Quality Adjustment in Service Industry Producer Price Indexes

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1 Introduction

The broad objectives of price indexes are to:

- provide accurate measures of inflation, and tools for indexation and escalation;

- enable value data to be decomposed into the price and volume components such that the effects of any changes in either product compositional mix, or the quality of the products, is reflected in the *volume* element and doesn't impact on the *price* element; and

- facilitate deflation to derive real volume estimates (levels) and hence estimates of changes in volumes over time (growth) and support productivity studies.

Therefore, national statistical agencies aim to measure *pure price change* over time through *pricing to constant quality*. To the extent that there is a failure to fully remove the impact of quality increases from the prices used in the compilation of a price index, then the index will be upwardly biased. As such, policy makers will have an *overstated* measure of inflation and *understated* derived national accounts volume levels, growth rates and estimates of productivity change.

The concept of measuring prices to constant quality is applicable to all products; that is to services as well as goods. Pricing to constant quality is not straightforward, with services products providing special challenges. The purpose of this paper is to discuss the issue of quality adjustment in constructing service industry producer price indexes.

2 Pricing services products

Defining a constant quality services product is difficult because the characteristics of services sold in the market place, along with their terms of sale, tend to change frequently. In addition, each transaction is often unique, being tailored to customer's individual needs (e.g., a management consultancy service).

Another complication encountered relates to the practice of *bundling*, where several separate services are provided to a client at the one contract price. In pricing these

services, either the whole service bundle can be priced as one, or separate prices can be collected for components of the total service, if available.

It is necessary to devise special techniques to help identify and quantify quality differences in services products and to eliminate their effect on prices when compiling price indexes. A great deal of industry information is required in order to apply these techniques.

3 Quality change

Different qualities occur when the characteristics of a provided service change to a degree which makes it distinguishable from an economic point of view, but still similar enough to be described in the same generic terms (e.g., consultancy, lease, etc). Similar services of different qualities attract different prices just as distinctly different products have different prices. Services of different qualities need to be treated in the same way as different products, with the quality change identified and quantified, and then removed from prices collected.

4 Input versus output approach to the assessment of quality change

If a price changes for a particular service, how do we assess whether the change is a pure price change or whether some, or all, of the change is attributable to a change in the quality of the product? Note that even if a price doesn't change, there may be a quality change in the product masking a pure price change.

Triplett (1985), suggested there are two different perspectives available when assessing quality change, and the choice between the two methods is dependent upon what a price index is attempting to measure. For an *input price index*, quality evaluations should be undertaken using the *user value* approach, because an input price index is derived assuming constant output. The user value approach adjusts for the change in value (or utility) to the user resulting from the change in the product purchased, regardless of what it cost to produce.

On the other hand, for an *output price index*, quality change should be assessed using the *production* approach, because on output price index is based on the assumption that the collection of productive inputs employed are held constant. The production approach adjusts for quality differences by calculating changes in the resource cost of producing the altered product (keeping unit resource costs constant between the period that the change in product occurs), regardless of the altered product's relative performance in use. The two methods become closely related if we assume the price paid for the altered product is determined in a free market.

The approaches outlined above assume that all relevant information is available. In practice this may not be the case and the selection of the approach to be employed may be dependent on the practicality of what information is, in fact, available. For example, the user value approach requires valuing the effect on purchasers' utility. Where this valuation is difficult to assess, the production cost approach may need to be used as an approximation.

Although conceptually the services producer price indexes are output indexes, in practice the pricing methodology actually used may not directly measure output prices; rather proxy prices may be used. The employment of differing pricing methodologies for different industries therefore necessitates the selection of an appropriate method on a case-by-case basis.

5 Alternative pricing methodologies for services products

Conceptually, service industry producer price indexes aim to measure prices of the output of the industry concerned. *Specification pricing* is the ideal method, but data availability (e.g., because each service transaction is unique) and industry pricing arrangements (e.g., bundling) may necessitate the selection of an alternative method. Because price information collected is tailored to each respondent, a variety of methodologies can be used for any given industry.

Types of pricing methodologies which can be used include:

(i) specification pricing, that is the selection of clearly identified and representative specifications of services provided by the respondent to their clients;

(ii) re-pricing models of selected revenue earning transactions;

(iii) monitoring of ongoing large contracts with a respondent's key clients ("evergreen" contracts). Note that changes in a respondent's customers may cause pricing continuity problems which require the selection of new specifications and splicing in the new prices;

(iv) average unit values. These may be acceptable where they are calculated across similar types of services with similar price levels; and

(v) charge-out rates, usually for the labour and other component costs of a service (e.g., a lawyer's labour charges and charges for disbursements, etc).

6 Identifying and measuring changes in quality

In order to identify changes in quality it is necessary to collect a considerable amount of detailed information about the services being priced. Some of this information will be obtained in the course of collecting and checking price data during regular compilation of the price indexes.

Additional information can be obtained during regular personal interviews with respondents, and from a study of articles and advertisements in industry publications, newsletters, etc., which could form the basis for querying respondents.

Where external sources of information on particular services are available (e.g., on the Internet), with detailed characteristics and prices of the services (e.g., Internet service providers), it may be possible to construct hedonic price indexes or derived hedonic functions.

7 Services case studies

In service industries, common drivers of quality change are:

- technological changes;
- productivity changes;
- changes in the composition of bundled services and pricing models; and
- a combination of the above.

7.1 Technological changes

Technological change may impact *indirectly* on all service industries at some point, but *directly* on industries involved in the supply, through hiring or leasing, of machinery and equipment. When the equipment being supplied is upgraded or replaced with a new model, a quality assessment of the physical attribute changes is required.

7.1.1 *Motor vehicle hiring or leasing*

Long term leasing

The measurement of quality is closely linked to the definition of the output for an industry. For this industry, the output can be defined as "the provision of a vehicle fleet of specified number, make and model vehicle with specified vehicle options, under specific conditions, for an agreed lease duration".

Based on the assumption that the decision to lease a fleet is a direct alternative to outright purchase of the same vehicle fleet, the quality of the vehicles is given the greatest weight in terms of the quality of the service provided. Therefore, existing procedures used in other traditional producer price indexes (such as manufacturing industry output and international trade indexes) for quality change assessment in motor vehicles can also be applied to leasing service quality change. These procedures may include obtaining valuations from manufacturers or motor magazines, or perhaps more sophisticated techniques such as the use of hedonic functions.

With respect to service and maintenance activities, the contribution of these to overall service quality is generally likely to be less significant and less variable, and may not be significant enough to warrant separate measurement unless specific changes are made to a contract which can be fairly readily valued.

Short term hire

Short term motor vehicle hire or rental is more complicated due to the high contribution of pure service delivery factors to the quality of the overall service provided, and associated bundling e.g., free kilometer limit, insurance, breakdown assistance, etc. Nevertheless, the type of vehicle is usually the main contributor to the price of the service. Respondents may be able to provide a rough split between the core value of the service provided by the vehicle and the value of the other bundled services. This may allow a proportionate quality adjustment to be made when vehicles are upgraded, in a similar way to that described for long term leases. When other components of the service bundle change, contact with the respondent for an approximate valuation is likely to be the only viable approach.

7.2 Productivity changes

Productivity improvements may impact on the prices of services transacted over time through allowing a business to restrict price rises or even decrease prices. In measuring output prices for service industries, the impact of productivity improvements in the combination of inputs should be reflected in the prices used to compile a price index (assuming there is no change to the final service provided). Deregulation of an industry can lead to productivity improvements and price falls for the service output.

The primary concern with productivity change in service industries is in cases where labour charge-out rates are used as proxies for output prices. This is a common practice in many countries for a range of service industries - e.g., legal services, accounting services, computer maintenance services - because of the relative ease of collection. However, improvements in labour productivity, which may often be associated with technological change, may not be effectively captured by depending on labour charge-out rates.

For example, the charge-out rate for a tax accountant may increase from $50 per hour to $55 per hour, but the time to complete a tax return for clients may be reduced from 2 hours to 1.5 hours as a result of the use of more efficient software. Clearly, in this simple example, if we were pricing the services of tax accountants we would want to show a 17.5% decrease in the price of this service rather than the 10% increase implied by the change in charge-out rates.

Therefore, the use of labour charge-out rates without productivity adjustment would generally lead to an upward bias in the price index. Nevertheless, the use of charge-out rates could be expected to yield better results than those that would be obtained by input pricing (e.g., using wage rates and prices of intermediate inputs to represent output prices), a method of deflation which national accountants may need to resort to in the absence of any service industry price indexes.

Recognising the reality that labour charge-out rates are commonly used as a pricing basis for service industries, a method for ensuring that appropriate adjustments are made for productivity improvements is required. At the *micro* level, this may be able to be achieved by collecting information from the respondent on improvements in labour productivity for their business. Discussions with respondents, and industry associations, on how labour productivity improvements impact on the company's overall pricing policy, and how this relates to labour charge-out rates, may enable an adjustment to be made to the data reported by the respondent. The obvious problem with attempting this kind of adjustment process is its potentially subjective nature.

Another possible approach would be to make a *macro* adjustment for labour productivity based on estimates derived from statistical agencies' national accounts. Unfortunately, such labour productivity data may not be available at a sufficiently detailed industry level from many countries national accounts. Also, there may be a risk of deriving implausible results. Nevertheless, this approach warrants further investigation.

There has been very little analysis of the potential bias associated with using labour charge-out rates as a proxy for output prices in service industries. Ron McKenzie from Statistics New Zealand (McKenzie 2000) presented a case study on legal services to the 2000 Voorburg Group meeting comparing indexes derived from respondents reporting labour charge-out rates with indexes derived from respondents reporting model-based prices. While the series had periods of divergence, the index levels were remarkably close at the end of an 8 year period of analysis.

Overall, it would be valuable to undertake further empirical investigations into methodologies for making productivity adjustments to labour charge-out rates, and to share different countries' experiences.

7.3 Changes in the composition of bundled services and pricing models

For a number of service industries, simple models are used to measure price change over time. These models have short, generic descriptions of the service provided. Over time, the relevance of the models may deteriorate as the nature of the services provided by businesses to their clients evolves. Contact with respondents is required to assess these changes on a regular (e.g., annual) basis and to review the model being priced.

For service industries, prices are often obtained for a collection, or bundle, of services. This may result in services for a group of different industry classes (as defined under an agency's industrial classification) being priced as one bundle. Over time, the composition of the bundle may change and quality improvements may occur in response to changing customer demands. Such quality changes need to be assessed and removed from the prices collected. The most effective way to perform this is through regular contact with the respondent, supplemented by the inclusion of questions on the collection form asking whether there have been changes to the service bundle.

7.3.1 *Specific industry examples*

Road freight

For this industry, the usual practice is for respondents to report prices for one way trips from specific listed origins to destinations. One respondent reported a price fall for a particular specification, advising that the reason for the fall was because backloading was included. That is, the client was charged a lower rate for the first trip because, in addition to paying for an item to be freighted to the destination, they also paid for another item to be carried on the return trip. In this case, it was necessary to contact the respondent and obtain a representative one way freight price. The original reported price fall could not be shown because it was associated with a change in the volume of the overall freight service provided.

Computer consultancy and computer maintenance services (combination of two separate industry classification classes)

If the composition of the output bundle changes over the term of a contract that is priced, then essentially it is a new bundle being priced and the quality difference needs to be evaluated. For example, under a particular contract for computer consultancy services the service provider added free maintenance of the systems into the current contract, meaning that additional services were added to the existing bundle, forming a new bundle. As the transaction price did not change, a real price fall needed to be estimated as the quality of service provided to the user had increased.

8 Conclusion

To support the process of pricing to constant quality, the specifications for a particular product being priced needs to be clearly defined with as much documentation as possible on all the price-determining characteristics. However, due to the dynamic nature of markets, the factors influencing prices often change over time and it is therefore necessary to maintain a vigilant monitoring of market practices, drawing on a variety of information sources.

For *service industries* defining a constant quality product is particularly difficult because of the following factors:

- the characteristics of the services provided change frequently over time;
- the services are often unique, being tailored to customers' individual needs;
- bundling of separate services is a common practice;
- it can be very complicated to define a product's specifications; and
- there is a need to make a choice about which method to use to assess quality change.

It is very important that every effort is made to eliminate quality change from prices collected for services products during processing cycles, to ensure that published indexes reflect pure price change only. To the extent that the impact of quality increases are not fully removed from the prices, then the resultant price indexes will be upwardly biased, and national accounts volume levels, growth rates and estimates of productivity change will be correspondingly understated.

9 Issues for discussion

1. What are the experiences of other countries with:

(i) making productivity adjustments to labour charge-out rates;

(ii) pricing bundled services; and

(iii) using simple models?

2. Are there any other methods being used for pricing services products in addition to those listed in Section 5, above?

Aknowledgements

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References

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