Measuring producer prices and productivity growth in services

The price index-productivity link

Empirical evidence presented in this publication points to relatively low productivity growth rates over long periods for several service industries. This is true even for some business sector services for which rapid technological change and increasing competitive pressures may argue for an opposite trend. However, for some services, this evidence may reflect an under-estimation of service productivity growth, linked to difficulties measuring price indices, and hence volume series of services value added (Wölfl, 2003). While problems estimating an appropriate price index may arise in several manufacturing industries, there are reasons that measurement problems may be stronger in the service sector than in manufacturing.

Because of the difficulty in measuring services producer price indices (SPPIs), different methods are used in OECD countries to compute volume series of value added. Moreover, even if producer price indices can be computed, different methods are typically used depending on the type of the service under consideration as well as data and availability. Over the past 10 years, much progress has been made by OECD countries in measuring SPPIs, in particular in business sector services. This has significantly increased the availability of SPPIs and has improved their comparability across countries. However, even where SPPIs have been computed, they are based on different pricing methods across industries and countries, potentially affecting comparability of productivity growth estimates.

General measurement issues when tracking price changes for services

Measurement of price changes in services is not trivial, in large part complicated by the way businesses provide and charge for services, by problems identifying quality change, through the provision of bundled services, and by the difficulty identifying separate price indices per end-user.

Pricing methods

The way businesses provide and charge for services can make it difficult for statisticians to observe prices for a repeated service transaction. As such, standard price measurement methods designed for repeated products can be difficult to apply for services. In practice, price statisticians are then obliged to use a number of methods to track price changes in services, with the methods typically varying across countries, depending on the pricing mechanisms used, and also on the producing industry or product.

However, over the last 10 years, considerable efforts have been made by price statisticians to provide a better understanding of the variety of methods used by countries to facilitate international comparability and hence improve matters. The three main classes of pricing methods are:

1. **Price of final service output:** price observations refer directly to specified service outputs and result in prices of final services output; examples are: direct use of prices of repeated services, contract pricing, unit value, percentage fee, component pricing and model pricing.
2. **Time-based prices:** price observations refer to the time used for the provision of the service rather than to the service itself. Several time-based methods can be distinguished: hourly charge out rate, hourly list rate, wage rates and working days.
3. **Margin prices:** price observations refer to the price that would have to be paid by the service provider for the good or service they provided and the price paid by the final consumer.

It is important to bear in mind that the way firms in a given sector charge for their products can impact considerably on the reliability of measured price indices for the industry. For example, when price indices are either based on a specified service output or are time-based, results of pricing methods can have a different interpretation. In the first case, the volume of output is, in principle, correctly measured (albeit depending on how well price-determining factors are specified). However, this is not necessarily the case for time-based methods, particularly whenever quality changes have occurred, or productivity changes impact on the input (hours spent). Indeed, for pricing based on working time, the price of the service finally provided is not identified. Rather, service provision is assumed to correspond directly or predominantly to different types of chargeable hours, actually worked for a client. The validity of the method depends on how realistic this assumption is, i.e., to what extent the quantity and quality of one chargeable hour's work remains the same in consecutive periods.

Quality changes

While in principle, the same quality adjustment methods can be used for goods and services, in practice, for services, fewer options are available and much more difficult to implement (Loranger, 2012). First, over time, the way in which a certain service is provided may change (e.g. a service is delivered in less time or by a better qualified employee). Second, the structure of services that are provided in a certain service industry will vary from one period to the next. Third, many service products are unique. In this case, prices cannot be observed over multiple periods requiring assumptions about quality changes that are mostly based on convention rather than reflecting "reality"; typically, constant quality is assumed.

Treatment of bundled services

Services are frequently (and increasingly) bundled with either another service or a good. This is particularly true in the case of transport and storage and information and communication services. Two main alternatives are commonly used: i) breaking down the bundle into components and price these separately, or ii) pricing bundled services together as a group. Each of these alternatives poses difficulties that are likely to imply biased measure of prices. A particular concern is keeping the bundle constant over time either through quality adjustment or regular updating of the selected bundled services. The ability to reflect the non-monetary benefits of the bundle in the price index may also be a complicated task. Finally, the treatment of bundled services may lead to a heavy calculation and response burden, in particular where bundled components are priced separately.

Decomposition by type of end-users

Breaking down SPPIs by type of user is an important requirement for the national accounts when price discrimination occurs which feeds through into heterogeneous price changes. Currently, decompositions of SPPI by type of end-users focus mainly on Business to Business (BtoB), Business to Consumers (BtoC) and Business to All (BtoAll) transactions.

The potential role of price measurement for measured productivity growth

Table 7.4 provides some indication of the potential effects on volume series of value added that may result from using different deflators for two services "telecommunication services", on the one hand, and "legal and accounting services", on the other.[4] These services provide two interesting

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[4] This exercise is of a purely hypothetical nature. Its aim is merely to illustrate the sensitivity of value added volume series and hence productivity growth to price index methods.

examples of how price index measurement could impact on measured productivity growth.[5] They are i) characterised by very different factors of service output and the way they are provided, and ii) by different availability of producer price indices and underlying methods.

Table 7.4 provides evidence for France and the United States, for which time series data are available for a large range of input and output variables, such that several different price and volume indices can be derived. The different deflators compared are those that are commonly used in countries either directly for a deflator of value added or as a reference for the computation of producer price indices:

- *Services Producer Price Indices (SPPI)*. From a methodological point of view, using SPPIs, especially in the form of a *price of final service output* as defined above, would represent the most appropriate way to deflate value added if the aim is the computation of productivity growth. Ideally, SPPIs would exist for both, gross output and intermediate inputs used in producing the good or service under consideration, and SPPIs would adjust for quality changes so that the resulting value added volume series reflect productivity growth changes properly.
- *Consumer Price Indices (CPI)*, for goods or services that are close to the services analysed, or the *CPI All items*. Using CPI's for deflation may result in measurement biases vis-à-vis SPPIs as they cover only household consumption and are not valued in basic prices. This may be particularly relevant for those services where the share of final household consumption in total output is low, and where price changes differ significantly between intermediate (business) and final use (consumption) (Eurostat, 2001).
- *Wage rate indices* per employed person or per hour worked (WRIE, WRIH). The latter can be seen as a proxy for a *time-based producer price index* as defined above. Productivity growth rates based on wage rate indices may underestimate true productivity developments.

Table 7.4. Average annual growth rates in gross value added per person employed using different deflators of value added, in %

			Base	Wage rate Employment	CPI - All items	CPI - related service	SPPI
France	Telecommunications services	2000-2010	6.37	0.55	2.71	6.32	
		2005-2010	4.73	-2.01	0.22	4.92	8.60
	Legal and accounting services	2000-2010	-0.24		1.17	1.02	
		2005-2010	-1.18	-3.26	-0.88	-1.58	-2.70
United States	Broadcasting & telecommunication	2000-2010	6.82	2.28	1.88	7.41	6.00
		2005-2010	5.64	0.40	0.85	5.67	3.12
	Legal services	2000-2010	-1.60	-0.28	0.53	-1.65	-2.68
		2005-2010	-3.00	-1.13	-0.36	-1.88	-4.12

Note: All results based on double deflation. "Base": value added deflator as given in National Accounts.
Source: *OECD Structural Analysis Statistics* (database), INSEE, Bureau of Labour Statistics.

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[5] In the empirical results presented in Table 7.4, labour productivity growth has been calculated as real value added per employment and not per hour worked. While hours worked is typically the more appropriate measure of labour input, employment has been chosen here for data availability reasons.

Table 7.4 suggests that the choice of the implicit value added deflator, or the pricing method for computing producer price indices, may matter significantly for measured labour productivity growth. For instance, in telecommunication services, average annual labour productivity growth rates over the 2000-2011 period would differ by between 5 percentage points (United States, both periods) and 10 percentage points (France, 2005-2011) using different deflators. In the case of legal services, the overall variation is with 1 to 4 percentage points lower, but still significant, especially given the generally lower level of productivity growth in this services activity.

Further reading

Loranger A. (2012), "Quality Change for Services Producer Price Indexes", *paper presented at the Group of Experts on Consumer Price Indices*, Geneva, Switzerland, May 30 – June 1 2012.

Eurostat (2001), *Handbook on price and volume measures in national accounts*, Eurostat, Luxemburg.

Wölfl, A. (2003), "Productivity Growth in Service Industries: An Empirical Assessment of Recent Patterns and the Impact of Measurement", *OECD Science, Technology and Industry Working Paper* 2003-07, OECD Publishing, Paris, http://dx.doi.org/10.1787/086461104618.
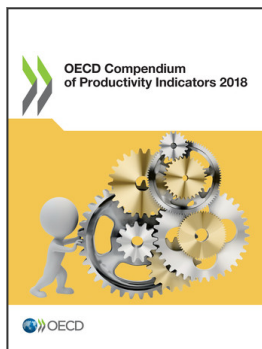
From:
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