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Measuring Quality Change in Producer Price Surveys for  
Rental and Leasing Services

André Loranger  
Statistics Canada

Alain Gallais  
Institut National de la Statistique et des Etudes Economiques (France)

## 1.0 INTRODUCTION

This paper summarizes international practices and challenges related to quality adjustment in price surveys for Rental and Leasing Services. The paper also touches on the System of National Accounts (SNA) requirement for deflators for the rental and leasing activity.

The main sources of information used in this paper include papers and presentations presented at previous Voorburg meetings, the results of a survey on international practices for quality adjustment conducted in the summer of 2009 and 2010 and various manuals on sources and methods such as the System of National Accounts 2008 and the Eurostat Handbook on Price and Volume Measures in National Accounts.

The paper is organized as follows. Sections 2.0 and 3.0 cover elements previously discussed in the Revisited Sector Paper on Rental and Leasing Services presented at the 24<sup>th</sup> Voorburg Group meeting in 2009. Section 2.0 revisits the industry and product classifications and pricing mechanisms while Section 3.0 touches on the definition of output: net or gross service (excluding or including the good rented). Section 4.0 discusses the conceptual requirements of the System of National Accounts while Section 5.0 summarizes the quality adjustment methods currently used by NSOs. Section 6.0 briefly describes the Australian, American, Canadian and French practices and experiences related to producing estimates for Rental and Leasing. This section also touches on other practical considerations and issues related to price measurement of rental and leasing activities and their treatment in the Canadian (CSNA) and French System of National Accounts.

## 2.0 CLASSIFICATION OF INDUSTRY OUTPUT AND PRICING MECHANISMS USED BY THE INDUSTRY

### Classification systems

Several different classification systems are currently in use by member countries of the Voorburg group however they are all fairly homogenous in the area of Rental and Leasing Services at the higher levels of the classifications systems. The classification systems used and their definitions are outlined below:

Table 1: Summary of Industry Classification Systems

<i>Classification system</i>	<i>Division/Sub-Division/Major Group</i>	<i>Sub-Groups</i>
<i>Australian and New Zealand Standard Industrial Classification (ANZSIG 2006, Revision 1.0)</i>	<i>Division L – Rental, Hiring and Real Estate Services</i>  <i>Sub Division 66 – Rental and Hiring Services (Except Real Estate)</i>	<i>661 - Motor Vehicle and Transport Equipment Rental and Hiring</i>  <i>662 - Farm Animal and Bloodstock Leasing</i>  <i>663 - Other Goods and Equipment Rental and Leasing</i>  <i>664- Non-financial intangible assets (except copyrights) leasing</i>
<i>International Standard Industrial Classification (ISIC, Revision 4)</i>	<i>Division 77 – Rental and Leasing Activities</i>	<i>771 - Renting and Leasing of Motor Vehicles</i>



		<p>772 - Renting and Leasing of Personal and Household Goods</p> <p>773 - Renting and Leasing of Other Machinery, Equipment and Tangible Goods</p> <p>774 - Leasing of Intellectual Property and Similar Products, Except Copyrighted Works</p>
<p>Statistical Classification of Economic Activities in the European Community (NACE, Revision 2)</p>	<p>77 - Rental and leasing Activities</p>	<p>77.1 - Renting and Leasing of Motor Vehicles</p> <p>77.2 Renting and Leasing of Personal and Household Goods</p> <p>77.3 Renting and Leasing of Other Machinery, Equipment and Tangible Goods</p> <p>77.4 Leasing of Intellectual Property and Similar Products, Except Copyrighted Works</p>
<p>North American Industrial Classification (NAICS 2007)</p>	<p>Group 53 - Real Estate and Rental and Leasing</p>	<p>5321 - Automotive Equipment Rental and Leasing</p> <p>5322 - Consumer Goods Rental</p> <p>5323 - General Rental Centres</p> <p>5324 - Commercial and Industrial Machinery and Equipment Rental and Leasing</p> <p>533 - Lessors of Non-Financial Intangible Assets (Except Copyrighted Works)</p>

Although there some small differences in the definition of the service between classification systems, the most significant portion of the service can be broadly defined as the renting and leasing of tangible assets such as automobiles, computers, consumer goods and industrial machinery and equipment to customers in return for a periodic rental or lease payment. Typically only operating leases are included and financial leasing is excluded from this activity. Financial leasing is characterized by the fact that the term approximately covers the expected life of the asset and the lessee acquires the benefits of its use and takes all the risks associated with its ownership. Distinguishing between financial and operating leases is sometimes difficult. For both (operating) lease and rental transactions, the contractual periods can vary considerably. In general, however rental agreements are usually concluded for periods of a few months or less. Lease transactions are generally concluded for equipment to be used for a long period of time, usually more than a year.

From a product classification perspective, three product classifications are currently used by NSOs: the Central Product Classification Version 2 (CPC Ver. 2), the Classification of Products by Activity (CPA 2008) and the North American Product Classification System (NAPCS Ver. 1). All these product classification systems include rental or operating leasing of machinery and equipment and personal and household good without an operator. Again, financial leases are excluded.

A more complete discussion of the classification of the activity by industry and by product was covered in the Revisited Sector Paper on Rental and Leasing Services.<sup>i1</sup>

## Pricing Mechanisms

As the industry classification reflects it, the pricing mechanisms used by rental firms depend mainly of the type of good rented and the term of the rental or the lease. Short term rentals typically specify the category of the good rented, instead of the specific brands and models, as is usually the case with long term leases. Factors such as the day of the week or the class of customer (business vs. households) can influence the rental price. These two specific factors are usually highly correlated.

In addition to list prices, contract prices are available, especially for long term leases. For other transportation equipment leases, the customers and the contracts are often unique, and distinguishing between operating and financial leases is difficult.

Usually, the monthly rental amount remains stable for long term leases. As well, the prices of old and new contracts can change differently. The inclusion of additional services, such as maintenance, insurance and usage limits can also affect the rental price.

## 3.0 DEFINITION OF THE OUTPUT: NET OR GROSS SERVICE

### Definition of output

Typically in the rental and leasing industries, the unit of measure for equipment rental is based on the time period that the equipment is in use or can be in use (some contacts specify that explicitly), expressed as price in currency units per hour, day, week, month or year.

According to the paper presented by Aurél Kenessey to the 20<sup>th</sup> meeting of the Voorburg Group in 2005<sup>2</sup>, three basic options for defining the output and pricing approaches of the rental and leasing activity are possible. These are:

#### Output is the rental service only

In this approach, also known as the “net approach”, the output is essentially treated as an intermediation service (like distributive trade) strictly defined as the provision of rental service excluding the value of the good being rented.

#### Output is a bundle combining the rental service and the rented good

Intuitively, the inclusion of the rented good in the definition of the service provided by the rental industry is reasonable. From the renter’s perspective, the rental transaction provides access to a tangible physical asset and it follows that the rental fee for the good covers some of the costs associated with owning and maintaining the asset (depreciation, interest costs) as well as the rental service. From the rental firm’s perspective, this definition of output is consistent with the industry turnover.

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<sup>1</sup> Fred Barzyk, Yana Mazin, Revisited Sector Paper: Rental and Leasing Services, (Statistics Canada, Canada, 2009) p. 1-3.

<sup>2</sup> Aurél Kenessey, Rental PPI’s: quality adjustment for changes in goods rented, (CBS Netherlands, 2005), p.2.

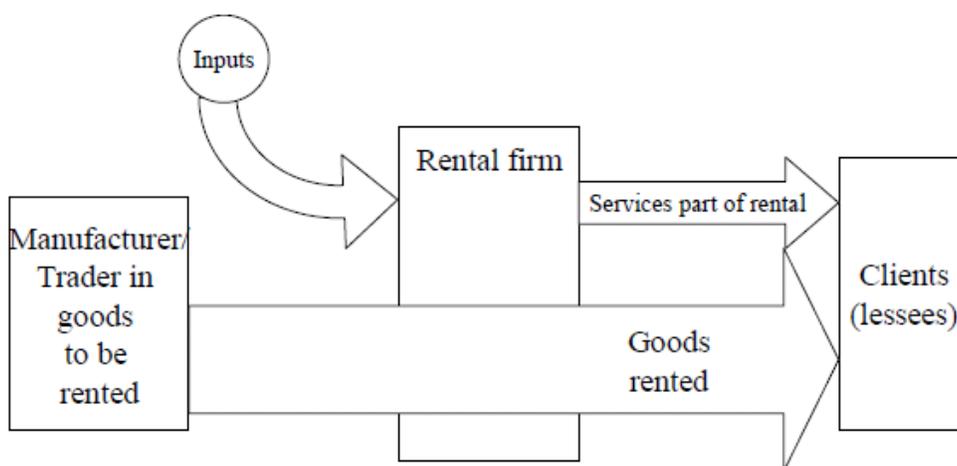
### Output is the good rented

Strictly speaking, nobody defines the output of rental services as the good rented only. Only when no price for the rental service can be observed does the Eurostat Handbook on Price and Volume Measures in the National Accounts recommend using the price index of the good rented as a proxy to the price index of the rental service provided. It is clearly a second best-approach and is not discussed further here, although this problematic can be recognized in section 5.0 on the explicit quality adjustment methods for the “gross rental service”.

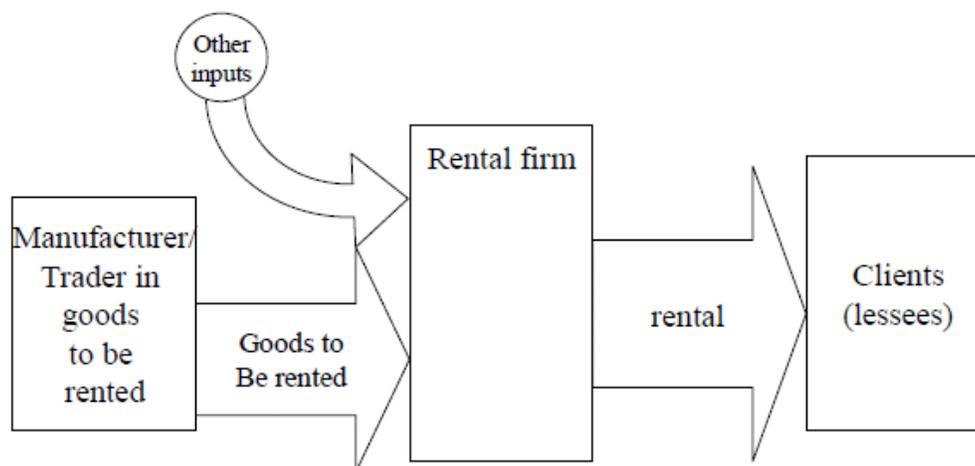
### Gross vs. Net

Kenessey outlines the concepts of the “net” and the “gross” approach using the diagrams below. Different approaches for the quality adjustment of price indexes are required based on the output concept chosen.

*Net approach:*



*Gross approach:*



Kenessey explains that, according to the definition of the output adopted, the amount of the output and the rules for quality adjustment are quite different: in the “net approach”, the output should exclude the good rented and no quality adjustment for the good is required; conversely with the “gross approach”, the

output includes the good being rented and the quality of that good should be taken into consideration.

## 4.0 Conceptual requirements of the National Accounts: the gross approach

Gross domestic product (GDP) in constant prices can be estimated two ways: the output approach or the expenditure approach. Countries may choose to compile their GDP estimates using either one of these approaches depending on the strengths and weaknesses of their respective data sources, however combining both methods into one integrated framework will ordinarily yield the best results.

Using the supply and use framework, it is possible to separate current price GDP estimates into separate price and volume measures. There are two basic accounting constraints in the supply and use framework. These are:

- Product identity: output + imports + transport margin + trade margin + taxes - subsidies on the products = intermediate consumption + final consumption expenditure + gross capital formation + exports
- Industry identity: output = intermediate consumption + gross value added

For the product identity, ideally each element within the identity (by product) is deflated using an appropriate price index to isolate the volume movement of each element. For the industry identity, after decomposing the output and intermediate consumption by product and deflating, the double deflation method is used to arrive at the gross value added in constant prices. The results can then be compared to evaluate the reliability of the results and reconcile the estimates.<sup>3</sup>

The SNA is quite specific about the definition and treatment of Rental and Leasing activity: "When the asset is actually rented under an operating lease or similar contract, the rental is recorded under intermediate consumption as the purchase of a service produced by the lessor" and "the rental needs to be large enough to cover (i) any direct costs incurred by the owner including the costs of maintaining the asset, (ii) the reduction in the value of the asset over that period (the consumption of fixed capital) and (iii) the interest costs in the value of the asset at the start of the period".<sup>4</sup> As such, it follows that defining rental service under the "gross approach" (described above) as a bundle that includes the rental service and the good being rented is conceptually consistent with the SNA requirements.

The Eurostat Handbook on Price and Volume Measures in National Accounts is also quite specific about the requirement for quality adjusting the rented good: "It should be noted that changes in the quality of the item rented (i.e. not only of the rental service) should also be reflected in the volume of the rental services."<sup>5</sup>

It should be noted that the System of National Accounts treats financial leasing as an intermediation service via a "net approach". The good is considered to be sold from the manufacturer to the user, and a loan is imputed between the "lessor" (financial institution) and the "lessee" (the borrower). As the loan is a financial transaction only, the quality of the good rented does not enter into account in the quality of the financial leasing.

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<sup>3</sup> Handbook on Price and Volume Measures in National Accounts, (Eurostat, European Communities, Luxembourg, 2001), p. 7-8.

<sup>4</sup> System of National Accounts 2008, Paragraph 6.245, p. 124.

<sup>5</sup> Handbook on Price and Volume Measures in National Accounts, (Eurostat, European Communities, Luxembourg, 2001), p. 101.

### Potentially double counting the quality adjustment in the National Accounts

During the discussion of this topic in the 2009 session of the Voorburg group, some participants expressed the view that an SPPI for rental services should not be adjusted for the change in quality of the good being rented as this practice would lead to a double counting of the quality adjustment in the GDP estimates (once in Gross Fixed Capital Formation (GFCF), the second time in household final consumption if the lessee is a household).

The SNA 2008 and the Eurostat handbook are quite clear in their recommendations for operating lease (the treatment of financial lease can be seen as a "net rental service" as defined in section 3.0). As a result of the recommendations, double counting in the GDP is a possibility, but is it a significant issue?

In addressing this issue, it should be noted that such a double counting in GDP is quite well known in the case of dwellings: both their quantity and quality are recorded once in GFCF, and a second time in actual or imputed rentals, part of the final consumption of households.

As well, GDP is not the pure measure of welfare that most people would like to see. Net measures such as Net Domestic Product and Net National Income are available better suited for this type of analysis. Rather, GDP should be considered as the means of reconciling the product and industry identities, both estimated in gross values (see beginning of this section). In addition to being part of GDP, each of these aggregate has its own logic and interest and should be measured without omissions:

- Final Consumption (especially actual final consumption of households as a direct estimate of economic welfare): The recommendations of SNA 2008 and of Eurostat Handbook on price and volume measures in national accounts guarantee a unique accounting of the quantity and quality of the goods used in the either the direct purchases of households or in rents by households;
- Inputs and production functions of the lessee: If the lessee is an enterprise, and if the good rented or purchased is a fixed asset, any reasoning on the productivity of the industry must take into account the quality change of this input. In the case of rental or leasing, the intermediate consumption of the "gross rental service" must be quality adjusted on the good rented, as is the Gross Fixed Capital Formation of the good purchased;
- Inputs and production function of the lessor: Consistent with the payment flows for good, the good rented is recorded in GFCF of the lessor. If the output of the lessor is not quality adjusted on the good rented, then the productivity of the lessor could decrease or be negative;
- Net Value Added of the lessee: This approach is considered as more relevant than Gross Value Added as it is a close proxy to the true cost of capital. The Net Value Added is derived by subtracting the "consumption of fixed capital" from the Gross Value Added. As this amount represents the main part of the rental, the Net Value Added represents the difference in costs between purchasing and renting the assets. Of course, the share between volume and price should also be consistent. As the Consumption of Fixed Capital is aligned with the breakdown of Gross Fixed Capital Formation and takes into account the quality of the good, so should the intermediate consumption in gross rental service;

Net Domestic Product and Net National Income are sometimes considered better estimates of economic welfare than final consumption from a sustainability perspective. There is no "double counting" in these aggregates, as the quality of the

good rented is counted once positively with the GFCF and once negatively with the CFC.

## 5.0 Pricing methods and quality adjustment practices by NSOs

### Pricing Methods

The Revisited Sector Paper on Rental and Leasing Services identified many countries that currently produce producer price indexes for the rental and leasing activity. These countries identified several pricing mechanisms for producing SPPIs for rental and leasing. These include:

#### Direct use of prices of repeated services

This pricing method involves surveying real transaction prices for a service or package of services that occur each period<sup>6</sup>. Widely accepted as the best and most straightforward pricing method, this method is used by most countries for pricing rental services. Survey respondents are asked to report the price for renting a specific product for a specified period of time that may be repeated throughout the duration of the rental contract.

#### Unit value pricing

With this pricing method, the price is calculated by dividing revenues from sales of services by the quantity of delivered services<sup>7</sup>. This method is also quite popular with countries producing rental and leasing SPPIs.

#### Contract pricing

Some countries also reported using contract pricing to price rental and leasing services. With this method, real transaction prices are used when the same provider delivers a repeat service to the same client across survey periods.<sup>8</sup>

#### Model pricing

Model pricing, the estimation of price for a standardised product ("model") which is not transacted in the survey period<sup>9</sup> is also used by some countries but less so than other methods.

The table below summarizes the coverage by country expressed according the ISIC classification (even though several other classifications are used). Additional details are available in the Revisited Sector paper.

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<sup>6</sup> Tom Langer, John Murphy. Glossary of Voorburg Group Terminology of Mini-Presentations, Sector Papers and Revisited Sector Papers, (Voorburg Group, 2009), p. 10.

<sup>7</sup> Methodological Guide for Developing Producer Price Indices for Services, (Organisation for Economic Co-Operation and Development, European Communities, 2006), p. 150.

<sup>8</sup> Langer, Murphy, p. 8.

<sup>9</sup> Methodological Guide for Developing Producer Price Indices for Services. p. 147.

Table 2: Summary of Rental and Leasing SPPIs and Pricing Methods by Country

Country	Coverage (ISIC)	Pricing methods
Australia	7710 (7711A, 7711B, 7712), 7730	• Direct use of repeated prices
Canada	7730	• Direct use of repeated prices
Czech Republic	7710, 7730 (7732, 7739)	• Direct use of repeated prices
Finland	7730 (7732)	• Direct use of repeated prices
France	7710 (7711A, 7711B, 7712), 7721, 7729, 7730	• Direct use of repeated prices • Contract pricing • Very few unit values
Japan	7710 (7711A, 7711B, 7712), 7730	• Direct use of repeated prices • Contract pricing
Netherlands	7710 (7711B, 7712)	• Contract pricing
Norway	7710 (7711A, 7711B)	• Unit values
South Korea	7710 (7711A, 7711B), 7730	• Direct use of repeated prices • Model pricing
Sweden	7710, 7730	• Unit values • Direct use of repeated prices
U.K.	7712, 7730	• Direct use of repeated prices • Contract prices
U.S.A.	7710 (7711A, 7712), 7730	• Direct use repeated prices (Net transaction prices) • Unit values

**Note:**
ISIC Definitions

- ISIC 7710 Renting and leasing of motor vehicles
  - NACE 7711A Renting and leasing of cars and light motor vehicles – short term
  - NACE 7711B Renting and leasing of cars and light motor vehicles – long term
  - NACE 7712 Renting and leasing of trucks and heavy motor vehicles
- ISIC 7721 Renting and leasing of recreational and sports goods
- ISIC 7722 Renting of video tapes and disks
- ISIC 7729 Renting and leasing of other personal and household goods
- ISIC 7730 Renting and leasing of other machinery, equipment and tangible goods
  - NACE 7732 Renting and leasing of construction and civil engineering machinery and equipment
  - NACE 7739 Renting and leasing of other machinery, equipment and tangible goods

Methods of quality adjustment can be either implicit or explicit. Implicit methods, utilize measurement techniques to compare the old product with its replacement and estimate the amount of quality change. These include the overlap method, overall mean/targeted mean, class mean imputation, comparable replacement, linked to show no price change and carry forward.

Explicit methods on the other hand are methods where an explicit adjustment is made for quality, usually based on external information. Explicit methods include expert judgement, quantity adjustment, differences in production/options costs and hedonic methods.<sup>10</sup>

It should be noted that some of these methods may not be appropriate for quality adjusting services mainly due to the lack of identifiable quality factors. Methods deemed more appropriate for services are the overlap method, comparable replacement, quantity adjustment, differences in production/options costs and hedonic methods.

<sup>10</sup> Producer Price Index Manual, Theory and Practice, (International Monetary Fund, Washington D.C., 2004), Chapters 7.75-7.135

In the case of (gross) rental services, the main point is that an explicit quality adjustment to control for a change of quality of the good rented is necessary. In his previous Voorburg Group contribution, Aurél Kenessey noted: "It is important to note that the quality adjustment for a quality change of the good rented belongs only to the goods part of the rental service. If for example a quality change of a good is valued at 50%, the quality adjustment is not 50% to the rental price, but only 50% to the part of the rental price that belongs to the good. The service (intermediation) part of rental does not have a different quality if the good has a different quality. Quality change in the intermediation part of rental consist of a change in the activities that make the good available to the client, like delivering the rental equipment to the clients premises instead of having the customer come to the outlet."

In an additive view, consistent with his schemes, Aurél Kenessey notes that countries who adopt an explicit quality adjustment relying on the quality of the good rented risk overestimating the quality adjustment in the rental service. On the other hand, there may be many auxiliary services (maintenance, insurance...) contributing to the full rental service so that the quality adjustment of the good can be attributed to the full service.

## Quality adjustment methods currently used by NSOs for Rental and Leasing

Of the countries producing SPPIs for rental and leasing<sup>11</sup>, 8 responded to a follow up survey on quality adjustment methods. Although there are a wide variety of potential quality adjustment methods available to price statisticians, in practice, only a small number are actually used in production. Both implicit and explicit methods are currently in use. The quality adjustment methods used by responding countries are identified below:

Table 3, Quality adjustment methods currently in use

Country	Quality adjustment method
Australia	<i>Implicit: overlap method, comparable replacement, class mean imputation</i> <i>Explicit: differences in production/option costs</i>
Canada	<i>Explicit: expert judgement, quantity adjustment, differences in production/options costs</i>
France	<i>Implicit: overlap method,</i>
Japan	<i>Explicit: expert judgement</i> <i>Implicit: hedonics, differences in production/option costs</i>
Netherlands	<i>Explicit: expert judgement</i> <i>Implicit: imputation</i>
Sweden	<i>Implicit: overlap method, comparable replacement</i>
U.K.	<i>Implicit: linked to show no price change</i> <i>Explicit: expert judgement</i>
U.S.A.	<i>Explicit: expert judgement</i>

<sup>11</sup> Barzyk, Mazin, 2009, p. 13.

## Price specifications, services vs. goods

All countries producing service producer price indexes for rental and leasing services ask very detailed specifications about the rental products and service terms. These detailed specifications allow for quality adjustments to both the rental product and the service. The detailed specifications allow price index specialists to track the products through time and isolate the pure price change from the quality change. In general, more detail is collected for product specifications than service specifications.

Typical product specifications include type of rented good (car, truck, equipment) and several characteristics such as model, brand, model year, capacity, horsepower and other identifying characteristics.

Conditions of service typically requested include duration of rental, distance included in rental or lease (motor vehicle rental), inclusion of insurance and other miscellaneous fees and services, sometimes day of week. Many countries also ask for the type of customer (household or business). This question is usually linked to the duration and/or the day of week

In Canada, in addition to detailed product and service specifications, respondents are asked to provide a breakdown of the reasons explaining the price change. The survey covers 7 potential reasons for price change (Overheads, Market conditions, Inflation, Exchange rates, Change in the equipment, Change in contract terms, other changes in service). The information for the last three categories is used for quality adjustment of the particular item. A similar approach is used in the U.K where the respondent is asked to provide justification for any price movement. If the reason for movement is a genuine price increase (such as market forces pushing price up or down, increase in costs or raw materials etc) the price change is accepted. However, any price change relating to a change in specification is quality adjusted.

## Use of SPPIs as deflators in the National Accounts

Most countries responding the survey use a "gross service value" for defining operating rental and leasing. Some countries already use SPPIs as deflators (France, United Kingdom, Japan, Norway, Czech Republic and the United States) in their National Accounts. Canada plans to incorporate the SPPIs into the deflation methodology of its National Accounts but has not yet done so as the index was only recently published. The Netherlands, on the other hand, produces indexes that are not used in the SNA.

## 6.0 Selected country approaches

### Australia

The "overlap method" is used when there is at least one period when both services/products are on sale in the market at the same time.

When the two services are not available in the market at the same time, indirect methods are used to quantify the change in quality. This occurs frequently for goods such as motor vehicles, where producers cease all production of an older model when a new model is introduced. In these cases, it is necessary to estimate the relative prices of the old and new models, had they been sold in the market at the same time. The estimated relative price then gives an indication of the measure of the relative qualities. In many cases, the difference between the old and new products is a matter of size or dimension and the difference in price is readily determined by considering the per unit price. In motor vehicle rental services, differences in

distances would be estimated when the rental company changed the pick-up/drop off locations.

In some cases, the “differences in production costs method” is used. Quality differences are identified and values are assigned to the differences. Often the composition of a particular product changes because of the use of different materials or the addition or deletion of particular features. For motor vehicle leasing, “not including petrol” would be a change in the quality of the service that would lead to a reduced cost of the service.

Despite the efforts to quantify exact differences in quality, circumstances occasionally arise where insufficient information exists to value the differences between two models of a product/service. In such cases it is still necessary to make a quality adjustment to allow comparison of prices. In the absence of any other information, the strategy employed is to consider the problem in two parts:

- If the old service/product had existed in the current period, how much would the price have changed between the current and previous period? What would the price have been in the current period?
- If no information is available, the quarterly movement in the price of the old service / product needs to be estimated from the price movements of similar products.

## United States

The U.S. PPI approach for rental services is unique in that, of the countries responding to the 2009 and 2010 surveys, the U.S. is the only country to use the “net approach” to define its pricing concept for the service.

The U.S. approach is outlined clearly in Michael Holdway’s paper delivered at the 20<sup>th</sup> meeting of the Voorburg Group. The argument however is limited to “leasing” and excludes “rentals”<sup>12</sup>:

“If the services provided by lessors are primarily viewed as tax and accounting benefits relative to bank loans (which lessors claim), then assets acquired through leases are no more outputs of leasing industries than assets acquired through lending are outputs of the banking industry.”

“Since lessor outputs are generally viewed as substitutes for bank loans, it may be desirable to develop a lessor pricing methodology that is more symmetric with the current methodology used by the PPI for banking.”

“If assets in leasing transactions undergo quality change, such change may not provide a reliable indicator for change in the services produced by lessors.”

The U.S. PPI considers the provision of rental services as the output being measured, not the asset that is rented. For this reason, in passenger car rental service, the U.S. PPI prices the current year automobile model and would not quality adjust when they change from one model year to the next. For example, if the passenger cars that are rented change from one model year to the next, the rental agreement prices are directly compared and no quality adjustment is performed. The same service is provided regardless of the model year.

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<sup>12</sup> Michael Holdway, Conceptual issues that influence measures of output and price change in the leasing industry, (BLS, United States of America, 2005).

For leasing transactions, the unit value pricing strategy used assumes that the quality of the service provided, a very narrowly defined asset class is consistent over time and quality adjustment is not needed.

Nevertheless, the U.S. PPI would only make a quality adjustment for the equipment when that change resulted in a different service being provided. For example, if there were changes in a rental agreement such that the capacity of a dump truck being rented doubled. In this case, the service provided is considered to have changed (the truck can haul double the amount) and the respondent would be asked to provide a value for the change in service. For the most part, this value would be related to the producer cost for the substitute piece of rental equipment, allowing the U.S. PPI to explicitly adjust the quality using this producer cost.

The U.S. PPI has avoided pricing leasing where there are frequent changes to the leased assets because there is no agreement about whether or not the lease should be quality adjusted for changes in the leased asset.

The U.S. Bureau of Economic Analysis (BEA) uses several BLS SPPI series to deflate industry gross outputs in its SNA estimates. The following rental series are used:

BLS PPI series	SNA industry
PPI 532111532111P Passenger Car Rental Primary Services	532111 Passenger Car Rental and Leasing
PPI 5321205321204 Truck Leasing PPI 5321205321201 Truck Rental PPI5321205321206 Truck Trailer, Utility Trailer, and RV rental and/or leasing	532120 Truck, Utility Trailer, RV Rental and Leasing
PPI 532412532412 Other Heavy Machinery Rental and Leasing	532412 Construction, Mining and Forestry Machinery and Equipment Rental and Leasing

Since the BEA are deflating gross output for these industries, they use the BLS indexes without making any further adjustments to account for the fact that the BLS indexes are defined using the net approach (i.e. the BLS does not quality adjust for changes in the underlying value of the asset).

Although this approach might not be ideal, it highlights an important point about the construction of SNA estimates. In constructing SNA estimates, national accountants often need to use imperfect data sources and make compromises as these data sources don't always meet the correct conceptual requirements. Furthermore, there are many examples where countries have not adopted the recommendations of the System of National Accounts, often for very practical reasons.

## Canada

Rental and leasing activity is measured quite thoroughly by Statistics Canada programs. Turnover surveys collect financial and operating data by industry as well as product (commodity) information while the CSNA and SPPI programs provide GDP estimates and price indexes for the sector. These programs are discussed in greater detail below.

The sector/activity is also covered by many other programs such as productivity estimates, income surveys (Labour Force Survey, Survey of Employment and Payroll Hours) and the Consumer Price Index. These programs are not discussed here.

### Canadian Annual Survey of Service Industries – Automotive Equipment Rental and Leasing

This annual sample survey collects the financial and operating data needed to produce statistics on the Automotive Equipment Rental and Leasing industry in

Canada. The Automotive Equipment Rental and Leasing survey comprises establishments primarily engaged in renting or leasing vehicles, such as passenger cars; passenger vans, trucks, truck tractors, buses, semi-trailers, utility trailers and RVs (recreational vehicles), without drivers. The survey collects the following variables which are used to compile the CSNA estimates described below: Operating revenue, Operating expenses, Operating profit margin, Salaries, wages and benefits.

#### Canadian Annual Survey of Service Industries - Commercial and Industrial Machinery and Equipment Rental and Leasing

This annual sample survey collects data required to produce economic statistics for the Commercial and Industrial Machinery and Equipment Rental and Leasing industry in Canada. The survey covers establishments primarily engaged in renting or leasing commercial and industrial machinery and equipment, without operator and collects the following variables: Operating revenue, Operating expenses, Operating profit margin, Salaries, wages and benefits. These data are used to compile the CSNA estimates described below.

#### Canadian Commercial and Industrial Machinery and Equipment Rental and Leasing Services Price Index

Canada published its Commercial and Industrial Machinery and Equipment Rental and Leasing Services Price Index in August 2010. The index is published quarterly but monthly data is available from the third quarter of 2006.

The price survey is a sample survey with a cross-sectional design and a longitudinal follow-up. The target population consists of all establishments primarily engaged in commercial and industrial machinery and equipment rental and leasing services as identified on Statistics Canada's Business Register. The respondents are selected through a probability sample survey proportional to the significance of their revenue and based on the region they are located in. The sample size is approximately 350 establishments. Weighting information is derived from the Annual Survey of Service Industries - Commercial and Industrial Machinery and Equipment Renting and Leasing (described above).

The price concept adopted in Canada is the "gross approach" where the service is defined as a bundle that includes the good being rented and provision of rental services. Transaction prices are collected and each firm in the sample is asked to provide price changes for three representative lease or rental contracts which are tracked over time.

No implicit quality adjustment methods are used for the Machinery and Equipment Rental and Leasing SPPI. Although imputation is used in the computation of the indexes for missing values, imputation is not used specifically within the quality adjustment process.

The quality adjustment method for this index is explicit in the sense that data for the quality adjustment comes directly from the respondent. As described in section 5, respondents are asked to provide a breakdown of reasons explaining the price change of a particular product. These breakdowns are used to adjust for changes in equipment, changes in the terms for the rental/leasing agreement and for other changes in service. Since the inception of the index, 27% of reported prices changes are due to quality change and are subject to quality adjustment.

It is difficult to classify the method used in Canada to any specific category of explicit quality adjustment methods. The method is closest to the "differences in production/options costs" approach but is not focussed entirely on production costs. The approach has proven to be quite effective in that respondents have been able to

provide the data and that the information can be easily incorporated into the quality adjustment process. Respondents may substitute unrepresentative or unavailable equipment with different products at any time provided that details on price change reasons are also provided allowing for quality adjustment.

### Canadian System of National Accounts Estimates for Rental and Leasing

Several products in the Canadian System of National Accounts (CSNA) publish data on the Rental and Leasing Industry: the Annual Current Price Input Output (IO) Accounts, the Annual Constant Price Input Output Accounts, the Monthly Industry GDP program and the Provincial Industry GDP program. As well, labour productivity and multi-factor productivity estimates contain industrial detail pertaining to rental and leasing. Only the IO accounts and the Monthly GDP program are discussed here.

### Current and Constant Price IO Estimates

The Input Output tables (in current and constant prices) contain 2 rental industries:

- Automotive Equipment Rental and Leasing
- Renting and Leasing Services (except Automotive Equipment)<sup>13</sup>,

and their associated outputs (products):

- Motor Vehicle Renting and Leasing Service
- Computer Equipment Renting and Leasing Service
- Office Machinery and Equipment Renting and Leasing Service
- Commercial and Industrial Rental and Leasing Service
- Other Goods Rental and Leasing Services

Current price IO estimates for rental and leasing are derived directly from the revenue and expense data available from Statistics Canada turnover surveys covering the sector (described above). Up until August 2010, there were no producer price deflators for the Rental and Leasing sector. As such, estimates of rental and leasing in the constant price IO accounts were derived by deflating the rental products using other available but less optimal price indexes such as Industrial Product Price Index, the Machinery and Equipment Price Indexes and the Consumer Price Index. These indexes track the production prices and the final selling prices of the goods rented but are not intended to measure the price change of rental and leasing services and as such are second best approaches for deflating service outputs.

### Monthly Industry GDP Estimates

The current and constant price estimates of GDP by industry estimated from the IO Accounts are only derived annually with a 2.5 year lag from the reference period. For the years following the most recent IO Accounts, real monthly GDP by industry can only be obtained by projecting the relationship between real gross output and real valued added, which holds over short periods of time. That is, the volume of value added generated from a given volume of output for a specific industry is generally constant over short periods of time, as major technological changes are required to change significantly this relationship. To estimate on a monthly basis the real value added by an industry, indicators of real output, employment, or real inputs

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<sup>13</sup> Renting and Leasing Services (except Automotive Equipment) includes Consumer Goods Rental Services, General Rental Centers, Commercial and Industrial Machinery and Equipment Rental and Leasing Services and Lessors on Non-Financial Intangible Assets and their associated products.

are used to project the relationship between these characteristics and value added, as determined from the deflated IO Accounts.<sup>14</sup>

With respect to the Motor Vehicle Rental and Leasing monthly revenues derived from monthly taxation data (Goods and Services Tax) are used to project the output/GDP relationship derived from the IO accounts. These revenues are first deflated using the Consumer Price Index. For Rental and Leasing (Excluding Motor Vehicle), sub-annual revenue information is not available. As such, monthly constant price value added is derived by mechanically distributing annual IO based estimates among the months in such a way that the resulting monthly series has a smooth transition from one year to the next while the sum of the months match the annual values. This is achieved by applying the quadratic minimization technique.<sup>15</sup>

The availability of the new price index for Commercial and Industrial Machinery and Equipment Rental and Leasing, will allow national accountants to directly deflate machinery and equipment rentals which will likely lead to changes the constant dollar CSNA estimates because there are significant differences between the newly published index and the indexes used in the current CSNA methodologies.

#### Other Considerations and Issues in Canada

##### *Incomplete Coverage*

The Canadian SPPI program is relatively new and much development remains. The coverage of the services sector is incomplete. With respect to the Rental and Leasing Sector, the program currently includes the Commercial Rent Price Index covering the NAICS industry 531120 - Lessors of Non-Residential Property and the Commercial and Industrial Machinery and Equipment Price Index described above. Although the remaining industries in the sector are in scope for development, the development of indexes in this area has not yet begun. Until new indexes are developed, in compiling CSNA estimates, national accountants will continue filling data gaps with available deflators that may not be ideally suited for deflating services.

##### *Industry Indexes vs. Commodity Indexes*

The Canadian SPPI program produces mainly industry price indexes. Due to the lack of an official classification of products and appropriate weight sources for service products<sup>16</sup>, the development of new SPPIs has focussed on industry indexes. Nevertheless, the CSNA requires commodity deflators. For the Rental and Leasing activity, deflators are required for the following products:

- Motor Vehicle Renting and Leasing Service
- Computer Equipment Renting and Leasing Service
- Office Machinery and Equipment Rental and Leasing Service
- Commercial and Industrial Rental and Leasing Service
- Other Goods Rental and Leasing Services

The SPPI indexes however are produced at a very detailed aggregation level that in many cases is sufficient for deflating commodities. The assumption being that at a very detailed level of aggregation the industry output and the specific products

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<sup>14</sup> Definitions, data sources and methods, Monthly GDP, <http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=1301&lang=en&db=imdb&adm=8&dis=2>

<sup>15</sup> Gross Domestic Product by Industry, Sources and Methods With Industry Details, Statistics Canada, Catalogue no. 15-548-XIE, Ottawa, 2006, p. 341-343.

<sup>16</sup> The North American Product Classification System was still being developed when SPPI development started a few years ago. Furthermore, for several industries a suitable source of commodity weights was not available.

produced by industry are one and the same, or at least very close. This is certainly the case for the Commercial and Industrial Machinery and Equipment Rental and Leasing Price Index which publishes separate aggregations for "Construction, Transportation, Mining, and Forestry Machinery and Equipment Rental and Leasing" and "Office Machinery and Equipment Rental and Leasing and Other Commercial and Industrial Machinery and Equipment Rental and Leasing". These individual indexes will be used to deflate the related products (listed above) in the IO accounts.

#### *Timeliness of the indexes*

Monthly data for the Commercial and Industrial Machinery and Equipment Rental and Leasing Price Index is collected and published quarterly. Although monthly collection and publication was the preferred option, the option was rejected as costs were prohibitive. The option of publishing monthly data on a quarterly basis satisfies most of the requirement of the CSNA in terms of timeliness with the exception of the Monthly Industry GDP program where for two months every quarter, deflators are not yet available. This issue applies to all new SPPIs published recently published by Statistics Canada including the Commercial and Industrial Machinery and Equipment Rental and Leasing Price Index, the Wholesale Services Price Index, the Commercial Rents Price Index and the For-Hire Motor Carriers of Freight Price Index. National accountants are presently investigating methodology options for dealing with this discrepancy.

## **France**

### French Annual Survey of Service Industries – "Enquêtes Statistiques Annuelles d'Entreprises (ESANE)"

This annual sample survey, along with the annual income tax data, provides all the Structural Business Statistics requested by Eurostat and other users. It provides the breakdown of turnover at the 5 digit level, in order to measure both "homogeneous branches" (in NACE) and products (in CPA) which are similar concepts in the European classifications. These data update the register of legal units SIRENE and are the comprehensive source of the National Accounts, where the Supply and Use Table is built in products x "homogeneous branches" (~ products x products).

### French five-year survey in SPPI, by field surveyors

These ESANE data (breakdown of turnover at the 4-5 digit level) provide also the sampling frame for SPPI: most often a cut-off sample and the weights of the turnover by homogeneous branch / product of the year of the survey. A sub-classification of the activity/product is usually discussed with a professional union, more or less close to the CPA at 5 or 6 digits. The survey also contains the main features required for quality change (more precisely: quality classes). A technical note is written in order to provide guidance to field surveyors that visit the sampled enterprises and asked for representative items with weightings.

### French theory and practice with respect to quality change for rental and leasing services

Like in the industrial PPI, the French techniques for quality adjustment in the SPPI are predominately implicit quality adjustment methods. Defining the goods rented and the conditions of services with as much precision as possible provides better overlap and higher quality price indexes in most cases.

At any rate, the comparison of international methods and the thinking behind this note has raised two ideas, which will perhaps lead to modifications of the current

French practice for the treatment of quality in the future once the Voorburg group has given its opinion on these issues:

- Narrowly defined asset classes: The brand and the model are sometimes specified (Renault Clio...) in the French survey, to ensure that the good rented stays the same over time. Quite often however, it is only a narrowly defined asset class that is defined (category A, category B, etc.), with a list of representative brands and models. Over time these brands and models change in quality, even if they remain in the same class. This quality change should be taken into account, but it is unclear how it should be measured. The Industrial PPI and the CPI could provide these quality adjustments within each class, if and only if they measure an explicit quality adjustment for each of these classes (the global quality change among passenger cars, i.e. the difference between the price index change and the mean price change, is not a right indicator, as it would take into account the change of classes). Hence, in the French practice, this quality adjustment of the good rented is here omitted, neglected, without any concept of "net rental service";
- The age of the fixed asset: Strictly speaking, a Renault Clio built in 2006 is not the same product "in volume" in 2006 and in 2007. With the consumption of fixed capital, even with a good maintenance, the volume decreases over time. However, the rental service usually remains stable (especially for long term leases) or only distinguishes between large intervals of age.
  - For short term leases, it can reasonably be assumed that the average age remains stable within each formula (not so sure during economic crisis!).
  - For long term leases, and especially for other transportation equipment, the direct use of repeated prices would often lead to null price indices because the same specific lessor always rents the same unique good at the same price to the same lessee. This is misleading however because the price of new rental contracts for similar goods changes over time, more or less proportionally to the industrial price index of the good rented. Hence, the use of the industrial PPI is perhaps not a second best approach in that case? The interest rate would also need to be taken into account. In long term rental of motor vehicles, the French SPPI presently distinguishes between old and new contracts, weighted by their relative importance in the turnover. The prices of the old contracts change generally more moderately than the new contracts, but the economic crisis can also change this logical situation.

#### Use in the French National Accounts

The SPPIs for the rental and leasing activity are already used as deflators by the French annual National Accounts team, but not yet by the French quarterly National Accounts team, as they use an econometric approach and need historical data in the long term.

#### Other uses than National Accounts and alternative compilation of price indices

In the industrial PPI, several products are compiled and disseminated two ways:

- at basic prices, strictly consistently with National Accounts rules;
- at purchasers' (when purchasers are enterprises) prices, for the purpose of contract escalation.

Outside considerations for taxes and subsidies, the two series differ by the inclusion of intra-group transactions. Some series can be redefined for a better understanding by the professionals of the sector itself. For example, "other printing services (NACE

18.12) are compiled according to a concept “pure service (of labour)”, or according to the composition of the turnover (which can include paper supplied to the customers).

In the SPPI, advertising and publishing will be disseminated with or without quality adjustment on the audience. In rental and leasing services, it will not be possible to compile both series (quality adjusted or not on the good rented) as it would request explicit quality indicators that we do not collect.

## Appendix

### Summary of quality adjustment practices for rental and leasing services

1) What is the output of the industry?	Renting and leasing of tangible assets such as automobiles, computers, consumer goods and industrial machinery and equipment to customers in return for a periodic rental or lease payment.
2) How is this treated in the 2008 SNA?	The 2008 SNA considers operating lease as a (gross) service for the total payment, which must cover (i) any direct costs incurred by the owner including the costs of maintaining the asset, (ii) the reduction in the value of the asset over that period (the consumption of fixed capital) and (iii) the interest costs in the value of the asset at the start of the period, to be recorded in intermediate consumption (for a fixed asset). Hence, a bundle combining the rental service and the rented good.
3) How is this measured in practice by national accountants from different countries?	Most countries consider a "gross service value" for operating rental and leasing. Some countries already use SPPI as deflators (France, United Kingdom, Japan, Norway, Czech Republic, United States), some not yet (too new for Canada, which uses industrial PPI or CPI of the good rented). The Netherlands produces an index that is not used by their SNA.
4) Building on points 1-3, what does an increase in output look like? What about a decrease?	An increase in the (quantity and) quality of the good rented should be taken into account in the quality change of the rental service (explicitly mentioned by the European handbook on price and volume measures in national accounts), for instance the size or the performance of the asset. Of course, other features of the "net service" have to be considered, typically the use characteristics of the asset: duration of rental, distance travelled (motor vehicle rental), and some miscellaneous auxiliary services (inclusion of oil, insurances, maintenance).
5) Regarding the specific issue of pricing to constant quality, is the change in "features" a change in production function for the producing industry?	A change of good rented normally incurs a change of price for the lessor enterprise. But usually there is a perpetual positive change of quality without such a change in price.
6) Should, therefore, these changes be reflected as price or quality?	Both from a producer or a user point of view, the change of quality of the good rented should be reflected as a change of quality for the (gross) rental service provided.
7) What pricing mechanisms do industries in different countries use for this industry?	Category of good rented (or main characteristics) or specific brands and models / duration, day of the week / auxiliary services (inclusion of oil, insurances, maintenance) / type of customer (household or business) and of contract (old or new)
8) What pricing methods do NSO's use for SPPI's for this industry?	Direct use of repeated prices is the preferred practice. Contract prices are also followed. Some countries use expert judgements or option costs as explicit quality adjustments.
9) Are the comments in (3), (4), (5), (6), (7) and (8) consistent?	With the exception of the US, the most the comments seem very consistent.

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