, petrol and other ancillary sales.

THE TYPES OF DEFLATOR USED IN THE MEASUREMENT OF SERVICE SECTOR OUTPUT | Notes : QTI = Phase 1 QTI indicator

Deflator Type	Deflator	Industry	Type of current price indicator	Notes
		Catering	Gross margin	
		Retailing excluding motor	Turnover	
		Non life insurance	Written premiums net of reinsurance	
Direct Output	Specific RPI components	Hairdressing	Turnover	QTI
		Postal and telecommunication services other than BT or PO	Turnover	QTI
		Repair of other consumer goods	Turnover	
		Local bus services	Turnover	QTI
		Motor trades : wholesaling, retailing and repair	Gross margin	
		British Telecom output	Turnover	
		Sport and entertainment and betting and gaming	Consumers' expenditure	
		Other entertainment - theatres, cinemas etc	Turnover	
		Miscellaneous transport services - travel agents etc	Turnover	
		Car parks,toll roads and toll bridges	Turnover	
Direct Output	Other direct measures of specific output prices	Life insurance	Consumers' expenditue	
		Private domestic services	Consumers' expenditure	
		Road haulage and non local bus and coach services	Turnover	QTI
		Contract cleaning and waste disposal	Turnover	QTI
		Private education	Turnover	QTI
		Advertising	Gross margin	QTI
		Sea Transport	Turnover	
		Laundries,dry cleaning etc	Turnover	
		Other road passenger transport : taxis	Consumers' expenditure ,Turnover	
		Repair of footwear and leather goods	Consumers' expenditure	
		Imputed rent from ownership of dwellings	Consumers' expenditure	
		Wholesaling excluding motor.	Turnover	
		Parts of central and local government	Imputed charge for non trading capital consumption	
Proxy Output	Producer Price Indices	Builders merchants	Turnover	QTI
		Hire of movables	Turnover	QTI
		Owning and dealing in real estate	Gross capital building stock	
Proxy Output	General Retail Price Index or implied GDP(E) deflator	Some banking proxies	Loans and deposits	
		Some other financial institutions proxies	Total liabilities and outstanding debt	
		British Rail (parcels indicator)	Turnover	
		Armed forces	Pay	
		National health services	Wages and salaries	
		Accountancy	Turnover	QTI
		Legal services	Turnover	QTI
Input Cost	Earnings indices and other input costs	Other professional services	Turnover	QTI
		Other business services	Turnover	QTI
		Research and development services	Turnover	QTI
		Private health services	Turnover	QTI
		Other personal services nes	Turnover	QTI
		Computer services	Turnover	

ANNEX B