



The 28<sup>th</sup> Voorburg Group Meeting on Services Statistics  
Tokyo, Japan, 7 -11 October 2013

Mini-presentation by Michael Morgan (Director Producer Price Indexes ABS)

**Measuring changes in output prices of the television  
broadcasting industry – the challenges**

Qinghuan Luo  
Services Producer Price Index Development  
The Australian Bureau of Statistics

## 1. Introduction

This paper discusses the challenges in pricing the output of the television broadcasting industry, focusing on three central questions:

- Should audience size be included in quality adjustment in pricing commercial free-to-air TV broadcasting?
- How to price the nonmarket output of public and community TV broadcasting?
- How to price pay TV that are sold in bundles with telephony and internet services?

The paper is organised as follows. Section 2 discusses the services and classification, and national accounts measurements, concentrating on Australian TV broadcasting industry. Section 3 discusses the issue of quality adjustment in pricing commercial free-to-air TV broadcasting. Section 4 presents three different methods for measuring nonmarket outputs from public and community TV broadcasting. Section 5 discusses the methodologies for pricing pay TV.

## 2. Television programming and broadcasting services

### 2.1 The services being priced and pricing unit of measure

The TV broadcasting industry generates both market and nonmarket outputs through programming and broadcasting activities.

Australian TV broadcasting industry consists of three major segments, commercial free-to-air TV broadcasting, public and community TV broadcasting, and pay TV broadcasting.<sup>1</sup> Commercial free-to-air TV operators derive their revenue primarily from sales of part of their schedule as advertising spots to advertisers such as advertising agencies and governments. Pay TV operators derive their revenue from subscription fees, TV commercials, and wholesales of pay TV packages to other operators. Subscription fees are the main revenue source for pay TV. Both commercial free-to-air TV and pay TV also derive revenues from sales of TV programs to other broadcasters. This component is relatively small in Australia. Public and community TV operators derive their revenue primarily from the Government or sponsorship. So, outputs of public and community broadcasting are mostly nonmarket.

Because of the differences in their revenue sources, different pricing methodologies are needed for compiling output price indexes for these three different segments of the industry. For commercial free-to-air TV broadcasting, the outputs can be priced based on prices for TV commercials. Pricing unit of measure can be a relevant unit value calculated as total revenue per spots at a given category of products,<sup>2</sup> or revenue per spot per audience size (if quality adjustment is made based on audience size, see Section 3.4). The unit value for a category is considered as an approximation to the average price for products within the category. For pay TV, the outputs can be priced primarily based on monthly subscription fees (Section 5). For public and community TV broadcasting, the outputs can be priced based on unit costs or using commercial TV broadcasting as proxies for market prices (see Section 4).

---

<sup>1</sup> Pay TV broadcasting includes cable and other subscription broadcasting. See Section 2.3.

<sup>2</sup> E.g. TV commercial spots with different durations are treated as different products. See Section 3.3.

## 2.2 Market conditions and constraints – Australian broadcasting industry

In Australia, free-to-air TV broadcasting, including commercial, public and community TV broadcasting, is a dominant component of the broadcasting industry, dominated by major TV broadcasting operators and their subsidiaries. The key players include four commercial TV broadcasters (Seven Network, Nine Network, Ten Network and WIN Corporation) and two public TV broadcasters (ABC and SBS<sup>3</sup>), which account for 59% and 17%, respectively, of total industry revenue in 2012-13. All the others make up the remainder revenue share 24% (IBISWorld<sup>4</sup> 2013).

The pay TV segment is even more concentrated- there are only two dominant operators, Foxtel and Telstra, which combine to account for over 97% market share (IBISWorld<sup>5</sup> 2013).

Table 1 shows the revenue distribution between free-to-air TV, pay TV and radio broadcasting, estimated from the ABS's published Input-Output Table which was compiled using the data sourced mostly from the ABS's Annual Integrated Collection (AIC). Specifically, the turnover data for commercial broadcasting was from the AIC, while the data on public TV was derived from the Government Finance Statistics.

Generally, free-to-air TV broadcasting has been dominant in the market. The drop in revenue during period 2008-09 was due to the effects of the global financial crisis (GFC) when the demand from advertising dropped. The revenue data from FreeTV<sup>6</sup> showed that the revenue from TV commercials recovered strongly after the GFC.

As pay TV providers derive their revenues mostly from subscription fees, the pay TV revenue is generally less affected by demand from advertising, but react more strongly to changes in household disposal income, as compared to free-to-air TV broadcasting.

Radio broadcasting in Australia is a small component of the broadcasting industry. Commercial radio broadcasters derive their revenue mainly from sponsorships and advertising. Radio broadcasting has experienced a slight decline in revenue share.

Table 1: Revenue distribution in the broadcasting industry.

	2006-07	2007-08	2008-09
<b>Free-to-air TV</b>	0.55	0.55	0.43
<b>Pay TV</b>	0.32	0.33	0.46
<b>Radio</b>	0.13	0.12	0.12
<b>Total</b>	1.00	1.00	1.00

Data source: ABS's published Input-Output Table.

Figure 1 is the time series of the advertising revenue distribution between three major commercial free-to-air TV broadcasters in the metropolitan city market (Sydney, Melbourne, Brisbane, Adelaide

<sup>3</sup> Australian Broadcasting Corporation (ABC), and Special Broadcasting Services Corporation (SBS). SBS also derives revenue from TV commercials, but this only comprises small fraction of their total revenue.

<sup>4</sup> IBISWorld Industry Report – *Free-to-Air Television Broadcasting in Australia*, April 2013.

<sup>5</sup> IBISWorld Industry Report – *Pay Television in Australia*, May 2013.

<sup>6</sup> FreeTV ([www.freetv.com.au](http://www.freetv.com.au)) is the peak body of the commercial free-to-air TV. It is responsible for classification of TV commercials to comply with Australian Communication and Media Authority (ACMA)'s relevant regulation on TV broadcasting contents.

and Perth). If the supply is held constant,<sup>7</sup> the trends in revenue give a rough indication on price movements. Thus, the differences in their revenue trends suggest that these three broadcasters may have experienced different price movements.

Figure 2 is the advertising revenue distribution of major commercial TV broadcasters by capital cities for year 2012-13. The distribution has remained relatively unchanged during past 7 years. The revenue distribution is in line with the population distribution.

The industry has undergone significant changes during the past decade, driven by switching to digital TV and wide use of internet with a fast download speed. This led to an increase in multi-channel services (a TV station broadcasts multiple TV channels), a growing trend in broadcasting through internet and catch-up TV services, and integration of traditional TV broadcasting with internet services. These changes may have impact on pricing of TV commercials. For example, an increase in catch-up services may shift part of the revenue source from TV commercials to internet advertising. Integration of TV broadcasting with internet services led to increasing participation of telecommunication companies in pay TV services (see Section 2.4).

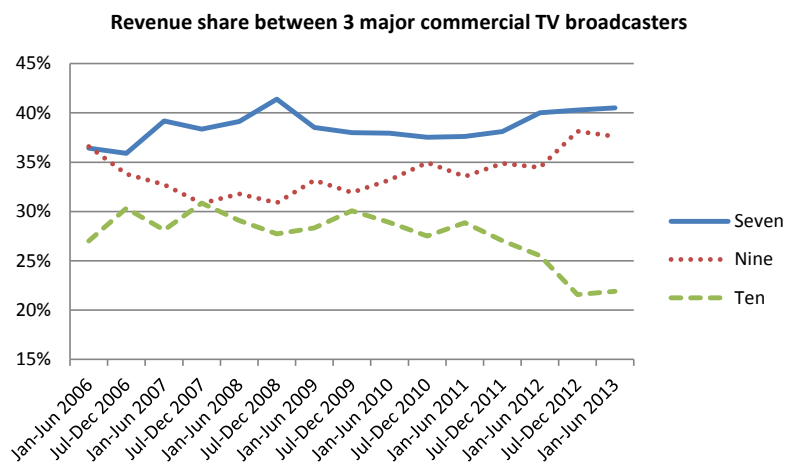


Figure 1: Advertising revenue share between three major commercial TV broadcasters in the metropolitan city market. The data was sourced from FreeTV.

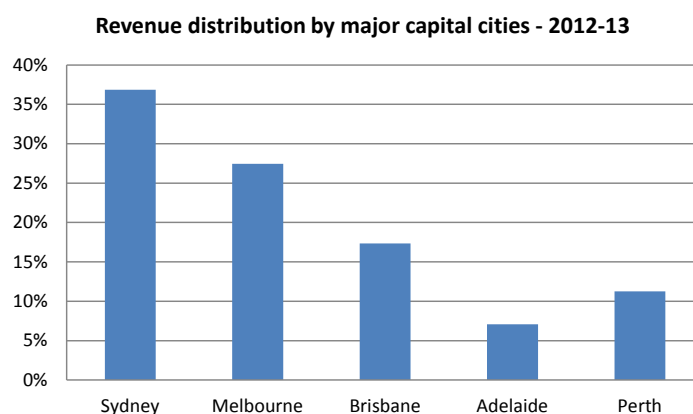


Figure 2: Advertising revenue of commercial TV broadcasters by 5 major capital cities. The data was sourced from FreeTV.

<sup>7</sup> In the TV broadcasting industry, the supply is fairly constant, i.e. the number of spots available can be regarded as being approximately constant. It may increase if TV stations offer new channels. See further discussion on this point in Section 3.1.

## 2.3 Standard classification structure and detail related to the area

In the International Standard Industry Classification (ISIC, Rev 4), TV programming and broadcasting is covered under Class 6020 – Television programming and broadcasting activities. Activities under ISIC Class 6020 include production of a complete TV program, from purchased program components (e.g. movies, documentaries etc.), self-produced program components (e.g. local news, live reports), or a combination of these components. A complete TV program can be either broadcast by the producing unit or produced for transmission by third party distributors, such as cable companies or satellite television providers. The programs may be made freely available to users or may be available only on a subscription basis.

ISIC Class 6020 also covers programming of video-on-demand channels and data broadcasting integrated with television broadcasting.

The ABS compiles PPIs using the Australian and New Zealand Standard Industrial Classification (ANZSIC 06). Broadcasting activities defined under ANZSIC 06 have a more detailed breakdown compared to ISIC. Broadly, ISIC 6020 corresponds to the following ANZSIC 06 classes:

- Class 5621 Free-to-air television broadcasting
- Class 5622 Cable and other subscription broadcasting
- Part of Class 5700 - internet broadcasting

## 2.4 Evaluation of standard vs. definition

Increasing integration of TV broadcasting, especially pay TV, with internet services raises a question as whether telecommunication companies operate pay TV networks should be included in programming and broadcasting. In Australian case, telecommunication companies such as Telstra and Optus participate in pay TV businesses. As these units normally do not produce TV programs, they seem to be out scope of Class 6020. Furthermore, ISIC Class 6020 specifically excludes activities of assembly of a package of channels and distribution of that package via cable or satellite to viewers, which are covered under division 61 of telecommunications.

Activities defined under ANZSIC 06 Class 5622 – Cable and other subscription broadcasting specifically include operation of pay TV networks. Therefore, participation of telecommunication companies in providing pay TV services should be in the scope of ANZSIC 06 Class 5622. Note that in Australia, the trend in integration of internet and TV broadcasting is expected to accelerate further when the National Broadband Network (NBN) becomes fully operational.

## 2.5 National accounts concepts and measurement

The ABS compiles annual estimates of GDP and its components in the Use and Supply (SU) framework with the majority data sourced from the AIC.<sup>8</sup> Current price outputs of commercial TV broadcasting are estimated from data collected as part of AIC. Nonmarket outputs generated from public TV broadcasting are estimated based on the revenue received from the Government.

---

<sup>8</sup> In the SU framework, annual supply and use are fully balanced. This ensures that final domestic expenditures, intermediate usage and exports are consistent with outputs and imports, and that incomes and gross value added are the same.

The ABS derives estimates of an industry's gross value added (GVA), in previous year's prices, using the double deflation method, i.e. the industry's outputs and intermediate inputs are deflated separately. The GVA in previous year's prices is calculated as the difference between the deflated outputs and inputs. Generally, output producer price indexes (PPIs) are used for deflating outputs. Thus, the outputs to be priced include broadcasting services produced for intermediate consumptions by other industries (mainly the advertising industry) as well as the broadcasting industry itself. An example of the latter is that TV programs are produced and sold to other TV channels for broadcasting. In Australian TV broadcasting industry, this component is considered to be small. Similarly, wholesales of pay TV to other pay TV operators should be in scope and this component can be important due to the growing trend in participation of telecommunication companies in pay TV markets.

The ABS currently does not compile a PPI for the TV broadcasting industry. Due to lack of a relevant PPI, the outputs of TV broadcasting are deflated by the price index of the services component of the CPI.

The ABS is currently developing a PPI for free-to-air television broadcasting, as part of the ongoing major program of developing a suite of PPIs for services industries.

### **3. Quality adjustment in pricing commercial free-to-air TV**

#### **3.1 Operation of commercial free-to-air TV broadcasting**

Operation of commercial free-to-air TV is supported mainly by the revenue from sales of advertising spots to advertisers, primarily to advertising agencies or governments. These advertising spots are usually in the form of short time slots, say in 15, 30, and 60 sec, which are interspersed with the scheduled program. From the supply-demand perspective, the commercial broadcasting industry is largely driven by demand - as the supply can be regarded as approximately constant, i.e. number of spots available remains relatively constant, the price for a spot is largely determined by the demand.

As sales of TV commercials spots are the principal source of revenue for commercial free-to-air TV broadcasters, prices for advertising spots can be used as price indicators for the output of commercial TV broadcasting. Thus, the key question on pricing the output of commercial free-to-air broadcasting is how to price TV commercial spots to constant quality. As shown below, the price for an advertising spot can be quite variable, depending on a number of price determinant factors. This poses a major challenge in pricing TV commercials.

#### **3.2 Quality adjustment in pricing TV commercials**

To specify what constitute quality of a TV commercial spot,<sup>9</sup> it is useful to identify the price determinant factors. As the main objective of advertisers is to use TV as media to reach target audience (certain demographic groups), the price for a TV commercial spot is determined by the following key factors:

- The anticipated number of target audience;
- The airing time of the day (e.g. prime time, nonprime time);

---

<sup>9</sup> It should be noted that the term 'quality' is not related to the content of the TV commercials.

- The duration (e.g. a 15 sec or 30 sec slot); and
- Region (where TV commercials are aired).

Since anticipated audience reach is an important price determinant factor, this raises a question as whether TV ratings should be reflected in specification of quality. Quality adjustment by factoring in audience reach was recently discussed for pricing advertising activities under ISIC Class 7310 (Pegler et al. 2011, Loranger 2012).

The use of TV ratings as part of the quality metrics for the purpose of quality adjustment poses a conceptual issue: Should audience size be regarded as part of the output of broadcasting activities?

To gain an insight into this issue, it is useful to distinguish between the concepts of the output and outcome of production. The output is the result of production, i.e. what are produced. The outcome is a state valued by consumers. The distinction between outputs and outcomes is especially important for quality adjustment for services industries. For example, the difference between the two concepts and its implication for quality adjustment has recently been discussed in the context of measuring nonmarket outputs of health and education (Shreyer 2012).

In the case of TV broadcasting as shown in Figure 3, relevant quantities for the output can be number of hours of programs broadcast, number of hours of programs sold to other TV stations, and number of TV commercial spots sold to advertisers. An important indicator for the outcome of broadcasting a program is how well the program is received by the audience and this is usually reflected in ratings of the program. Thus, it seems to be appropriate to consider TV ratings as part of the outcome, not the output.

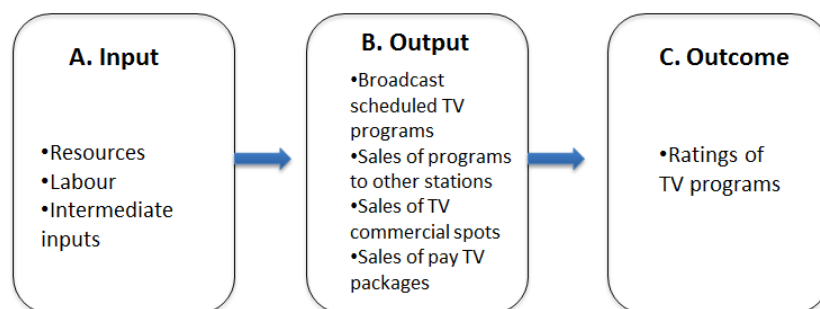


Figure 3: Input, output and outcome of TV broadcasting activities. In the general context, the production boundary defined in national accounting covers the output of production, but not the outcome.

It is worth commenting that the System of National Accounts 2008 (2008 SNA) recommended that caution be taken in using outcome indicators in measuring nonmarket output volumes – for the reason that some of the outcome indicators may actually depend on other factors that are not directly related to the production (paragraph 15.121, 2008 SNA). The similar issue was also discussed in the recent review paper by Iorwerth (2012).

Currently, the theoretical issue as to whether outcomes should be considered in quality adjustment remains unresolved. There is a view that outcome metrics may be included in quality adjustment if they are strongly connected to production processes (e.g. Shreyer 2012).

In the following, we consider two approaches to pricing TV advertising spots. The first approach is based on the output only without taking into account the outcome. The second approach, referred to as the outcome-adjusted approach, assumes that audience size has a role in specifying product quality and is taken into account in quality adjustment.

### 3.3 The output-based approach

Conceptually, the output-based approach without taking into account the outcome is in line with the purposes of national accounting. In theory, the production boundary in national accounts covers outputs, not outcomes. In the case of the broadcasting industry, the prime objective is to measure the output volume of broadcasting activities, not how well TV programs are received by the audience.

In this approach, TV commercial spots are grouped by their durations, airing hours and region (capital city TV stations, regional TV stations). For example, spot durations can be classified into 15sec, 30sec, 60sec, and other. Broadcasting hours can be classified into 5 bands: 6:00am-9:00am (morning peak), 9:00am-6:00pm (daytime), 6:00pm-10:00pm (prime hours), 10:00pm-12:00am (late night), and 12:00am-6:00am (night off-peak). Such grouping is needed to capture effects of any compositional changes. Products within each group are regarded as homogeneous, having similar qualities. The approach assumes that qualities of products in each group do not change significantly from period to period. For each group, a unit value is calculated as the total revenue divided by total number of spots in the group. The average price is obtained as a weighted average of unit values for all groups.<sup>10</sup>

In this approach, it is assumed that audience size has no effects on product quality. Thus, an increase in cost per spot as a result of a greater demand due to expected higher ratings of the program is regarded as a pure price movement. For example, two episodes of a reality TV series shown on two consecutive periods may attract a variable number of viewers. If we assume that cost per spot in period 1 is \$10,000. The cost per spot increases to \$12,000 for period 2 due to demand based on expectation of a larger audience. In purely output-based approach, this increase in cost is treated as a pure price movement.

The approach is based on the assumption that TV ratings play no role in production, i.e. audience size is not related in any way to the characteristics of production function.

### 3.4 The outcome-adjusted approach

A useful measure of target audience reach is cost per thousand impacts (CPM<sup>11</sup>), calculated as 1000 times the cost for a spot divided by total number of the target audience. CPM can be used in defining quality of an advertising spot. The measure is usually used by advertising agencies as benchmark for placing advertisement on TV.

In the simplest case, realised CPM is considered as 'unit value' which is used as an approximation for the average price for purchasing a commercial spot that has potential audience reach of 1000 target viewers.<sup>12</sup> In principle, the realised CPM can be calculated from the data of audience measurements for a program. The audience measurement data can be sourced from TV audience measurement companies, e.g. OzTAM.<sup>13</sup>

---

<sup>10</sup> Alternatively, the average price is obtained as geometric mean if products from different groups are considered as heterogeneous.

<sup>11</sup> Abbreviation for *Cost per Mille*, i.e. cost per thousand, the term used in OzTAM data.

<sup>12</sup> The difference between expected and actual audience size in quality adjustment was discussed in Pegler et al. (2011).

<sup>13</sup> OzTAM ([www.oztam.com.au](http://www.oztam.com.au)) is a TV audience measurement company which provides TV measurement services including various TV program ratings data.



To illustrate the approach, consider a hypothetical example of comparing prices for a commercial spot, say on a reality TV series aired over two consecutive periods (1 and 2), as shown in Table 2. Assume that the price for a 30 sec spot on the episode in period 1 is \$10,000 and that the episode in period 2 is the finale of the series which is expected to attract a larger number of viewers than the usual episodes. So, the price for the spot of the same duration placed on the final episode in period 2 is higher than that on the previous period, say \$21,000. Without explicit adjustment for quality changes as in the output based approach, one would see a 210% price increase from period 1 to period 2. By contrast, with adjustment for quality changes using CPM, one would see a 5% price increase. In this example, the increase in revenue due to larger audience size is regarded mainly as an increase in the volume output.

Table 2: A hypothetical example for explicit quality adjustment based on TV program ratings.

	Period 1	Period 2
<b>Cost per 30 sec spot (\$K)</b>	10	21
<b>Audience reach (,000)</b>	1,000	2,000
<b>Cost per 1000 impacts (CPM)</b>	10	10.5
<b>Price index without adjustment</b>	100	210
<b>Price index with adjustment</b>	100	105

Compared to the advertising industry (e.g. Pegler et al 2012), audience size plays an important role in production in commercial TV broadcasting. Commercial TV broadcasters do take into account expected ratings of their programs in their production process. For example, they make efforts in programming to achieve high ratings to attract revenue from TV commercials. Thus, from this perspective, audience size may need to be taken into account in quality adjustment.

#### 4. Pricing nonmarket outputs of public and community TV

The general challenge in pricing nonmarket outputs is to identify appropriate market prices for service products with comparable qualities. Three methods are discussed and compared.

The first method is based on the input cost factors, referred to as the input cost factor method, which involves breaking down broadcasting activities into a set of standard broadcasting programs, e.g. news, current affairs and drama. These programs are assumed to be fixed over repricing periods. For each program, the total cost is broken down to number of cost factors, including labour cost, various resources, and intermediate inputs. For each factor, a price index is compiled from sample data or where possible existing price indexes may be used as a proxy. For example, the price index for the costs on staff may be taken from Wage Price Indexes (WPIs). The price index for the program is a weighted average of all cost factors.

A limitation of the input cost factor method is that the price determined based on input costs does not necessarily reflect market prices. A second limitation is that the method does not capture changes in productivity in the broadcasting activities.

The second method is to use costs per unit of outputs, i.e. the unit cost method. This method has recently been discussed for measuring nonmarket outputs of health and education (e.g. Diewert 2008, Shreyer 2012). This method requires some meaningful quantity of outputs and in the case of TV broadcasting, one may use quantities such as number of hours of programs broadcast in a particular category. Unit cost for the category is calculated as total costs of broadcasting programs

in the category divided by total hours. The weighted average of unit costs for all categories is used as a proxy to the average output price.

The unit cost method is generally regarded as more robust than the input cost factor method - as in principle, the method can capture changes in productivity (Diewert 2008).<sup>14</sup> The likely issue with the unit cost method is that one needs to collect cost data with splits at the component level of the output, i.e. costs need to be split between different types of programs (broadcasting news, drama, and other).

The third method is to use the output price of commercial TV broadcasting as a proxy for the output price of public and community TV broadcasting. The underlining assumption is that public and community TV broadcasters operate in the same way as their commercial counterparts. Commercial free-to-air TV broadcasting represents about 75% revenue share within the free-to-air TV broadcasting market (IBISWorld 2013). Thus, prices of commercial free-to-air TV broadcasting should be good proxies for public and community TV broadcasting. A practical issue with this approach is to identify market prices to comparable quality, given that different TV stations face very different price movements as implied in Figure 1. Thus, it is difficult to find proxy 'TV stations' that match public TV stations. A possible solution is to use the average output price of the commercial free-to-air TV segment as whole.

In theory, the third approach is preferred provided quality difference between outputs of commercial and public TV broadcasting can be accounted for. In practice, the choice of pricing methods also depends on how national accounts measure current price outputs of public TV broadcasting. For example, if the outputs are estimated based on the revenue received from the Government (i.e. input cost approach), the unit cost method should be used for pricing the output.

## 5. Pricing pay TV

The ABS currently compiles the pay TV price index for the CPI and this index is used as a proxy for the PPI for the pay TV industry.

The ABS's current methodology for compiling the price index for pay TV for the CPI involves selecting a set of representative pay TV packages. The price index for pay TV is calculated based on monthly subscription fees. The ABS's current approach does not price pay TV packages that are sold in bundles with other services. The implicit assumption is that price movements for bundled pay TV packages are similar to those of standalone packages.

The use of the pay TV price index from the CPI as a proxy for the PPI has some limitations as the CPI covers only households. Pricing mechanisms for households may differ from that for businesses. For example, pay TV may be bundled in a different way when sell it to household as to businesses. As one of the main purposes of output PPIs is for deflation in estimating volume outputs in national accounts, wholesales of pay TV to other TV operators are in scope for the output PPI.

In principle, the ABS's current approach can be extended to include business and wholesale components and then applied to compiling a PPI for pay TV. However, pricing pay TV in bundles with other services such as internet services remains a challenge. We face an issue similar to that in pricing bundled products in telecommunication services i.e. how to unpack the bundled products. A

---

<sup>14</sup> Diewert (2008) considered the unit cost approach as the second best approach when market prices are not available. The best approach is to price nonmarket outputs based on market prices, which is usually not feasible.

possible solution to this issue is to use wholesale prices as an approximation to final demand market prices.

## 6. Summary

- Prices for TV commercial spots can be used as price indicators for the output of commercial free-to-air TV broadcasting. The main rationale is that commercial free-to-air TV broadcasters derive their revenue primarily from sales of TV commercial spots in their scheduled programs.
- Pricing TV commercial spots is a major challenge as price for an advertising spot on a scheduled program is highly variable, depending on expected ratings of the program and competition from other TV channels. The higher ratings usually attract higher price due to a higher demand.
- For commercial TV broadcasting, quality adjustment based on audience size may be needed, on the basis that broadcasters make efforts in programming to attract audience and that TV ratings have feedback effects on their production process. However, the theoretical issue remains unresolved, i.e. whether audience size should be considered as part of characteristics of the production function (e.g. Loranger 2012).
- Pricing nonmarket outputs of public and community TV broadcasting is a challenge. The preferred method is to use market prices – for example, output prices of commercial TV broadcasting may be used as proxies for pricing the outputs of public and community TV. However, adjustment for differences between public TV and commercial TV broadcasting may be needed. An alternative approach is to use the unit cost method as output quantity indicators, e.g. number of hours of broadcasting programs, are generally available.
- The main issue with pricing pay TV is how to price pay TV in bundles with other services.

## References

Diewert, W.E., 2008. The measurement of nonmarket sector outputs and inputs using cost weights.

Iorwerth, A., 2012. To capture production or well-being? A review article on *Towards Measuring the Volume Output of Education and Health Services: A Handbook*. International Productivity Monitor, No. 23, pp. 55-70.

Loranger A., 2012. Quality change for services producer price indexes, 27<sup>th</sup> Voorburg Group Meeting on Services Statistics, Oct 1-5, 2012.

Pegler, K., von Borstel, J., Jenkins, C., 2011. Quality adjustment on ISIC 7310 Advertising, 26<sup>th</sup> Voorburg Meeting.

Shreyer, P., 2012. Output, outcome, and quality adjustment in measuring health and education services. *Review of Income and Wealth*, Vol. 58, pp. 257-278.