



BOJ *Reports & Research Papers*

June 2018

Compilation Method of the “Wholesale Services Price Index” in Japan

Research and Statistics Department, Bank of Japan

Please contact below in advance to request permission when reproducing or copying the content of this paper for commercial purposes.

Research and Statistics Department, Bank of Japan

Tel: +81-3-3279-1111

Please credit the source when reproducing or copying the content of this paper.

Compilation Method of the “Wholesale Services Price Index” in Japan^{*}

Abstract

The Bank of Japan has started a full-scale development of the “Wholesale Services Price Index (WSPI),” intending to launch the index in mid-2019.

The transaction amount of wholesale services accounts for the largest portion of that of services not incorporated in Japan’s “Services Producer Price Index (SPPI),” produced and published every month by the Research and Statistics Department of the Bank of Japan. Therefore, the Bank had conducted the experimental survey for the WSPI since 2014 to accumulate practical know-how. The Bank’s new step also responds to the recent increasing needs of service sector’s statistical development for improving the accuracy of the GDP statistics in Japan.

This paper explains the methodology of compiling the WSPI (subject to change as the WSPI is currently under development), and provides a preview of the Japanese WSPI compiled by using data provided by cooperating companies as of May 2018.

Keywords: price index, wholesale service, GDP, statistical reform in Japan

^{*} This paper is an English translation of the original Japanese released on May 22, 2018 by the Price Statistics Division, Research and Statistics Department (Email: post.rsd3@boj.or.jp)

1. Introduction

The transaction amount of wholesale services accounts for the largest portion of that of services not incorporated in Japan's "Services Producer Price Index (hereafter, SPPI)," which is produced and published every month by the Research and Statistics Department of the Bank of Japan. Therefore, the Bank had conducted the experimental survey for prices of wholesale services since 2014 to accumulate practical know-how.¹

Following the experimental survey, the Bank has started a full-scale development of a "Wholesale Services Price Index (hereafter, WSPI)," intending to launch the index in mid-2019.² The Bank's new step also responds to the increasing needs in recent years of service sector's statistical development for improving the accuracy of the GDP statistics in Japan.

In this paper, we explain the methodology of compiling the WSPI (subject to change as the WSPI is currently under development), and we provide a preview of the Japanese WSPI compiled by using data provided by cooperating companies as of May 2018.

This paper is organized as follows. In Section 2, we discuss benefits of constructing the WSPI and explain the relevant policy of the new survey. Then, we explain the details of the compilation method of the WSPI in Section 3. Section 4 provides the tentative estimates of the Japanese WSPI. Section 5 concludes the paper.

2. Benefits of Constructing the WSPI and Relevant Policy of the New Survey

(1) Benefits of Constructing the WSPI

Wholesale trade sector is one of the most significant sectors in the Japanese economy. For example, the amount of products wholesaled is about 437 trillion yen (in 2016 by Economic Census), and the share in the nominal value added of the whole economy is 8.4% (in 2015 by the GDP statistics). Thus wholesale services should be in scope of the SPPI. However, until now, due to the difficulty in surveying their prices, the Bank regarded them as one of the "uncovered services" in the SPPI, and incorporating them has been a remaining issue.

In addition to measuring the price trends of wholesale services, there are several kinds of benefits which the WSPI will be able to yield, such as (a) use for deflators in the

¹ The details of the experimental survey are mentioned in Research and Statistics Department, Bank of Japan [2013, 2014].

² The Bank is working on rebasing the SPPI to the base year 2015, accompanied with the development of the WSPI, and the results are planned to be published in mid-2019 (Research and Statistics Department, Bank of Japan [2018]).

GDP statistics, (b) use for analysis of productivity of wholesale trade sector, (c) use for assessment on economic conditions and analysis of price setting behavior of wholesalers (Chart 1). Therefore, economists and external statistics authorities such as the Cabinet Office have strongly requested the creation of the WSPI for years.

(Use for deflators in the GDP statistics)

The WSPI will play an important role in efforts to improve the accuracy of deflators in the GDP statistics. In other words, in the GDP statistics, nominal output of wholesale trade sector is measured by nominal amount of wholesale margin (difference between value of total sales and that of total purchase), and in order to calculate real output of wholesale trade sector, it is necessary to divide the nominal margin by a “wholesale deflator.” Since the wholesale trade sector consists of large amount of nominal GDP as mentioned above, an accurate deflator for the wholesale trade sector is indispensable for precise measurement of real GDP.

Nonetheless, at present in Japan’s GDP statistics, the wholesale deflator is simply estimated using price data of products purchased by wholesalers (i.e. the Producers Price Index) as substitute for the corresponding service prices which is not yet available.³ This method is however, often mentioned as an inappropriate method because of the strong assumption that price trends of wholesale services are identical to price trends of the corresponding goods transacted by wholesalers (Chart 2).⁴ On the other hand, in the U.S. and Canada, the price statistics divisions compile quality-adjusted price indexes of wholesale services by surveying prices with constant quality from myriad companies, and the indexes are used for wholesale deflator in their GDP statistics.⁵

In other countries such as the United Kingdom and Germany, where WSPI does not exist, real output of wholesale trade sector is estimated by using the assumption that the volume of margins follows the volume of sales (measured by deflating nominal sales using sales price index).⁶ Since this assumption is relatively plausible, and it does not require additional burden of constructing new statistics, many countries adopt this

³ The wholesale deflator is mainly used for estimating the “GDP by economic activity (production-side estimate of GDP)” in Japan’s GDP statistics (Cabinet Office [2017, 2018] and Moriya [2017]).

⁴ According to Eurostat [2016] and Timmer and Ypma [2006], this method is regarded as “a method which shall not be used.”

⁵ As for the WSPI in the U.S. and Canada, refer to Chart 19.

⁶ Other countries which have adopted this method include France, Italy, and Australia. Eurostat [2016] regards it as a method which can be used in case the most appropriate methods cannot be applied.

methodology. However, this has an issue in terms of sector analysis since the method does not take quality of wholesale services into account (United Nations [2010]).

The Bank intends to construct the WSPI as a quality-adjusted price index of wholesale services by surveying prices from companies, as are in the U.S. and Canada. This is mainly because the “Basic Policy for the Fundamental Reform of Economic Statistics” (December 2016) by the Council on Economic and Fiscal Policy, suggested that the Bank should start surveying the prices of wholesale services which will contribute to improving the accuracy of the GDP statistics.

(Use for productivity analysis of wholesale trade sector)

Productivity of wholesale trade sector is measured by dividing real output of the sector by the volume of its input such as labor or capital. Therefore, as in the case above, in order to measure the productivity precisely, again the accuracy of the deflator for the real output does matter. Since it is difficult to currently grasp the comprehensive picture of productivity of the Japanese wholesale trade sector due to inadequate deflator, analyzing the productivity using the WSPI can be a promising research subject, for example in terms of international comparison.⁷

(Use for economic conditions assessment and price setting behavior analysis)

Sales activities of wholesalers are closer to final users compared to those of manufacturers, thus prices of wholesale services can be more sensitively affected by demands in the business cycles. Therefore, if the prices can be captured promptly, it will provide beneficial information which can contribute to assessment on economic conditions and monetary policy management. Furthermore, data may be useful to analyze companies’ price setting behavior, such as how wholesalers pass their cost on to selling prices when the purchase prices increase.

Related to this discussion, the Bank used to construct and publish the Wholesale Price Index, which is the predecessor of the Corporate Goods Price Index (hereafter, CGPI). In the WPI, the Bank surveyed transaction prices which sensitively reflect the demand and supply developments of products from wholesalers (since 1887 for Tokyo), with an aim of using as an important reference for economic conditions assessment. The Bank has shifted the type of surveyed prices at the wholesale stage to prices at the producer stage in order to enhance the deflator function. However, based on the fact that

⁷ As for studies on international comparison of wholesale trade sector, see Nishimura and Tsubouchi [1990], Ito and Maruyama [1991], Maruyama et al. [1991] and recent studies such as Nomura and Miyagawa [2017], and Fukao et al. [2017].

sensitivity to demand and supply may differ depending on the transaction stage, it is still considered important to track price developments in the wholesale stage.

(2) Relevant Policy of the New Survey for Constructing the WSPI

While there are strong needs for the WSPI as mentioned above, surveying prices of wholesale services is very challenging due to the unintuitive concept of the price and the practical difficulty in the compilation procedure. And hence, the Bank has accumulated practical know-how in recent years. In particular, in the experimental survey which started in 2014, the Bank has been seeking out methods to grasp prices of wholesale service by a simple margin percentage survey for limited parts of the entire wholesale trade sector. In addition, regarding the precedent works of constructing WSPI among countries abroad, the U.S. Bureau of Labor Statistics (BLS) kindly provided detailed information about the compilation method and the practical reality of the U.S. WSPI.⁸

Based on the findings obtained through the experimental survey and the information of foreign real examples, the Bank sets the relevant policies of the new survey for the Japanese WSPI as follows (Chart 3).

(Organizing concepts of “wholesale services”)

Wholesalers offer their “wholesale services” to their clients through purchasing and selling merchandises. However, a “wholesale service” itself is not explicitly transacted. For goods, the actual transaction prices can be collected, but when it comes to “wholesale services,” prices cannot be observed directly. Therefore, in order to conduct a price survey of wholesale services, it is necessary to organize concepts on what “wholesale services” are to be presented to the survey respondents.

At the same time, organizing concepts is important for “quality adjustment” which is necessary for compiling price statistics. In price statistics, “pure price changes” should be captured by distinguishing them from price changes due to quality changes. Generally, in order to measure changes in the quality of goods and services, decomposing the functions of the goods and services and quantifying how much each function affects the change in the price are required. However, before discussing how to decompose and quantify, there is no general consensus about what the functions of “wholesale services” are.

⁸ For detail on compilation method of the U.S. WSPI, see Appendix 1. Continuous efforts have been made to improve the methodology for constructing the U.S. WSPI since it was newly developed in 2000's. We would like to thank Michael Conforti, Jeffrey Hill, Bonnie Murphy and Melanie Santiago at the U.S. BLS for their very helpful cooperation.

(Consideration for reporting burden of companies)

Companies in Japan adopt a wide variety of margin management systems depending on their size and business customs. Some companies manage selling prices and purchase prices for each individual product or transaction, and others manage margin percentages for each product segment using accounting information. In the price survey, it is necessary to reduce the reporting burden of companies and enhance response rate by preparing various reporting methods according to their situation. In addition, such consideration could lead to improve accuracy of the index by reducing the non-response bias.

(Adoption of efficient methods in the price survey)

Since the wholesale trade sector has a large role of distributing a wide variety of products in the country, a large number of samples (called “sample prices”) reflecting all transactions should be necessary to create an accurate price index. This may simply mean that the Bank of Japan would be required to start a survey with the size similar to that of the Bank’s GGPI which investigates domestic producer prices for all products traded in the country.⁹ Under various resource constraints, however, it is crucial to use efficient methods in the price survey which enable to compile an accurate price index with a small number of samples.

⁹ Moreover, when considering distribution level of wholesalers such as primary, secondary and final wholesalers, much more number of samples are required to create a comprehensive price index of wholesale services.

3. Compilation Method of the Japanese WSPI

The following Subsection 3.1 focuses on the conceptual aspects, and explains general principles to survey prices of wholesale services. The next Subsection 3.2 discusses detailed practical issues and efficient methods in the price survey.

3.1. How to Survey Prices of Wholesale Services (General Principles)

(1) Concepts of “Wholesale Services”

In this paper, the “wholesale services” are defined as “services provided by wholesalers.” In the Japan Standard Industry Classification (JSIC), an establishment in the wholesale trade sector is defined as “an establishment that purchases physical merchandise and sells them to retailers, other wholesalers or industrial users without transformation of the merchandise.”¹⁰ Therefore, wholesale services are basically provided through purchase and sales activities of goods.

Specifically, based on the literature on distributive trade sector and various industry research papers, it can be said that “wholesale services” mainly consist of the following functions (Chart 4).¹¹

[a] Commercial Intermediation

Developing sales channels for suppliers and procuring products for customers.

[b] Transaction Cost Reduction

Reducing the number of transactions by being a hub of distribution channels, and reducing administrative costs and risks related to transactions.

[c] Assortment Building

Selecting items in response to customers’ demand and breaking bulk for customers.

[d] Market Information

Provide information to suppliers and customers about existing products and price developments by summarizing information of transactions.

[e] Transportation and Warehousing

Provide delivery, warehouse service, and inventory management.

[f] Financing

Providing credit and financing through payment collection.

[g] Research and Development

Developing new products such as private label products.

¹⁰ For details on definition of wholesalers and coverage of the WSPI, refer to Appendix 2 and 3.

¹¹ For example, see Wholesale Business Workshop in Ernst & Young ShinNihon LLC. (ed.) [2013], Distribution Economics Institute of Japan [2017], Takashima [1999], Nabeta [2005], Nishikawa [2006] and Ishikawa [2011].

Commercial intermediation by wholesalers listed in [a] is a function provided through their purchase and sales activities, and therefore the function is recognized by both suppliers and customers. The functions listed in [b] and [c] are often pointed out in the literature as the central reasons for existence of wholesalers.¹² It can be said that the functions listed in [a] to [c] are the characteristic functions originally possessed by wholesalers. However, since these functions make products distribution efficient through connecting clients and reduce transaction costs of society as a whole, it is difficult to identify functions of each individual transaction.

On the other hand, although the functions listed in [d] to [g] are not exclusively provided by wholesalers, they apparently provide these functions from the practical point of view. As the functions related to intermediation of goods, money and information are highly synergistic with networking, it can be said that these functions are easily provided accompanying the wholesale-intrinsic functions listed in [a] to [c] above. Therefore, in this paper, the Bank assumes that wholesalers integrate all of these functions and provide them as an inseparable service (so-called “bundled service”).

As described above, since most wholesalers perform the functions that can be offered by companies other than wholesalers, some insist that they should be eliminated from the economy by the companies in other sectors providing the functions more efficiently (discussion called “unnecessity of wholesalers” or “disintermediation of wholesalers”). This kind of discussion has appeared since the 1960’s.¹³ To confirm this point, looking at the wholesale margin of the whole economy (i.e. “sales minus cost of sales” of the wholesale trade sector by company size in the “Financial Statements Statistics of Corporations by Industry, Annually”) in Chart 5(1), the wholesale margin has decreased since the 1990’s, mainly for small-size companies. This can be explained by movements in which manufacturers and retailers became directly engaging in transactions in the 1990’s (so-called “distribution rationalization”) and spreads of e-commerce through the Internet in the 2000’s.¹⁴ However, in response to these environmental changes, wholesalers have strived to survive by increasing the scale through management integration and by strengthening its own functions. As a result, the margin percentage during this period rather increased.¹⁵ In addition, in terms of GDP share, the

¹² For example, see Hall [1949] for [b] and Alderson [1965] and Tamura [1980] for [c].

¹³ Hayashi [1962] was a best-selling book in Japan which predicted prevails of mass market retailers and decline of wholesale sector.

¹⁴ Maeda et al. [2001] mention that reasons of disinflation in the 1990’s can be attributed to these movements.

¹⁵ Suzuki [2005] also mentions that the margin percentage during this period increased. Kitamura et al. [2000] suggest that the wholesalers which can make transactions trustful will be rather important in the network economy.

significance of the wholesale trade sector has surprisingly not declined in the long run (Chart 5(2)), while the share rose in the 80's and 90's and then has remained largely flat in recent years.

(2) Pricing Method of Wholesale Services

(Price concept and price reporting methods)

Price statistics is generally based on periodical survey of prices of goods or services with constant quality. Following the principle, the survey for the WSPI is conducted by collecting wholesale margin which is subtracting value of purchase from value of sales after specifying various price-determining characteristics, such as “contents of goods, quantity, customers and suppliers, transaction terms, contents of accompanying service,” which represent the quality of certain wholesale service (Chart 6).

When collecting prices from companies in practice, setting a quantity unit is useful. In case of goods, for example, collecting a “price per package” may make reporting easier for companies. In case of services, it is often difficult to set an appropriate unit because the transaction unit is usually invisible (and the scale measure is unavailable). In terms of wholesale services, however, “a price of a wholesale service per unit of goods wholesaled (per unit margin)” is able to be collected on a continuous basis.¹⁶ While it is regarded as a bundled service including various functions mentioned previously, the volume of the wholesale service is supposed to be mostly proportional to the quantity of goods wholesaled since it is provided through trading of goods.

While the Bank has decided to collect “per unit margins” as prices of wholesale services, this concept is usually unfamiliar among reporting companies. For this reason, it may be difficult to obtain cooperation from companies, and incorrect data tend to be reported in practice. Considering such reporting burden, in principle, the Bank prepares two methods: (a) per unit margins calculated using reported “unit selling price” and “unit purchase price,” and (b) per unit margins calculated using reported “unit selling price” and “margin percentage.” Of the two, the one that fits the data management system adopted by each respondent is selected. These price reporting methods are the same as the price survey of wholesale services in the U.S.

(Price setting behavior of wholesalers)

In general, it is desirable that the selected reporting method suits the realities of contracts and price setting behaviors of companies as much as possible. Regarding

¹⁶ Nishioka et al. [2010] organize three patterns of how to collect service prices depending on the type of services. The survey method for the WSPI proposed here is regarded as a basic pattern.

prices of wholesale services, the way how the prices are affected by price fluctuations of goods wholesaled is likely to be different depending on the price setting behavior of each company. Therefore, it is necessary to select an appropriate reporting method in order to accurately capture this difference (Chart 7(1)).

Specifically, assuming a case where a purchase price rises as a result of exogenous supply shocks to the economy, if the selling price and the purchase price are respectively set by individual contracts with each counterpart, the price of the wholesale service tends to decline in the short term since it is not always possible to pass a rise in purchase price onto selling price. On the other hand, if it is agreed in advance with the counterpart that a fixed margin amount or margin percentage is adopted, an increase in purchase price is directly passed onto selling price, resulting in the price of the wholesale service to remain unchanged or to rise. Typical wholesalers that purchase and sell goods take the former price setting behavior, but some others in Japan (such as a sales subsidiary of a manufacturer, a special authorized agent, and a wholesaler dealing with commodity goods) tend to take the latter behavior. In order to compile an accurate price index of wholesale services, the Bank should understand the individual price setting behavior behind the prices.

Also, assuming a case where selling price rises due to exogenous demand shocks, prices of wholesale services are expected to increase for both companies that separately set purchase and selling prices and companies that set certain margin percentages. From this reason, an individual price of wholesale services tends to be pro-cyclical to the business cycles.¹⁷

In addition, in the long run, prices of wholesale services seem to be less sensitive to price fluctuations of goods wholesaled. Looking at the input cost share of the wholesale trade sector in the Input-Output Tables (Chart 7(2)), the cost share of labor input (i.e. personnel expenses) is higher than that of other service industries, while the cost share of intermediate goods input is limited. In other words, while prices of wholesale services are affected by price fluctuations of goods wholesaled in the short term, by passing on the cost of purchased goods to selling prices gradually, the prices of wholesale services approach prices mainly corresponding to labor cost in the long term.

¹⁷ Even if a price of wholesale services was pro-cyclical to the business cycles, the margin percentages would not necessarily be pro-cyclical. As for cyclicity of the margin rate (markup rate) in Japan, see Ariga [2006].

(Types of surveyed prices)

While the unit selling price is obviously defined as selling price at the timing of sales, the unit purchase price is defined as replacement cost (at current price) of the goods sold at the timing of sales (Chart 8(1)). This treatment is in line with the 2008 SNA, which is the international statistical standard for GDP statistics.

In practice, the unit purchase price at current price is obtained by surveying “price of goods purchased at the same timing as sales” as “replacement cost of goods sold at the timing of sales.” However, since these definitions are not strictly the same, problems may arise in some cases. For example, there can be (a) cases where the quality of the goods sold and that of the goods purchased are different due to seasonality of the product (e.g. a lightweight spring coat and a thick winter coat), (b) cases where data of purchase prices are temporally unavailable as companies only purchase the goods periodically with their arrangements of purchasing in large lots, and (c) cases where margins show extraordinary fluctuations due to temporally changes in transaction terms for periods with small purchase volume (Chart 8(2)). In these cases, it is necessary to make efforts so that reasonable price can be obtained as replacement cost of the goods sold, recalling the original definition of purchase price.

There are other cases where calculating prices of wholesale services by using purchase prices at current price is difficult due to limitation in respondents’ data management systems. In most cases, it is possible to reduce the reporting burden of the respondents by accepting “historical acquisition cost of goods sold (cost of sales / sales volume)” calculated from their accounting information systems. This treatment is regarded as the second-best method since this purchase price is not at current price. However, the advantage is that the price-determining characteristics of the wholesale services (such as content of goods sold and purchased and transaction terms) are relatively stable because the goods purchased for the calculation should correspond to the goods sold in accrual accounting.

(Prices calculated using price indexes of goods wholesaled)

Depending on respondent’s data management system, there are cases where they are only able to report margin percentages and not selling prices.¹⁸ It is desirable to add these samples to the aggregation from the viewpoint of increasing the survey response rate which contributes to reducing biases induced by non-response samples. Therefore, when a sample only with margin percentage is obtained, the price of the wholesale

¹⁸ The share of cases where only margin percentages are reported is about 20 to 30% in all samples (Chart 12).

service is calculated by multiplying the margin percentage by the price index corresponding to the goods wholesaled (the Bank call this sort of price index an “inflator”) (Chart 9).¹⁹

This method is justified especially when wholesalers set selling prices or purchase prices using pre-determined margin percentages. In other words, this method is equivalent to “asking the respondents the price of wholesale services as the selling price they would charge for the goods in the survey month given the purchase price from the Bank which is estimated by using the price index of the goods purchased.” This is regarded as a form of “model pricing method.” Such price is desirable because the quality of the service is stable as long as the correspondence between the actual price of goods wholesaled and the price index used as an inflator is appropriate.

On the other hand, if the margin percentage was not pre-determined for setting prices, the price calculated using the actual margin percentage and the inflator would be very volatile. This is because the quality of the surveyed price is likely to be less stable when the ex-post calculated (actual) margin percentage includes noises caused by various factors in transactions. In such a case, it is better to reconsider the pricing method, in particular to make efforts to survey both unit selling price and unit purchase price.

Moreover, even when both unit selling price and margin percentage are reported, if the selling price includes large noises due to the survey products consisting of products with various quality, using an inflator instead of the selling price may be more preferable for calculating the price of the wholesale service. Specifically, when trying to compile the WSPI based on a small number of surveyed prices, it is necessary to avoid reflecting the unique movements of individual prices into the aggregate index (in other words, maintaining the “representativeness” of each surveyed price is important). In this sense, it may be effective in some cases to adopt the method using a price index corresponding to goods wholesaled instead of reported selling price.

(3) Treatment of Quality Changes

(Quality adjustment in price statistics)

In the price survey for wholesale prices, one of the most difficult issues is quality adjustment when the quality of wholesale service has changed, such as when the goods wholesaled have changed by replacing the old model with the new model.

¹⁹ As for compilation method of the inflators (price indexes of goods wholesaled), see Appendix 4. If the producer price indexes are used for calculating the inflators, the price of the wholesale service is calculated by multiplying the corresponding inflator not by the margin percentage but the markup rate which is equal to margin percentage / (1 - margin percentage) (Chart 9(1)).

In general, price statistics capture price changes of goods and services with constant quality. In the price survey, when a sample (i.e. price-determining characteristics such as surveyed goods/services and transaction terms) changes, the surface price difference of the old and new price is divided into “price changes due to quality changes” and “pure price changes.” Then, only the “pure price changes” is reflected in the price index. This is called “quality adjustment.”

For example, the difference in quality between different computer models strongly depends on the difference in intermediate parts in the computer, such as main memory capacity and storage capacity of hard disk drive. In this case it is easy to specify the quality. Quantifying the quality can be relatively easy by utilizing the cost information of these intermediate parts. On the other hand, since the quality of service generally depends mainly on the capital stock required for production and the quality of labor input, criteria for quantifying the quality are not as clear as the intermediate parts in goods and difficult to identify. The criteria are also likely to depend on subjectivity of each individual consumer, and therefore, it is often impossible to quantify the relationship between price and quality. For these reasons, it can be said that it is far more difficult to evaluate the quality of services compared to goods.

In particular, wholesale services are regarded as bundled services in which various functions are provided inseparably, and therefore the quality cannot be easily measured with simple criteria. This makes quality adjustment difficult in many cases. However, since there are some cases where quantifying changes in quality has been achieved by gaining cooperation from companies, the Bank will make efforts to actively apply quality adjustment methods in the price survey in order to obtain practical know-how.

(Quality adjustment methods in the WSPI)

As for quality adjustment in the WSPI, the same methods applied to other services in the SPPI are adopted. Specifically, the Bank will apply the following 5 methods: [a] direct comparison method, [b] unit price comparison method (quantity adjustment), [c] production cost method (differences in production and option costs), [d] overlap method, and [e] hedonic regression method, with individual consideration for each surveyed price (Chart 10).

Among them, the production cost method is a method to calculate “pure price changes” with the assumption that “price changes due to quality changes” is equivalent to the changes in production costs between the old service and its replacement given that the cost information can be provided by respondents. The following examples are potential cases of introducing the production cost method (Chart 11). (a) If a price of a wholesale

service increases due to development of a new private label product, the price may be adjusted by the R&D cost per expected sales volume (presuming not as pure price increase but as quality improvement), and (b) if a price of a wholesale service decreases due to change in payment method from credit to cash, the price may be adjusted by the decrease in interest and credit cost (presuming not as pure price decrease but as quality deterioration). In reality, however, it is difficult and very rare to obtain the necessary information from respondents after identifying the quality change of wholesale services, so production cost method can be applied for the limited cases.

Moreover, application of the hedonic method is also difficult in reality. Although the hedonic method is a method of statistically quantifying the price impact of quality improvement from a perspective of consumers of a service, it is difficult to acquire data on characteristic information required for the estimation.

However, in cases where it is difficult to apply any of the above five quality adjustment methods, the Bank has to accept “treating the price changes as if the pure price was unchanged.” If the Bank is able to distinguish in advance the case where none of the quality adjustment methods can be applied, it must be useful to change the sample to a sample which requires as little quality adjustment as possible. In particular, (a) to confirm that the goods wholesaled are expected to sustain its transaction into the future and (b) to bundle goods with similar functions or with similar transaction terms have to be considered. When bundling goods, it is necessary to regularly confirm whether the quality of the wholesale service remains stable.

(Relationship between quality of goods and quality of wholesale services)

Finally, we discuss the issue of “whether the quality of wholesale services will improve if the quality of goods wholesaled improves.” First of all, there is a view that the quality of wholesale services is proportionate to the quality of goods. i.e. if the evaluation of the quality of goods has increased in the view of the final users, the quality of wholesale services essential for distribution of the goods is also supposed to have increased. On the other hand, there is another view that wholesale services do not change the quality of goods (by its definition), and conversely, they are not affected by changes in the quality of goods. In this regard, the UK Office for National Statistics takes a case of wholesale service of computers and mentions that the real value of wholesale service calculated using the price index of computer, of which price declines at remarkable rates due to the quality improvement, grows at indefensible rates. It also mentions that (a) the rate of quality improvement of wholesale service of computers is smaller than that of computers itself, and that (b) Eurostat recommends using non-quality adjusted price of computers (ONS [2002], United Nations [2010]). Considering reality, we cannot say

that the quality of the wholesale service and the quality of the computer are completely unrelated. This is because wholesaling high quality computers may require more advanced knowledge of the products and more expensive promotional expenses. In any cases, in order to conclude this discussion, it is necessary to conduct empirical analysis such as hedonic regressions based on detailed information of characteristics of wholesale services.

The method of calculating prices of wholesale services by multiplying margin percentage by price indexes of goods wholesaled implicitly assumes that the quality of wholesale services is proportionate to the quality of goods.²⁰ Besides considering the plausibility of the assumption, if the distortion caused by the assumption is relatively small, adopting this method may release us from the practical issue of “the difficulty of evaluating quality of wholesale services.”

(4) Comparison with Our Old Experimental Survey

Here, we explain the characteristics of our new price survey of the WSPI, comparing with our old experimental survey (Chart 12).

First, while the scope of the experimental survey is limited to a few subsectors in the wholesale trade sector, that of the new survey has expanded to cover the entire sector defined in the Input-Output Tables which is one of the fundamental source statistics of the GDP statistics.

Second, when expanding the coverage, the Bank prepares various reporting methods in order to increase possibilities of reporting by companies. In the experimental survey, the Bank basically collects margin percentages by product segment, where the quality of wholesale services is not strictly specified, in order to conduct an efficient survey under resource constraints, focusing mainly on companies that manage margin percentages based on accounting information. Meanwhile, in the new survey, the Bank prepare various surveying methods depending on ways of margin management by companies since it is necessary to survey prices of wholesale services comprehensively on various goods wholesaled. Specifically, as explained previously, companies can select a reporting method, either “unit selling price and unit purchase price” or “unit selling price and margin percentage,” and the Bank accepts “historical acquisition cost” of sales as the second-best method for reporting purchase price where the principle method is using “current replacement cost” of selling goods.

²⁰ This method also implicitly assumes that the volume of margins follows the volume of sales. As mentioned in 2.(1) and footnote 6, many countries have adopted this method as the second-best method.

In this regard, recently, there are increasing numbers of companies that introduce a new data management system in order to exploit their big data acquired through their purchase and sales activities for marketing. Therefore, in the new survey, the Bank found many cases where the quality of surveyed wholesale service can be more stable than that in the old experimental survey in terms of contents of the goods wholesaled and transaction terms. In the experimental survey, since the characteristics of surveyed wholesale services were not strictly defined, the price of the service could increase even when the contents of the accompanying service improved. In this case, it can be regarded as an quality improvement of the wholesale service (i.e. the price of the wholesale service is unchanged) in the new survey.

Third, regarding quality adjustment, the new survey has a policy to treat it more often. In the experimental survey, prices of wholesale services were calculated by multiplying reported margin percentages from the company by the price index of corresponding goods wholesaled. As discussed above, this calculation is under implied assumption that the quality of wholesale services proportionally correlates to the quality of goods wholesaled, and therefore, the quality adjustment method for goods wholesaled is uniformly adopted for wholesale services. On the other hand, in the new survey, the Bank will focus on the quality of wholesale services themselves, and examine an appropriate quality adjustment method for each surveyed price.

3.2. Practical Aspect of the Compilation Method (Detailed Methodology)

(1) Sample Selection (Chart 13)

(Number of sample prices and survey frequency)

The Bank intends to survey 1,000 sample prices in the WSPI, considering the accuracy of the index.²¹ As the number of sample prices in the existing price surveys conducted by the Bank is roughly 12,000 (8,500 in the CGPI and 3,500 in the SPPI, respectively), roughly 10% more sample prices are going to be added by starting the price survey of the WSPI. Since it requires a lot of work to gain agreements with candidate companies to participating in the survey, and the burden in routine procedure of compiling the price indexes is supposed to increase, it is necessary to make the survey method as efficient as possible.

The Bank plans to conduct the price survey quarterly. This is because some companies can reduce the reporting burden significantly using accounting information which is

²¹ In the U.S. WSPI, the number of surveyed price for wholesale service is about 4,000, which is 4 times more than that in the Japanese WSPI.

processed on a quarterly basis. This can make it possible to collect more samples efficiently, which contributes to compiling an accurate price index. Also, quarterly data are sufficient to meet the needs in the GDP statistics whose preliminary figures are estimated on a quarterly basis.

(Selecting candidate companies and survey products)

The Bank makes efforts to select samples efficiently in order to compile an accurate price index even with the limited number of samples.²² For instance, the Bank chooses some price-determining characteristics which may differently affect changes in the prices and sets the sample composition ratio of the price-determining characteristics. As the price-determining characteristics, (a) a subsector of wholesale trade which the reporting company belongs to, (b) a product wholesaled by the reporting company, (c) the place of origin of the product (domestic or foreign) are always taken into consideration. There is an advantage that the composition ratio of these price-determining characteristics can be estimated by using the amounts of wholesale margin by product category in the Input-Output Tables.

To select candidate companies, the Bank employs judgmental sampling (non-probability sampling) where a company which has larger amount of wholesale margin (gross profit of sales) is selected with higher probability. However, if companies are selected only based on amount of wholesale margin, survey products may not be selected with the appropriate composition ratio. Therefore, when a company trades the products which have significant amount of wholesale margin, the company can also be a candidate irrespective of its size. Meanwhile, the Bank selects all kind of products wholesaled in the economy comprehensively as the WSPI covers the entire wholesale trade sector defined by the Input-Output Tables, which is one of the source statistics of the GDP statistics.²³

Additional price-determining characteristics such as usage of product (for industries or consumers), how to procure products (purchase or consign), contract term (long-term or on spot), firm size (large or small), geography (urban or rural), and distribution level (primary or secondary wholesalers) should be taken into account if necessary in cases where these transaction conditions may cause the price differences. However, with only 1,000 sample prices, it is difficult to take these conditions into account in selecting

²² This policy is the same in the CGPI and the SPPI. As for the sampling method in the CGPI, refer to Research and Statistics Department, Bank of Japan [2017] “Explanation of Corporate Goods Price Index (2015 base).”

²³ As for details on calculation method of weights of wholesale margin used for sampling and aggregation, see Appendix 3.

every sample price uniformly, as the number of product categories (excluding services) defined by the Input-Output Tables is as many as 400. Therefore, these additional conditions will be considered only for products whose transaction amount is significant since the weight is sufficiently large and many samples are required. This will contribute to making the WSPI more accurate.

(Publication items of the Japanese WSPI)

In the WSPI, the Bank plans to compile and publish the subsector indexes in addition to the index of the entire wholesale trade sector. The number of subsector indexes will be determined depending on whether enough sample prices for each subsector index can be acquired to maintain the accuracy of the indexes. At present, in line with the “major groups” of the Japan Standard Industrial Classification (JSIC), the Bank plans to publish five subsector indexes (Chart 14); [a] wholesale trade of textile and apparel, [b] wholesale trade of food and beverages, [c] wholesale trade of building materials, minerals and metals, etc., [d] wholesale trade of machinery and equipment, [e] miscellaneous wholesale trade.

The Bank selects samples by product category in the Input-Output Tables and classifies them into the corresponding subsector where the products are mainly wholesaled. Therefore, wholesale services in each item are classified based on their activities although the classification of the items follows the industry classification.

(2) Specifying Transaction Conditions to Control Quality Changes (Chart 15, 16)

(Specifying contents of survey products)

From the viewpoint of surveying prices of wholesale services with constant quality, it is desirable to collect prices of “single product” for which the range of survey products for wholesaling is narrowed as much as possible. However, under limited number of samples, narrowing the range for every sample too much may make the aggregated price index less accurate due to an increase in number of sample prices which show extraordinary fluctuation (which are called “non-representative prices”).

To avoid this, collecting prices of “comparable product lines” with wider range of survey products can be adopted as an alternative option. In particular, this method may be desirable in cases where companies trade a myriad number of products or trade products like durable goods which are not repeatedly transacted. The “comparable product lines” is defined as a group of products of which (a) usages are similar (i.e. they can substitute each other because of similar functions and demands) and (b) are traded in the same transaction unit. By grouping the comparable products which have similar

demand trend as much as possible, the noise caused by the composition change in the products with different characteristics can be diminished.

(Specifying customers and suppliers)

To survey prices of wholesale services with constant quality, it is desirable to specify the characteristics of customers (buyers of products) for the sample. The size of margins of wholesale services will differ between customers because wholesale services are usually different depending on needs from the customers, such as size of selling lots and payment terms.

On the other hand, characteristics of supplier are not to be explicitly considered. This is because by specifying contents of survey products for samples, characteristics of supplier are by and large determined. In cases where the products are procured from the market, the quality of products is identical regardless of suppliers, and it is unnecessary to specify the suppliers for the samples. By specifying the characteristics excessively, continuous survey of prices may possibly be disrupted by changes in suppliers.

(Treatment of transportation cost and specifying accompanying services)

Transportation services can be provided by wholesalers as bundled service, but in cases where other companies provide the transportation services, the cost is to be deducted from price of wholesale services. Specifically, if the wholesaler covers the freight cost at the point of sales, the cost is to be deducted from selling price, and if the wholesaler covers the freight cost at the point of purchase, the cost is to be added to the purchase price. Similarly, other accompanying services (above-mentioned functions [c] to [f] listed in Subsection 3.1.(1)) are to be deducted from prices of wholesale services when the wholesale services cannot be considered as bundled service, such as the case when those accompanying services can be clearly separated. For example, information fee is sometimes included in selling prices.

When the accompanying services cannot be separated (e.g. wholesaling including delivery between branches using self-owned truck), the wholesale services are considered as bundled services, and the contents of accompanying services are to be specified to select samples for surveying prices with constant quality.

(Treatment of rebate and specifying transaction terms)

In some wholesale trade subsectors, providing rebates to customers or accepting rebates from suppliers frequently occur. These rebates need to be reflected to prices of wholesale services in principle, deducting the rebates from both selling and purchase prices. For example, in the wholesale trade of medicines in Japan, purchase prices are

usually set as provisional prices in advance which are higher than selling prices, and the margins become positive after adjusting them for rebates or allowance decided ex post. In this case, ex ante prices of wholesale services are negative, and purchase rebates should be taken into account to collect appropriate prices.

Whether the rebates are entitled is typically conditional on various targets determined in contract terms, and therefore the requirements should be taken into account in sample selection in order to survey prices with constant quality. For instance, in the case of quantity rebates, where amount of rebates will depend on amount of quantity transacted, the requirement of quantity should be specified in sample selection. Moreover, in the wholesale trades of food and beverages in Japan, various rebates with various names, such as sales promotion premium and marketing support money, are conducted as industry customs. However, since the requirements on the rebates are often opaque in recent years, the industry tries to make rebates more transparent by introducing so-called “functional rebate.” This is paid based on clients’ support for functional enhancement, such as contribution to reduction of distribution cost. When surveying sample prices with these kinds of rebates, the requirement for rebate payment should be taken into account.

There are also cases where rebates are not set to each product but to each supplier. In these cases, it is difficult to reflect rebates to each price of wholesale services because the rebates do not correspond to individual transaction. Therefore, the prices should be confirmed to be appropriate prices by asking reporting companies for changes in rebates and the requirements.

(Treatment of consumption tax)

The Bank plans to calculate the index of prices including consumption tax. In collecting procedure, however, the Bank will not ask reporting companies for prices including consumption tax. This is because it is sometimes difficult to collect appropriate prices by taking differences between selling and purchase price including tax. For instance, the consumption tax at the point of purchase is refunded ex post in cases of exporting. Therefore, the Bank will ask reporting companies for prices excluding consumption tax, and multiplying them by appropriate tax rate for each sample.

(3) Aggregation

As for the index aggregation, the fix-weighted Laspeyres formula is adopted in the same way as the SPPI. CY 2015 is the base year for index and weight calculation.

Subsector indexes which are the lower category are calculated as follows. First, the individual sample price index is calculated by dividing the reported price (which is called current price) by the average price in the base year (which is called base year price). Next, the weighted sample price index is calculated by multiplying the sample price index by each sample price weight, and then the subsector indexes are calculated by dividing the sum of the weighted sample price indexes by the sum of the weights of the sample prices which belong to each subsector. The index of entire wholesale trade sector (i.e. WSPI) is calculated by dividing the sum of the weighted indexes of all sample prices by the sum of the weights of all sample prices.

(4) Other Efforts Making the Survey Efficient

(Considering distribution level of wholesalers)

Distribution level of wholesalers should be taken into account in sample selection (Chart 17(1)). Even if the same product is traded, size of margin of each company will vary widely depending on its distribution channel, such as a distribution channel with one primary wholesaler (“direct trade wholesaler”) or that with wholesalers of multiple distribution levels. Therefore, the aggregated price index is likely to be distorted if sample prices are not selected by following an appropriate composition ratio which represents sizes of margin for every distribution level.²⁴

Since the appropriate composition ratio is unknown, the Bank intends to survey only distribution channel with one primary wholesaler (“direct trade wholesaler”). This is plausible because the sum of margins of multiple-level wholesalers shows similar size to margin of a direct trade wholesaler as long as these distribution channels compete with each other. Of course, knowledge about industry customs and distribution channel is important to make sure whether this idea is eligible or not.

(Utilization of external database)

By using external database, distribution level can be taken into consideration appropriately. Prices of wholesale services for products with little difference in quality, such as gasoline, can be efficiently measured by using macro data of producer price and wholesale price published by external organizations. As for wholesaling of gasoline, the Bank considers to measure prices of the wholesale service by differentiating between

²⁴ In the U.S. WSPI, sampling based on employment size from the Unemployment Insurance System and aggregation based on amount of wholesale margin taken from reporting companies have been adopted. If the weight information is accurate with sufficient sample size, accurate price index of wholesale services can be constructed without explicit consideration for distribution level of wholesalers.

wholesale price to gas station in the “Petroleum Products Price Survey” compiled by the Agency for Natural Resources and Energy and spot gasoline price at shipping from petroleum refineries in the “Rim Report” published by Rim Intelligence Co. (Chart 17(2)).

In addition, as for wholesale trade of agricultural, animal and poultry farm and aquatic products, shipping associations such as agricultural cooperative and fishermen’s cooperative occupy significant share of amount of wholesale margin. The Bank also considers to measure prices of the wholesale services by using the average margin percentages taken from statistics published by the Ministry of Agriculture, Forestry and Fisheries.

(Ensuring representativeness of Sample Prices)

In order to compile accurate aggregate indexes with the limited number of samples, it is desirable that price developments of each sample should be as close to developments of the true market price as possible and does not show extraordinary movement caused by individual specific factors. In particular, since prices of wholesale services tend to show large fluctuations intrinsically, meticulous care needs to be taken.²⁵ This is why the Bank confirms representativeness of each sample price in terms of the following points:

[a] Representativeness of reporting company

Significance of the reporting company in each wholesale trade subsector;
Whether wholesale services provided by the reporting company contain similar quality to other companies in the subsector if the size of the reporting company is not significant.

[b] Representativeness of survey product

Whether the selling and purchase prices of products wholesaled correspond to the price index of the products wholesaled (used as the inflator).

[c] Representativeness of price developments

Whether the size of the fluctuation of the reported price is acceptable;
Whether the wholesale service is representative in the base year.

Especially, with regard to [c], prices of wholesale services sometimes show unusual price developments which rarely occur in general goods and services. For example, the margin price has suddenly risen 20 times higher than that in the previous quarter after remaining the same level for long time. In cases where unexpected fluctuation like this occurs, it is necessary to investigate whether the price developments are caused by the

²⁵ BLS [2012] argues that prices of wholesale services intrinsically show large fluctuations.

individual specific factors (whether prices of wholesale services for comparable products do not fluctuate in the similar way) and whether the amount of the wholesale margin in the base year is insignificant (whether the sample is lacking representativeness in the base year).

Prices of wholesale services may also be negative when the purchase price exceeds the selling price. For example, negative margin can be caused by (a) purchasing rebate not reflected into the purchase price and (b) timing of rebate payment, for example where the purchase rebate for the previous year is paid in certain month. In these cases, the rebates should be appropriately taken into account to prevent the margins from being negative. (c) In the case of discounted selling price for clearance sale, it is reasonable to make the price of wholesale service be the same as the price in the previous quarter because the price loses its representativeness temporally under irregular circumstances. On the other hand, (d) in the case of negative margin due to discounted selling price for promoting other products which can more than compensate for the loss, the price of wholesale service should not be selected as a sample in the first place because the price has not been representative. Finally, (e) in the case of delayed pass-through of an increase in purchase price to selling price, this negative margin is supposed to have economic reasons. In this case, the margin is set at the lower bound of “zero,” or the average margin for the long period is calculated in order to prevent the margin from being negative.²⁶

Like these cases, in order to deal with large fluctuations of prices of wholesale services, the individual reasons which cause the fluctuations should be considered meticulously.

²⁶ If the zero lower bound was set, the aggregated price index would be upper-biased.

4. Preview of the Japanese WSPI

We calculated tentative estimates of the Japanese WSPI by using price data collected from companies cooperating in the survey as of May 2018. The findings are as follows (Chart 18).

First, while a number of surveyed prices show considerably large fluctuations (the standard deviation of quarterly changes is about 20% on average), the fluctuation of the aggregate price index is relatively less volatile. Since 2015, the beginning of the data, the index fluctuates in the range of several percentages (its standard deviation of quarterly changes is 1.2%).

Second, the aggregate price of the corresponding goods wholesaled, which is calculated mainly using the CGPI, shows a very different movement from the aggregate price of wholesale services. While the former has increased since mid-2016 after falling in mid-2015, the latter has remained largely flat from 2015 to 2016. This could mean that the wholesale deflator of the current GDP statistics calculated using the price indexes of goods wholesaled is likely to show a different movement by changing to calculations using the WSPI.²⁷

Third, the difference of movements between the price index of goods wholesaled and that of wholesale services is considered to be caused by different responses to economic shocks during this period. In particular, while the price index of goods wholesaled had fluctuated along with the falling of natural resources prices and the yen's appreciation from mid-2015, the price index of wholesale services had remained unchanged as a whole. Assuming that the declines in prices of goods purchased are mainly attributable to supply shocks, (a) if a company sets selling prices and purchase prices independently, the company would not immediately change the selling price in response to declines in the purchase price, and therefore, prices of wholesale services, the difference between the selling price and the purchase price, would increase. (b) If a company sets margin percentage constant in short runs, prices of wholesale services would fall together with the purchase price. The fact that the WSPI remained mostly unchanged during the period probably implies that both movements of (a) and (b) are offsetting each other. On the other hand, in 2017, the price index of goods wholesaled rises, driven by the increase in domestic and foreign demand, and the price index of wholesale services is rising in the same manner. It is consistent with the situation mentioned earlier that a rise in selling prices due to demand shocks will result in an increase in prices of wholesale

²⁷ According to the year-on-year comparison in 2016, the WSPI increased +0.3% and remained almost flat, while the aggregate price index of the corresponding goods wholesaled fell -2.5%.

services, regardless of the case when a company sets selling prices and purchase prices separately or a company sets fixed margin percentage in short term.

Looking at prices of wholesale services in the U.S. and Canada (Chart 19), similar to the Japanese tentative estimates, fluctuations of their WSPI have been relatively less volatile than those of goods price indexes through companies' price setting behaviors.

5. Conclusion

As discussed in the previous sections, the Bank of Japan has started a full-scale development of the Japanese WSPI, with a planned roll-out date target of mid-2019, in order to expand coverage of the SPPI as well as to respond to the following needs:

- Use for deflators in the GDP statistics;
- Use for productivity analysis of wholesale trade sector; and
- Use for economic activity and corporate price setting behavior analysis.²⁸

This paper proposes the compilation method of the WSPI, outlining concepts and effective methods to create an accurate price index efficiently with small samples, based on practical know-how obtained from the old experimental survey and the cases in foreign countries.²⁹

Finally, the Bank would like to mention practical issues which the survey is going to be confronted with (Chart 20). There are (a) difficulties in obtaining appropriate sample prices corresponding to the population due to limitation of survey candidates, (b) difficulties in dealing with “large fluctuation” of individual price of wholesale services, and (c) difficulties in treatment of quality change of wholesale services. In particular, (b) and (c) will be inevitable issues in monthly routine procedure of the price survey.

Thus, the Bank is developing the “wholesale services price index” so that it can fulfill various user needs despite having various practical issues. Regarding the contents of this paper, the Bank would like to receive feedbacks and constructive comments from readers, especially on the part where there is room for improvement.

²⁸ The WSPI only covers wholesale trade sector, so the use for analysis of pass-through of production cost and import price changes to consumer price inflation may be limited. In this point, however, Nakamura and Zerom [2010] argue that delayed pass-through in the coffee industry in the U.S. occurs almost entirely at the wholesale rather than the retail level.

²⁹ Development of the survey methods for prices of wholesale services can also have a useful implication for the survey methods for prices of retail services which have similar concepts (refer to Appendix 5).

Appendix 1. Compilation Method of the U.S. WSPI

The Bureau of Labor Statistics (BLS) compiles the Produce Price Index (PPI) for industries classified by the North American Industry Classification System (NAICS). For wholesale trade sector, price indexes for NAICS Sector 42 (Wholesale Trade) at the 3 digits level are compiled and published.³⁰

Reporting units (establishments) are selected using “sampling with probabilities proportionated to size (PPS)” based on employment size from a list of all companies that file with the Unemployment Insurance System. From the selected units, the dollar value of total wholesale margin is additionally collected as size measure to use as weight for index aggregation. Attribution other than size (e.g. geography, type of final users) is not taken into account upon the sampling procedure.

“Per unit margin price” is the most commonly selected unit of measure for collecting prices of products wholesaled by the selected units, and the survey is conducted continuously under the same transaction condition such as type of buyers and size of shipment. For selecting products wholesaled, “comparable product lines” are strongly preferred over the collection of “single products”. Although “single products” is desirable in terms of collecting constant-quality price and therefore had been adopted in the early years of the U.S. WSPI survey, high volatility of the surveyed prices had been a critical issue under the limited number of surveyed prices, thus BLS had switched to preferring comparable product lines. Also, in recent years, considering convenience of reporting units, in addition to (a) the method for calculating “per unit margin price” by surveying “selling price” and “acquisition price” and subtracting, (b) the method for calculating that by surveying “selling price” and “margin percentage” and multiplying, was newly introduced.

At BLS, to compile the U.S. PPI for both goods and services, roughly 200 staffs are assigned, and electronic questionnaires are fully introduced. This enables them to collect about 10,000 prices for wholesale and retail services.

³⁰ According to U.S. NAICS, general characteristics of wholesale trade are (1) selling merchandise to other businesses (2) without transformation, (3) operating from a warehouse or office, and not advertising directed to the general public.

Appendix 2. Definition of “Wholesalers” and Scope of the Survey

The target population (companies) for the price survey of wholesale services is based on (a) wholesalers defined in the Japan Standard Industry Classification (JSIC) and (b) wholesale trade activity defined in the Input-Output Tables, which provides the appropriate scope for the wholesale deflator in the GDP statistics.

According to the definition of wholesalers in the JSIC and that of wholesale services discussed in Subsection 3.1.(1), wholesale services are often bundled and provided with various services, and in such cases it is difficult to judge whether to be in the scope of the survey. In addition, even if a company is decided to be conceptually in the scope, it is often practically difficult to collect prices from the company. The following criteria are set to judge whether to be in the scope of the survey, conceptually or practically respectively.

	Conceptually in/out of the scope	Practically in/out of the scope
Bundled services, defined in Subsection 3.1.(1)	In the scope unless the services are separable	In the scope unless the services are outsourced
Additional services, such as manufacturing and installation	In the scope if the services are not separable and a limited part of the wholesale service	In the scope if the services are not separable and a limited part of the wholesale service
Development of natural resources and M&A	Out of the scope (regarded as investment returns)	Out of the scope (but sometimes contaminate wholesale margins)
Retail services	Out of the scope	In the scope if the revenue share of wholesale activity for the establishment is more than 50%
Branch/sales office of manufacturer	In the scope	In the scope only if the establishment is a separate profit maximizing center
Sideline wholesaling business of manufacturer	In the scope	In the scope only if the transaction volume of the wholesaling services is large
Factory-less goods producer	In the scope (but there are a classification issue and discussions in foreign countries)	In the scope
Agent/Broker	In the scope	In the scope (but very rare in Japan)
Wholesaling export/import goods	In the scope (domestically provided services)	In the scope
Export/import of wholesaling	Out of the scope (not domestically provided services)	Out of the scope
Service intermediaries	Out of the scope	Out of the scope

Appendix 3. Coverage of the WSPI and Weights for Aggregation

The WSPI covers goods traded in the corporate sector as well as in the CGPI. In other words, in addition to the goods sold to company and used by it, the WSPI covers goods finally sold to household and used by them as long as the goods are traded in the corporate sector at the distribution stage. The WSPI, however, does not cover scrap and waste but covers used and secondhand goods in line with the definition in the Input-Output Tables. While export and import of wholesale trade captured by the Balance of Payments are not covered, the wholesale service for products at the domestic distribution stage before exporting or after importing are covered in the WSPI.

The weights of wholesale margin by product category used for compiling the WSPI including sample selection and aggregation are calculated as follows.

- (1) The amount of wholesale margin by product category and activity in the 2011 Input-Output Tables for Japan is proportionally divided to that for domestic products and for import products by using domestic/import ratio of each product category.
- (2) For each product category, the amount of wholesale margins is aggregated. Then, the amount of wholesale margin in corporate sector is calculated by subtracting exports (special trade and direct purchase) from domestic production.
- (3) The amount of wholesale margins is aggregated according to classification for subsector of wholesale trade. The correspondence between the product category classification in the Input-Output Tables and the subsector of wholesale trade in JSIC is based on the correspondence table in the “Commercial Margin Survey” of 2015.

Thus, the amount of wholesale margin used as weight information in the WSPI is based on the 2011 Input-Output Tables for Japan.³¹ For the 2015 base WSPI, the weights are planned to be updated by using latest data such as the 2015 Extended Input-Output Tables and 2015 Economic Census.

³¹ Nomura et al. [2017] however suggest that commercial margin in the Input-Output Tables for Japan has an issue on accuracy of the estimation.

Appendix 4. Compilation Method of “Price Indexes of Goods Wholesaled”

The price indexes of goods wholesaled used as “inflaters” are basically calculated using the Corporate Goods Price Index (CGPI) which is compiled and published by the Bank on a monthly basis.

Specifically, the Bank firstly selects the corresponding indexes from the Producer Price Index (PPI) and Import Price Index (IPI) in the CGPI for each product category in the Input-Output Tables mentioned in Appendix 3, and aggregates these indexes to compile each product category index using the weights in the PPI and the IPI. This is the same methodology in compiling the Input-Output Price Index of the Manufacturing Industry by Sector (IOPI) which is also published by the Bank on a monthly basis, so the Bank uses these published data for calculating the inflators. As for some product categories such as agricultural, forest and fishery products (e.g. vegetables, fruits and so on) whose corresponding indexes do not exist in the CGPI, other price indexes such as the Agriculture Price Index (API) or the Consumer Price Index (CPI) are used complementary.

Next, since some product categories have a little wholesale margin weights in the Input-Output Tables, the Bank defines about 50 product groups (named “inlator product group”) by integrating the product categories. The Bank calculates the aggregate price indexes for each inflator product group by using the product category indexes and the wholesale margin weights calculated in Appendix 3.

In cases where reporting companies set prices of wholesale services based on pre-determined margin percentages, the prices calculated using inflators are expected to be more representative than the prices calculated using individual selling prices. Moreover, using the pre-determined inflators for the calculations will significantly reduce burden for managing sample prices. Thus, setting the inflators for each inflator product group has many advantages in practice.

Appendix 5. Implications for a Price Survey of Retail Services

In the U.S., the price survey of retail services is conducted as well as that of wholesale services. In Japan, since the price survey of retail services does not exist at present, the “Basic Policy for the Fundamental Reform of Economic Statistics” suggests that the research members including the Bank of Japan should investigate how to grasp prices of retail services. Here, we discuss implications for the price survey of retail services from findings obtained from development of the methods of the price survey of wholesale services and knowledge obtained from the precedent cases including those of the U.S.

Basically, since prices of retail services have a concept similar to those of wholesale services, collecting “per unit margins” with constant transaction conditions is expected to be effective. The practical procedure is also expected to be similar when conducting the survey by using this method.

On the other hand, as for differences between retail and wholesale services, prices of retail services are likely to have a large regional difference, and different characteristics such as store location and size, hours of operation, number of products offered for sale, and display methods of products are considered important as a price-determining characteristics. In addition, there are a large number of small retailers, and the share of internet retailers in the retail market has increased rapidly in recent years.

Regarding quality adjustment methods, the hedonic method can be applied for prices of retail services. Since retail services basically reflect the needs of customers (consumers) directly, the functions are more explicit than those of wholesale services. In the U.S., hedonic method had been adopted for quality adjustment of retail services using information such as characteristics of stores. However, it is now suspended since collecting related data became more difficult and the explanatory power of the regression was relatively limited.

Furthermore, in retail services, the speed of technological progress may be faster than that in wholesale services, for instance automated checkout-free systems and effective display methods by utilizing big data.

Considering the similarities and differences from the case of wholesale services will be beneficial for starting a development of the price survey of retail services.

References

- Alderson, W. [1965] *Dynamic Marketing Behavior*, Richard Irwin, Inc.
- Ariga, K. [2006] "Price Mark up and the Philips Curve," the Bank of Japan Working Paper Series, No. 06-J-11 (in Japanese).
- Bureau of Labor Statistics (BLS) [2012] "Wholesale and retail Producer Price Indexes: margin prices," *Beyond the Numbers: Prices and Spending*, Vol.1, Number 8 (August 2012).
- Cabinet Office [2017] "Methodology of Compiling Preliminary Quarterly GDP (CY2011 Benchmark Edition)."
- Cabinet Office [2018] "Methodology of Compiling Annual GDP (CY2011 Benchmark Edition)," (in Japanese).
- Distribution Economics Institute of Japan [2017] "Seminar of Development in Wholesale Distribution Sector: daily necessities products wholesale" (in Japanese).
- Eurostat [2016] *Handbook on Prices and Volume Measures in National Accounts*.
- Fukao, K., T. Kameda, K. Nakamura, R. Namba and M. Sato [2017] "Measurement of Deflators and Real Value Added in the Service Sector," *Economic Analysis*, No. 194, pp. 9-44.
- Hall, M. [1949] *Distributive Trading: an Economic Analysis*, Hutchinson's University Library.
- Hayashi, S. [1962] *A Revolution in Distribution: Products, pathways, and consumers*, Chuko Shinsho (in Japanese).
- Ishikawa, T. [2011] "New ideal ways of small and medium wholesale companies: strengthening functions to increase value added and to expand activity area," *Journal of Distribution & Marketing*, No. 491 (in Japanese).
- Ito, T. and M. Maruyama [1991] "Is the Japanese Distribution System Really Inefficient?," in P. Krugman, (ed.) [1991] *Trade with Japan: Has the Door Opened Wider?*, National Bureau of Economic Research, University of Chicago Press, pp. 149-173.
- Kitamura, Y., A. Otani and T. Kawamoto, [2000] "Current Conditions and Issues of E-commerce: birth of new type of intermediaries and formation of trust," IMES Discussion Paper Series, No. 2000-J-13 (in Japanese).
- Maeda, E., M. Higo and K. Nishizaki [2001] "A Study of 'Economic Structure Adjustment' in Japan," Bank of Japan Monthly Research, June 2001 issue (in Japanese).
- Maruyama, M., R. Sakai, Y. Sotokawa, N. Sakamoto, M. Yamashita, M. Arakawa, and H. Iba [1991] "Distribution System in Japan: Theory and Empirical Analysis," *Economic Analysis*, No. 123 (in Japanese).
- Moriya, K. [2017] "Estimation of Deflator of Japan's National Account in Response to 2008 SNA," *National Accounts Quarterly*, No. 161, pp. 49-88 (in Japanese).
- Nabeta, H. [2005] "Consideration on Elimination of Intermediaries in Distribution," *Bulletin of Toyo Gakuen University*, Vol. 13, pp. 201-215 (in Japanese).
- Nakamura, E. and D. Zerom [2010] "Accounting for Incomplete Pass-Through," *Review of Economic Studies*, 77(3), pp. 1192-1230.

- Nishikawa, H. [2006] “Rethinking the concept of 'assortment': Case study of MUJI,” *Hitotsubashi Business Review*, Vol. 54(1), pp. 84-97 (in Japanese).
- Nishimura, K. G. and H. Tsubouchi [1990] “Is the Japanese Distribution System Efficient for Consumers?: Comparison of Commerce Margin Ratio of Consumer Goods Based on the Input-Output Tables for Japan and the United States,” *Keizaigaku Ronshu (Journal of Economics)*, Vol. 56(2) (in Japanese).
- Nishioka, S., H. Kikegawa and M. Higo [2010] “How Should We Measure Service Prices: Based on actual examples in the Corporate Services Price Index,” Bank of Japan Working Paper Series, No. 10-J-09 (in Japanese).
- Nomura, K. and K. Miyagawa [2017] “Are Japan’s Wholesale and Retail Prices Higher than Those in the United States? Estimation of margin rates using microdata from the Census of Commerce,” RIETI Discussion Paper Series 17-J-026 (in Japanese).
- Nomura, K., K. Miyagawa and S. Arai [2017] “Issues in Commercial Margin Estimation in the Input-Output Tables and Consideration on How to Improve its Accuracy,” *Research on Economic Statistics*, Vol. 45 (III), pp. 23-52 (in Japanese).
- Office for National Statistics (ONS) [2002] “Wholesale Industry Review,” in the Industry Review Programme for the experimental index of services (IoS).
- OECD/Eurostat (2014), *Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services: Second Edition*, OECD Publishing.
- Research and Statistics Department, Bank of Japan [2013] “Basic Policy of Rebasing the Services Producer Price Index to the Base Year 2010,” *BOJ Reports & Research Papers* (in Japanese).
- Research and Statistics Department, Bank of Japan [2014] “Rebasing the Services Producer Price Index to the Base Year 2010,” *BOJ Reports & Research Papers*.
- Research and Statistics Department, Bank of Japan [2017] “Explanation of Corporate Goods Price Index (2015 base).”
- Research and Statistics Department, Bank of Japan [2018] “Basic Policy of Rebasing the Services Producer Price Index to the Base Year 2015,” *BOJ Reports & Research Papers* (in Japanese).
- Suzuki, H. [2005] “Distributive Margin and GDP,” ESRI Discussion Paper Series, No. 131 (in Japanese).
- Takashima, K. [1999] “Reconsideration of Product Assortment Concept,” *Journal of Marketing and Distribution*, Vol. 2(1), pp. 1-13 (in Japanese).
- Tamura, M. [1980] “Formation and Variation of Commercial Sector,” in Y. Suzuki and M. Tamura (ed.) *Theory of Commerce*, Yuhikaku (in Japanese).
- Timmer, M. and G. Ypma [2006] “Productivity Levels in Distributive Trades: A New ICOP Dataset for OECD Countries,” GGDC Research Memorandum GD-83, University of Groningen.
- United Nations [2010] *Indices of Distributive Trade: Handbook on Good Practices*.
- Wholesale Business Workshop in Ernst & Young ShinNihon LLC. (ed.) [2013] *Business Accounting Series: Wholesale Business*, Dai-ichi Houki (in Japanese).

Benefits of Constructing the Wholesale Services Price Index

Use for deflators in the GDP statistics

- While wholesale trade sector is one of the most important sector in Japan's economy, consisting of 8.4% of GDP, current method to construct deflator for estimating the real output of wholesale trade sector in the GDP statistics is not appropriate (see next slide for details).
- "Basic Policy for the Fundamental Reform of Economic Statistics" (December 2016) by the Council on Economic and Fiscal Policy, suggests that BOJ should start surveying prices of wholesale services which will contribute to improve the accuracy of the GDP statistics.

Use for productivity analysis of wholesale trade sector

- While analyzing productivity of wholesale trade sector can be a promising research theme in terms of international comparison for example, it is currently difficult to grasp the comprehensive picture due to inadequate deflator.

Use for economic conditions assessment and price setting behavior analysis

- As sales activities of wholesalers are closer to final users compared to those of manufacturers, if prices of wholesale services can be captured promptly, it will provide beneficial information which can contribute to assessment on economic conditions and monetary policy management.
- Data may be useful to analyze companies' price setting behavior, such as how wholesalers pass their cost on to selling prices when purchase prices increase.

Wholesale Services Price Index for GDP Statistics

- ✓ Nominal output of wholesale trade is equivalent to nominal amount of wholesale margin (value of total sales – value of total purchase).
- ✓ Although there are several ways to measure real output of wholesale trade, method currently adopted by Japan's GDP statistics (deflating nominal wholesale trade margin using Producer Price Indexes) is inappropriate according to Eurostat and other previous studies.
- ✓ BOJ intends to newly construct "Wholesale Services Price Index (WSPI)" as with the U.S. and Canada, where the most appropriate method is adopted.

◆ Methods to measure real output of wholesale trade and computation of deflator

	Most appropriate method		Second-best method	Inappropriate method
Methods to measure real output	Using WSPI	Double deflation	Equivalent to real sales or sales volume	Using price index of products sold or purchased
	Deflating nominal trade margin using the deflator explained below	Taking the difference of real sales and real purchase deflating individually with corresponding price indexes	Presumes that real output is proportional to real sales (deflating sales with price index)	Deflating nominal trade margin using the deflator explained below
Computation of deflator	Calculated using quality adjusted price indexes of wholesale services (WSPI)	----	----	Calculated using price indexes of selling products or purchased products
Challenges	Difficulty in surveying prices with constant quality	Real output is influenced by the accuracy of sales and purchase price indexes (large measurement error)	Unsuitable for analyzing productivity as quality of wholesale service is not considered	Assuming that price developments in wholesale services coincide with those of products is unreasonable
Adopting Countries	U.S., Canada	Korea (only for total of wholesale and retail trade)	UK, Germany, Australia etc.	Japan (current method)

Source: Eurostat (2016) "Handbook on Prices and Volume Measures in National Accounts", Timmer and Ypma (2006) "Productivity Levels in Distributive Trades: A New ICOP Dataset for OECD Countries", Each country's statistical authority

Relevant Policy for Constructing the Wholesale Services Price Index

Organizing concepts of “wholesale services”

- There is no concrete concept of “wholesale services” as wholesalers offer their service to their clients through purchasing and selling merchandises. Therefore in order to conduct a price survey it is important to organize concepts on what “wholesale services” are and present it to the survey respondents.
- Organizing concepts is also important for “quality adjustment” when compiling price statistics.

Consideration for companies’ reporting burden

- Japanese companies adopt various margin management systems depending on their business customs. To reduce companies’ reporting burden and increase responding possibilities, several reporting methods need to be prepared when conducting price surveys considering these situations. These considerations could reduce non-response bias and improve index accuracy.

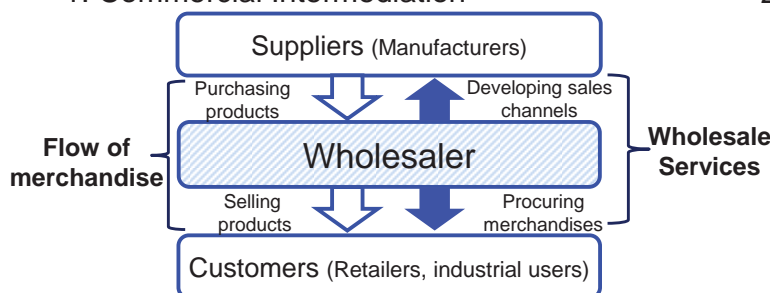
Adoption of efficient methods in the price survey

- Wholesale trade sector has a large role of distributing wide variety of products. So to compile an accurate price index, reflecting all transactions will require a large number of samples. Under various resource constraints, it is crucial to use efficient survey methods which enable to compile an accurate price index with small survey price samples.

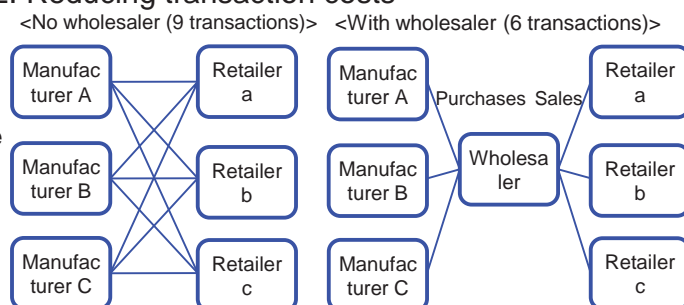
Organizing Concepts of “Wholesale Services”

- ✓ Wholesale services are defined as “services provided by wholesalers”.
- ✓ Through trading merchandises, wholesalers have a function of developing sales channels or procuring merchandises on behalf of clients, and reducing transaction costs by being a hub of distribution channels. In addition, some services with strong synergy are often accompanied as an inseparable service (so-called “bundled services”). For instance, transportation and warehousing function which provides delivery services and inventory management, and market information function which summarizes and provides transaction information.

1. Commercial Intermediation



2. Reducing transaction costs



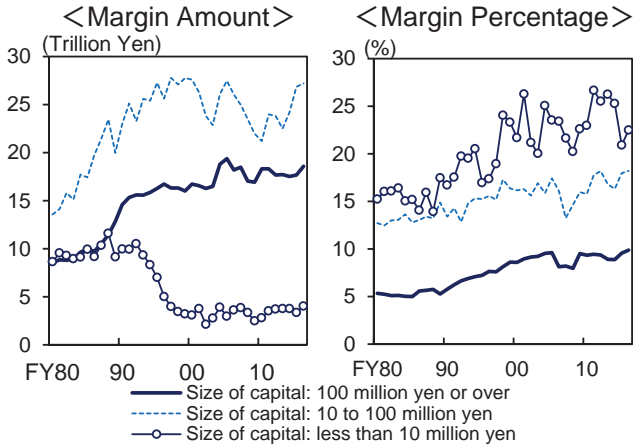
3. Main functions of wholesalers

Intrinsic functions of wholesalers		Functions providable by other sectors (accompanying services with strong synergy)	
Commercial Intermediation	Developing sales channels for suppliers and procuring products for customers.	Market Information	Making use of summarized transaction information for marketing.
Transaction Cost Reduction	Reducing costs and risks related to transaction by being a hub of distribution channels.	Transportation and Warehousing	Providing delivery, warehouse service and inventory management.
Assortment Building	Bulk breaking and enriching product lineup to support various demand of customers.	Financing	Providing credit and financing through payment collection.
		R&D	Development of private label products, product planning.

Current Picture of Japan's Wholesale Trade Sector

- ✓ Discussion about “unnecessity of wholesalers” and “disintermediation of wholesalers” has been going on for a long time. When looking at the wholesale margin for the whole economy in terms of company size, it has declined mainly for small companies since the 90's. This is likely influenced by distribution rationalization caused by retailers engaging in transaction directly with manufacturers, and e-commerce prevailing.
- ✓ Wholesalers in the meantime, have strived to survive through management integration and strengthening functions, thus margin percentage for this period has increased and the long run significance has not declined in terms of GDP share.

1. Wholesale margin by company size



Note: Margin amount = Sales – Cost of sales
 Margin percentage = Margin amount / Sales volume
 Source: Ministry of Finance

2. Nominal GDP share by economic activity

◆ GDP share ranking (CY2015)

1	Manufacturing	20.7%
2	Real estate	11.4%
3	Wholesale trade	8.4%
4	Professional, scientific and technical activities	7.2%
5	Human health and social work activities	6.8%
6	Retail trade	5.6%

◆ Change in GDP share of wholesale trade

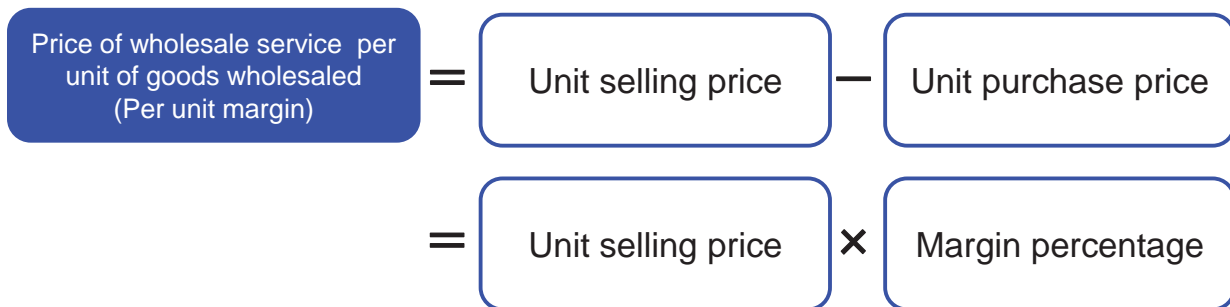
CY1981	1986	1991	1996	2001	2006	2011
-1985	-1990	-1996	-2000	-2005	-2010	-2015
7.2%	6.9%	8.0%	8.4%	8.6%	8.6%	8.7%

Note: Figures prior to 1993 is estimated based on figures of benchmark year 2000 (1993SNA).
 Source: Cabinet Office

Pricing Method of Wholesale Services (1)

- ✓ Survey for the WSPI will be conducted by firstly setting various price-determining characteristics such as “contents of goods, quantity, customer and supplier, transaction terms, contents of accompanying services”. Wholesale margin (value of sales minus value of purchase) will be surveyed on a quarterly basis.
- ✓ Considering burden of respondents, in addition to setting quantity unit for reporting, either “unit selling price and unit purchase price” or “unit selling price and margin percentage” is collected periodically, depending on respondents’ data management system.
 - This method is equivalent to that of the U.S. WSPI.

◆ Pricing method of wholesale services from respondents



↑
 (Unit selling price – Unit purchase price) / Unit selling price
 or (Sales – Cost of sales) / Sales

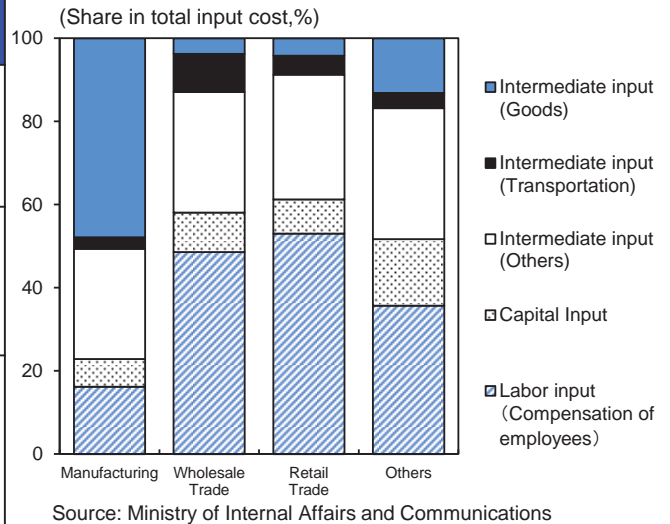
Pricing Method of Wholesale Services (2)

- ✓ Selecting price reporting method to suit the respondent's contract realities and price setting behavior is desired whenever possible. Price fluctuations of goods wholesaled is likely to differently affect price of wholesale services depending on the price setting behavior of respondents (e.g. how cost is passed on to selling prices when purchase price increase), thus reporting method to accurately capture this difference needs to be selected.
- ✓ However, as cost of labor input (personnel expenses) accounts for most share of wholesale sector input cost, in the long run, price of wholesale services is likely to gradually match the labor cost.

1. Short term price setting behavior of wholesalers

Short term pricing method of wholesales firms		Short term impact of purchasing price increase	
Selling price and purchase price is decided respectively with each counterpart on an individual contract basis (so-called merchant wholesalers).		If selling price is sticky, margin will decline. (Imperfect pass-through)	Price of wholesale services ↓ Purchase price ↑ Selling price → Margin percentage ↓
Either selling price or purchase price is not decided independently (so-called commission agent).	Set a margin amount and decide selling price by adding the margin price to purchase price.	If margin amount is sticky, selling price will increase proportionate to purchase price. (Perfect pass-through)	Price of wholesale services → Purchase price ↑ Selling price ↑ Margin percentage ↓
	Set a margin percentage and decide selling price by adding the percentage (markup percentage to be exact) to purchase price.	If margin percentage is sticky, selling price and margin price will increase at the same rate as the purchase price increase. (Excessive pass-through)	Price of wholesale services ↑ Purchase price ↑ Selling price ↑↑ Margin percentage →

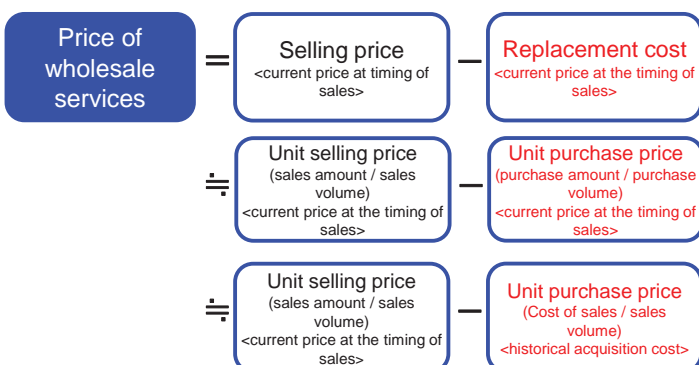
2. Input structure in the Input-Output Tables



Pricing Method of Wholesale Services (3)

- ✓ In survey for the WSPI, to match the concept of SNA, unit selling price is at the timing of sales and unit purchasing price is the replacement cost (current price) of goods sold at the timing of sales.
- ✓ In practice, generally, price of goods purchased at the same timing as sales (current price), will be surveyed as replacement cost. However, there may be cases where products sold and purchased may differ, or transaction terms may vary seasonally. If there are possibilities for sample price to be inappropriate, confirmation needs to be made returning to principle.
- ✓ There are cases where purchase price at current price is difficult to report, due to company's data management system. In such cases, considering burden on respondents, purchase price based on historical acquisition cost (cost of sales / sales volume) will also be accepted.

1. Evaluation method of unit purchase price



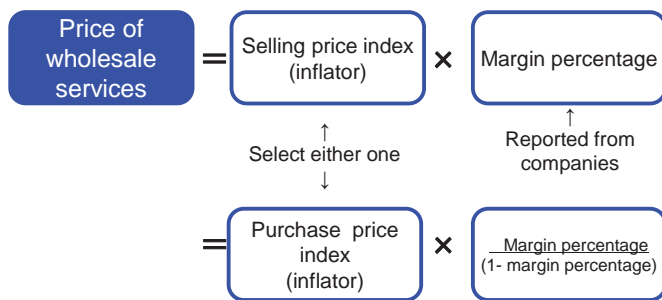
2. Example of wholesale of apparel (seasonal products)

		Each seasonal product can be specified	
		Yes	No
Timing of purchasing and selling the product is in the same period	Y e s	Apply usual pricing method (Single seasonal product). For missing price data due to no transaction, impute prices using average of high season.	Apply usual pricing method (Group of seasonal products). Price of wholesale services may fluctuate due to seasonality of the product.
	N o	Aggregate survey prices for each season. If using usual pricing method, price of wholesale services may be calculated inappropriately due to seasonality of transaction terms.	Aggregate survey prices yearly. (Assume the quality is stable on a yearly basis). If using usual pricing method, price of wholesale services are calculated inappropriately due to seasonality of product and transaction terms.

Prices Calculated using Price Indexes of Goods Wholesaled

- ✓ Depending on company’s data management system, there are cases where reporting selling price is difficult and only “margin percentage” is reportable.
- ✓ However, to increase survey response rate and reduce non-response bias, these cases should not be excluded. In these cases, price of wholesale services is calculated by multiplying margin percentage by price index corresponding to the goods wholesaled (hereafter, “inflator”).
- ✓ Even if both unit selling price and margin percentage are reportable, if there is noise resulting from average price in the unit selling price, it may be more preferable to calculate price of wholesale services using not the selling price but corresponding inflator.

1. Sample price using price index of goods wholesaled



2. Characteristics of sample price using inflator

	Companies set price by pre-determined margin percentage	Companies do not set price by margin percentage
Only margin percentage is reportable	As long as inflator is selected appropriately, sample price using inflator will be desirable because of highly stable quality . (A form of model pricing method)	If noises exist in the ex-post calculated margin percentage, quality may be less stable for sample price using inflator. In such case survey method needs to be re-considered .
Both unit selling price and margin percentage is reportable	If noises exist in the reported unit selling price, quality may possibly be more stable for sample price using inflator.	From the same reason as above, quality will be less stable for sample price using inflator. Basic method (sample price using unit selling price) should be adopted.

Quality Adjustment of Prices of Wholesale Services

- ✓ If there are changes in surveyed products or transaction terms of wholesale services, the price of the wholesale services needs to be adjusted for quality changes (to reflect only the “pure price changes” in the price index).
- ✓ For quality adjustment methods in the WSPI, the same 5 methods as the SPPI presented in the chart below, can be considered. In particular, in cases where cost information of services can be interviewed, production cost method can be adopted (see next slide for detail). Hedonic regression is not adopted as acquiring data on characteristic information is difficult for wholesale services.
- ✓ In cases where it is foreseeable that it is difficult to apply any of the quality adjustment methods, bundling goods with similar functions and transaction terms is an option. In such cases, confirmation that quality remains stable needs to be made regularly.

◆ Quality adjustment method adopted in the Services Producer Price Index

Direct comparison method	If difference in quality between old and new services is ignorable, the price difference is treated as “pure price changes”.
Unit price comparison method	If difference in quality between old and new services is proportionate to transaction volume (sales volume), the price difference arising when same volume is compared is treated as “pure price changes”.
Production cost method	If cost accounting for quality difference between old and new services can be interviewed, the amount is treated as “price change due to quality changes”.
Overlap method	Treat all price difference between old and new services as “price change due to quality changes”.
Hedonic regression method	From difference in specification of old and new services, quantitatively estimate “price change due to quality changes” using regression analysis.

Applicability of Production Cost Method

- ✓ The applicability of Production Cost Method for the WSPI is under consideration.
- ✓ Following cases are some examples:
 1. If price of wholesale services increases due to development of a new private label product, the price may be adjusted by R&D cost per expected sales volume (presume not as pure price increase but as quality improvement).
 2. If price of wholesale services decreases due to change in method of payment from credit to cash, the price may be adjusted by modifying the decrease of interest and credit (presume not as pure price decrease but as quality deterioration).

◆ Examples of applying production cost method

Examples	Practical approach of quality adjustment
Increasing promotion expenditure at launch of new model (improvement in quality of wholesale services)	<ul style="list-style-type: none"> ✓ If expenditure for promoting new model increased compared to that of old, it can be assumed as function of developing sales channels increased (quality improvement). ✓ Practical approach : Expected margin percentage which is equivalent to promotion cost was interviewed, so price of wholesale services was adjusted for the margin percentage.
Discount due to changing method of payment for sales (deterioration in quality of wholesale services)	<ul style="list-style-type: none"> ✓ Quality of wholesale services deteriorate when payment method change from credit to cash, as in the prior method credit and financing function was provided. ✓ Practical approach : Information on decrease of interest and credit cost was interviewed from company, so price was compiled by adjusting the selling price for that amount.
Decreasing use of private warehouse due to buyer's newly built distribution center (deterioration in quality of wholesale services)	<ul style="list-style-type: none"> ✓ If wholesaler's use of private warehouse decreases due to usage of buyer's newly built distribution center, it can be assumed as deterioration of quality as they no longer provide logistic function. ✓ Practical approach : Interview the facility usage fee and adjust for the equivalent amount.

Comparison with the Experimental Survey

- ✓ Since 2014, practical know-how has been accumulated through the experimental survey for prices of wholesale services with data starting from 2010.
- ✓ The coverage which was limited to a few subsectors for the experimental survey will be expanded to the entire wholesale trade sector of the Input-Output Tables for Japan, which is one of the fundamental source statistics for the GDP statistics.
- ✓ In expanding the coverage, efforts such as preparing various surveying methods to consider company's data management system have been made to increase reporting possibilities by respondents. This also enabled the adoption of different quality adjustment methods.

1. Coverage of the Survey

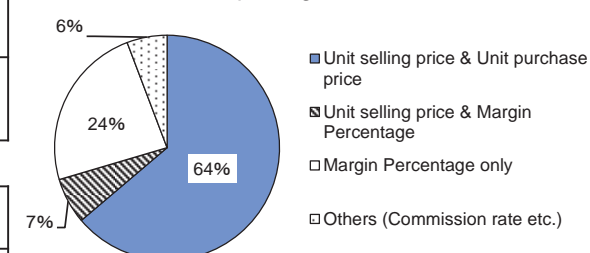
Experimental Survey	Food and Beverages	Plastics	Electronic Parts and Devices
WSPI	The entire Wholesale Trade Sector		

Note: "Recycled Material" is included in wholesale trade sector in the Japan Standard Industrial Classification but excluded in the Input-Output Tables for Japan.

2. Reporting method of respondents

Experimental survey	Margin percentage
WSPI	"Unit selling price" and "Unit purchase price" or "Unit selling price" and "Margin percentage" (Only margin percentage in cases where selling price is difficult to survey)

◆ Breakdown of reporting method for the WSPI



Note: Data as of May 2018.

3. Quality adjustment of surveyed price

Experimental survey	Assumes that quality is proportionate to quality of goods (Uniformly using price index)
WSPI	Consider the appropriate quality adjustment method for each individual price

Number of sample prices and survey frequency

- Intended sample size of the survey is roughly 1,000 sample prices. It is small compared to the size of current CGPI (roughly 8,500 prices), so index accuracy needs to be maintained by conducting the survey efficiently.
- Survey frequency will be quarterly. By accepting the of accounting information processed on a quarterly basis, reporting burden can be reduced for some respondents.

Selecting candidate companies and survey products

- To select samples efficiently, the following price-determining characteristics are taken into consideration to choose the candidate company when deciding the composition of samples (composition ratio can be estimated using the Input-Output Tables).
 1. Wholesale trade subsector which the reporting company belongs to;
 2. Product wholesaled by the reporting company;
 3. Place of origin of the product (domestic or foreign).

Companies with large amount of wholesale margin (gross profit of sales) are selected from each subsector as candidate by judgmental sampling according to composition ratio.
- If necessary, characteristics such as the following are additionally considered: usage of product (for industries or consumers), how to procure products (purchase or consign), contract term (long-term or on spot), firm size (large or small), geography (urban or rural), distribution level (primary or secondary wholesalers).

Publication Items of the Wholesale Services Price Index

- ✓ Subsector indexes will be compiled and published in response to user needs. Number of sample prices for each subsector index should be sufficient to maintain accuracy of the index.
- ✓ Current plan is to provide indexes for 5 subsectors based on “major group” of wholesale trade sector of the Japan Standard Industrial Classification (JSIC).
 - Samples are selected based on product category of the Input-Output Tables and classified into the corresponding subsectors. Therefore, wholesale services in each item are based on their activities.

◆ Publication items of the WSPI

Item	
Wholesale Trade	Wholesale Trade (Textile and Apparel)
	Wholesale Trade (Food and Beverages)
	Wholesale Trade (Building Materials, Minerals & Metals, etc.)
	Wholesale Trade (Machinery and Equipment)
	Miscellaneous Wholesale Trade

Specifying Transaction Conditions for Each Sample (1)

Chart 15

Specifying contents of survey products

- From the viewpoint of surveying prices of wholesale services with constant quality, it is desirable to collect “single products” narrowing the range of survey products for wholesaling as possible. However, under limited number of samples, narrowing the range too much may make the aggregated price index less accurate due to an increase in number of sample prices showing extraordinary fluctuations. To avoid this, collecting prices of “comparable product lines” with wider range of survey products are an alternative option.

Specifying customers and suppliers

- The size of margins of wholesale services will differ between customers because wholesale services are usually different depending on needs from the customers, such as size of selling lots and payment terms.
- On the other hand, characteristics of supplier are not to be explicitly considered. By specifying contents of survey products for samples, characteristics of supplier are by and large determined. In cases where the products are procured from the market, the quality of products are identical regardless of suppliers. By specifying the characteristics excessively, continuous survey of prices may possibly be disrupted by changes in suppliers.

Specifying Transaction Conditions for Each Sample (2)

Chart 16

Treatments of transportation cost and specifying accompanying services

- Transportation services can be provided by wholesalers as bundled service, but in cases where other companies provide the transportation services, the cost is to be deducted from price of wholesale services. Specifically, if the wholesaler covers the freight cost at the point of sales, the cost is to be deducted from selling price, and if the wholesaler covers the freight cost at the point of purchase, the cost is to be added to the purchase price.
- When price of wholesale services is compiled including freight costs such as delivery between branches using self-owned truck, and the cost cannot be separated, these are considered as bundled services. To survey prices with constant quality contents of accompanying services are to be specified when selecting samples.

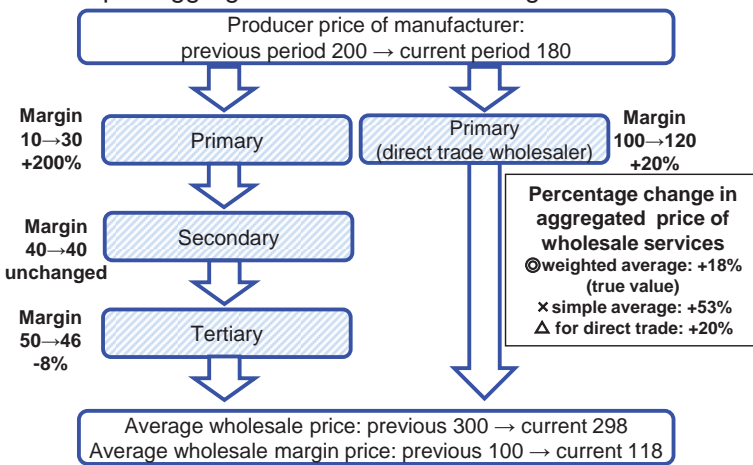
Treatment of rebate and specifying transaction terms

- In some wholesale trade subsectors, providing rebates to customers or accepting rebates from suppliers occur frequently. These rebates need to be reflected in prices of wholesale services in principle, deducting the rebates from both selling and purchase prices.
- Whether entitled to rebates or not is typically conditional, based on various targets included in contract terms. Therefore the requirements should be taken into account in sample selection in order to survey prices with constant quality. For instance, in the case of quantity rebates, where amount of rebates will depend on amount of quantity transacted, quantity required should be specified in sample selection.

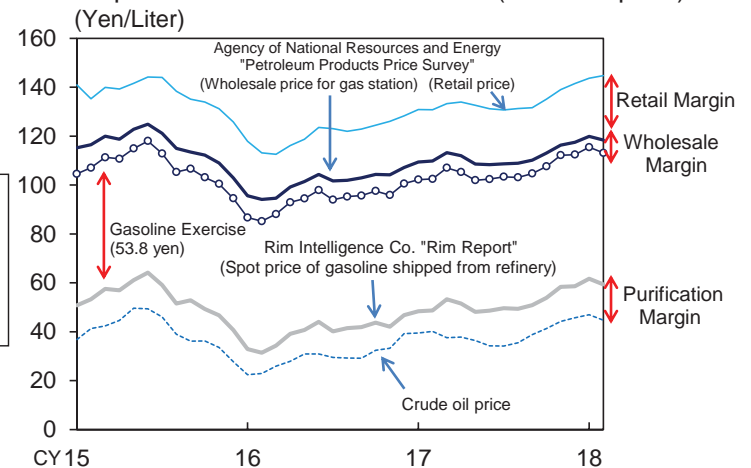
Considering Distribution Level and Utilization of External Database

- ✓ Distribution level of wholesalers should be taken into account in sample selection. Even if the same product is traded, size of margin of each company will vary widely depending on its distribution channel, such as between a distribution channel with only primary wholesaler ("direct trade wholesaler") and with multiple distribution levels. The aggregated price index is likely to be distorted if sample prices are not selected by an appropriate composition ratio. Therefore, the Bank intends to survey only direct trade wholesalers.
- ✓ For products with little difference in quality, price of wholesale services can be measured efficiently by using macro data of producer price and wholesale price published by external organizations.

1. Example: Aggregation method considering distribution levels



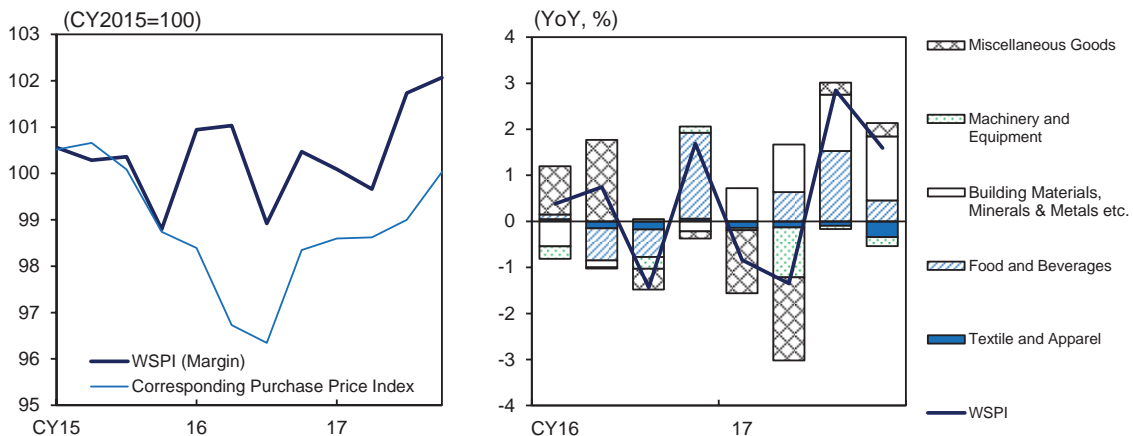
2. Proposed use of external database (Gasoline price)



Tentative Estimate of the Wholesale Services Price Index

- ✓ Tentative estimate of the Japanese WSPI is calculated using price data collected from companies cooperating in the survey as of May 2018. On the individual sample price basis, some prices show considerably large fluctuations, yet the aggregated price index is relatively less volatile and is fluctuating within a several percentage for 2015 onwards.
- ✓ Aggregated price of wholesale services has remained largely flat through 2015 and 2016 whereas aggregated price of corresponding goods wholesaled has turned to an increase in mid-2016 after declining in mid-2015. In 2017, price of wholesale services has increased following the increase in price of goods wholesaled, driven by increase in domestic and foreign demand.

◆ Tentative estimate of the WSPI



Note: Estimated by taking simple average of individual surveyed prices (CY2015=100). Data as of May 2018.

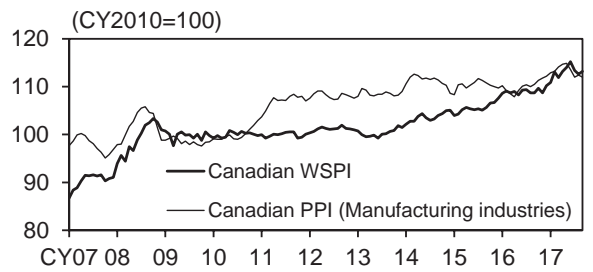
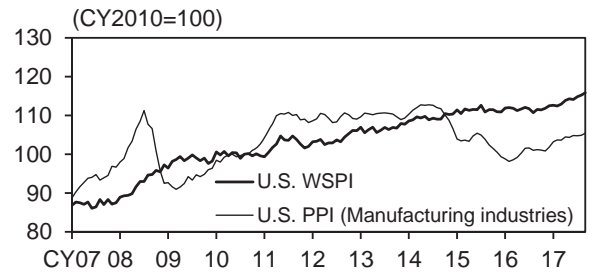
Wholesale Services Price Index of the United States and Canada

- ✓ As for experiences among foreign countries, both the U.S. and Canada started the survey of the WSPI in mid-2000s and publishes monthly data.
- ✓ Looking at the development of the index for the U.S. and Canada, although it is affected by the fluctuation of price of goods wholesaled, through price setting behaviors, the index is relatively less volatile.

1. Outline of WSPI in the U.S. and Canada

	United States	Canada
Start of data	December 2006 onwards (June 2004 onwards for durable goods)	January 2006 onwards
Frequency	Monthly	Monthly (Published quarterly)
Reporting Method	Electronic questionnaire	Electronic questionnaire
Published Indexes	Wholesale Trade Sector	Wholesale Trade Sector
	Merchant wholesalers durable goods	8 major categories: <ul style="list-style-type: none"> Farm product merchant wholesalers Petroleum and petroleum products merchant wholesalers Food, beverage and tobacco merchant wholesalers Personal household goods merchant wholesalers etc. Detailed classification of major category 70 indexes
	9 categories : <ul style="list-style-type: none"> Distribution of motor vehicles and motor vehicle parts and supplies Distribution of machinery, equipment, and supplies etc. 	
	Merchant wholesalers nondurable goods	
9 categories : <ul style="list-style-type: none"> Distribution of apparel, piece goods, and notions Distribution of chemicals and allied products etc. 		

2. Price developments of the U.S. and Canada



Sources: Bureau of Labor Statistics, Statistics Canada

Issues Faced in Practice

Difficulties in obtaining the appropriate sample price composition

- Many companies have already kindly participated in the survey, and thus the number of new survey respondents enough to compile the WSPI is likely to be achieved.
- To increase index accuracy, composition of sample prices needs to be decided according to various characteristics (Chart 13). In practice, candidate with the targeted characteristics can be scarce and therefore deciding the appropriate balance is difficult.

Difficulties in dealing with “large fluctuation” of individual price of wholesale services

- Large fluctuation of prices of wholesale services can be caused by various factors (Chart 18). Extraordinary “fluctuation” which hardly occurs for price survey for goods and services, such as prices suddenly increasing 20 times, can be seen for the WSPI. When these fluctuation occurs, the cause needs to be identified and the individual fluctuation is appropriately dealt with according to the cause.

Difficulties in treatment of quality change of wholesale services

- In the months ahead, change in samples is likely to occur with a reasonably high frequency. For method of quality adjustment, method such as production cost method is under consideration (Chart 11). However it is a rare case to be able to interview necessary information from survey respondents.