

Explanation of Final Demand-Intermediate Demand price indexes (FD-ID price indexes) (2015 base)

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1. Overview, Purposes and Functions

(1) Overview

The Final Demand-Intermediate Demand price indexes (FD-ID price indexes) are price index series by stage of demand that are comprised of the final demand index (FD index) and four intermediate demand indexes (ID indexes).

Name	• The Final Demand-Intermediate Demand price indexes (FD-ID price indexes) ¹
Compilation section	• Price Statistics Division, Research and Statistics Department
Frequency of compilation	• Monthly
Time of release	• In principle, the date of release is the 20 th business day of the following month (two business days after the release of the Services Producer Price Index). The time of release is 2:00 p.m.
Method of release	• Bank of Japan's website
Starting time of data	• Starting time of data for the basic series: January 2015 • Starting time of data for the special series: January 1970
Price concept/price data	• In principle, producer prices at the time of shipment by producers are used. Therefore, while the Corporate Goods Price Index (CGPI) and the Services Producer Price Index (SPPI) are used in principle, some commodity-level indexes within the CPI are also used. • CGPI: 1,206 commodities; SPPI: 151 commodities; CPI: 126 commodities (as of 2015)
Index series classification	• The total number of indexes in the basic and special series is 112. • Regarding the basic series, a total of 109 component indexes, classified by type of goods/services and by domestics/imports, are compiled with respect to the price indexes for Stage 1 to 4 of intermediate demand and the final demand index. • For the special series, the three final goods indexes within the Index by Stage of Demand and Use (ISDU) in the CGPI ("Final goods," "Final goods/capital goods" and "Final goods/consumer goods," all of which cover domestic goods), which are substituted for by index within the FD index, the linked indexes are compiled and published, with historical data dating back to January 1970.
Calculation of weights	• Based on the 2015 Input-Output table (I-O table), compiled by the Ministry of Internal Affairs and Communications
Index calculation formula	• The fix-weighted Laspeyres formula
Correction of indexes	• Correction is made in accordance with the correction of the CGPI and the SPPI.
Others	• Sector for which there is no corresponding commodity-level index in the CGPI, the SPPI and the CPI are excluded from aggregation. • As the 2015 I-O table is used for the assignment of sectors to stages and the calculation of weights, 2015 is used as the current base year of the FD-ID price indexes. The rebasing of the FD-ID price indexes to 2020 is scheduled to be implemented after the publication of the 2020 I-O table, separately from the rebasing of price statistics (the CGPI and the SPPI).

¹ The FD-ID price indexes are regarded as satellite series (which complement the indexes for all commodities within the basic group index system as processed statistics compiled through re-aggregation of commodity-level indexes in the CGPI and the SPPI).

(2) Purposes and Functions

One of the primary functions of the Producer Price Index (PPI) is to serve as an aggregate price index that appropriately represents the supply-demand condition of goods and services on a whole economy. In this respect, the Bank publishes the CGPI and SPPI for all commodities as aggregate price indexes for producer prices in Japan with respect to goods and services, respectively.² However, a price index that integrates goods and services would be more useful for tracking inflationary and deflationary pressures in the entire economy. There are presumably some user needs for tracking supply-demand trends in the entire economy, including goods and services sectors, by stage of demand, such as in the upstream or downstream of the production flow.

Moreover, when using the index for all commodities, the so-called "multiple counting problem" makes it somewhat difficult to track supply-demand trends regarding goods and services. In other words, as the index for all commodities is compiled by aggregating commodities in different stages of demand through weighted-averaging by gross trade value, the effects of price changes in an upstream stage of demand may be counted again in a downstream stage. As a result, in the case of the CGPI in particular, the effects of prices of resources, such as crude petroleum, tend to be overrepresented in the index for all commodities.

The Final Demand-Intermediate Demand price indexes (FD-ID price indexes) have been developed in order to address those problems. The FD-ID price indexes are characterized by the following four features: (i) aggregating prices of goods and services in an integrated manner; (ii) dividing demand into the stage of final demand and the stages of intermediate demand, and compiling the Final Demand Index (FD index) and the Intermediate Demand Indexes (ID indexes); (iii) dividing intermediate demand into four stages, from upstream to downstream stages in the production flow, and compiling the ID indexes for Stage 1 (the most upstream stage) to Stage 4 (the most downstream stage); and (iv) excluding transactions conducted within stages (internal flow) from the calculation of weights for the ID indexes. Using the FD-ID price indexes makes it possible to track the process of transmission of price changes across goods and services and also to avoid the multiple counting problem.

(3) Method of compiling the FD-ID price indexes (overview)

When compiling the FD-ID price indexes, the Bank used as a reference the compilation method

² As for the SPPI, the all commodities index is called the "index of all items" in the official statistics.

used by the U.S. Bureau of Labor Statistics, which started compiling and publishing the indexes earlier. For example, the structure of the Japanese FD-ID price index series, comprised of the FD index and four ID indexes, follows the example of the U.S. methodologies. Even so, the Japanese FD-ID price indexes have some original features. For example, taking into consideration the distinctive characteristics of Japan's economic and industrial structures, the Japanese indexes are designed so as to cover not only domestics but also imports.

The overview of the method of compiling the FD-ID price indexes are as described below. (i) to (iii) correspond to Sections 4 to 6, respectively, of this paper.

- (i) Stage assignments: Goods and services sectors are each assigned to one of the four stages of intermediate demand in a way that is consistent with the production flow in Japan as described in the I-O table. The optimal assignment of sectors is achieved by seeking to maximize the value of net forward flow, which is obtained by subtracting the value of goods and services that move from downstream to upstream in the production flow (back flow) from the value of goods and services that move from upstream to downstream (forward flow).
- (ii) Calculating weights: After the completion of assignment of goods and services sectors to their respective stages, weights used in aggregation for compiling the FD-ID price indexes are calculated. The weights used in aggregation for compiling the FD price index are the weights in final demand sectors in the I-O table. As for the ID price indexes, the weights of goods and services sectors input to each of the four stages of intermediate demand categorized based on stage assignments are used.
- (iii) Matching of price data (commodity-level indexes): Following the calculation of the weights of sectors for the FD and ID indexes, the FD-ID price indexes are calculated by matching sectors with price data (commodity-level indexes). In the matching process, commodity-level indexes in the CGPI and the SPPI are used in principle. However, with respect to some sectors that are not covered by those indexes, such as services for households and household-use electric power, commodity-level indexes in the CPI are also used.

An intuitive explanation of the method of compiling the FD-ID price indexes is as follows: (i) assign goods and services sectors (column sectors of the I-O table) to the four stages of intermediate demand; (ii) calculate the weights of all goods and services sectors (row sectors of the I-O table) that are used as inputs in each of those stages and the stage of final demand; and (iii) match each of those

goods and services sectors (row sectors of the I-O table) with price data, thereby compiling weighted average price indexes. Consequently, the FD-ID price indexes have the characteristics of input price indexes.

2. Scope and Coverage

(1) Scope

As the FD-ID price indexes are aggregate producer price indexes integrating prices of goods and services, their scope covers the whole of goods and services transactions, including transactions not only in domestics (domestically produced goods and services) but also in imports.³ As shown in Chart 1, while ID indexes, which cover intermediate demand, include domestics and imports, the FD index, which covers final demand, includes domestics, imports and exports. If we look at the scope of the FD-ID indexes in reference to the I-O table, we see that those indexes are distinctive in that goods and services sectors are classified by stage of demand in the flow of production (column sectors of the I-O table), rather than by type of goods or services (row sectors of the I-O table).⁴

³ The Bank follows the U.S. BLS's method for compiling the FD-ID indexes. However, as the U.S. FD-ID indexes cover only domestically produced goods and services, they do not directly take into consideration the effects of imports. On the other hand, in Japan, industries depend on imports for most of the raw materials needed for their production, and imports also play an important role in each stage of demand. Therefore, in order to examine the inflationary trend and the transmission process of price changes, it is important to take into consideration the effects of not only domestic prices but also import prices on price changes in each stage of demand. Therefore, for the compilation of the Japanese FD-ID price indexes, imports are included in aggregation.

⁴ In this respect, the ISDU, which was compiled and published as a reference index for the CGPI until the 2015 base year, is a price index aggregating goods classified by commodity type (row sectors of the I-O table), rather than by stage of demand (column sectors). As a result, "Raw materials" and "Intermediate materials" in the ISDU in the CGPI are very different in scope from the ID indexes, as goods are aggregated on the basis of the level of processing by commodity type (row sectors). On the other hand, regarding "Final goods," it is mostly the same as the FD index (goods) in scope, as goods are classified by stage of demand (column sectors).

Chart 1. Scope of Japan's FD-ID Indexes

Commodity type (row sector)	Production sector	Demand sector (column sector)																
		Intermediate demand												Final demand				
		Stage 1			Stage 2			Stage 3			Stage 4			PC	CI	Gov	Exp	
		2	3	9	1	4	10	5	7	8	6	11	12					
Goods	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
Services	7																	
	8																	
	9																	
	10																	
	11																	
	12																	
Imports																		

Stage 1Stage 2Stage 3Stage 4Final demand

Note: PC, CI, Gov, and Exp stand respectively for personal consumption, capital investment, government expenditure, and exports.

(2) Coverage

The coverage of the FD-ID indexes are obtained by calculating the percentage ratios of the value of transactions in the sectors covered by the respective indexes to the total value of transactions minus the value of transactions within stages (internal flow). The coverage of the FD-ID price indexes as a whole is approximately 70 percent, which is a generally sufficient level for an aggregation price index based on producer prices that integrates prices of goods and services.⁵

Chart 2. Coverage

	Intermediate Demand				FD (including exports)	FD+ID
	Stage 1	Stage 2	Stage 3	Stage 4		
The value of transactions covered by indexes/ The total value of transactions	88%	79%	86%	87%	63%	72%

⁵ The United States has shifted to an FD-ID aggregation system because in recent years, the coverage of services has surpassed 70%, a level comparable to the coverage of goods. In Japan as well, the coverage of services rose from 50.5 percent to 71.3 percent (including wholesale service prices) as a result of the rebasing of the SPPI to 2015, so the prerequisite for compiling the FD-ID price indexes has been met. Therefore, the starting time of data for the basic series is January 2015.

3. Index Series Classification

There are a total of 112 indexes, including the basic and special series of indexes. For more detailed information, see (Reference).

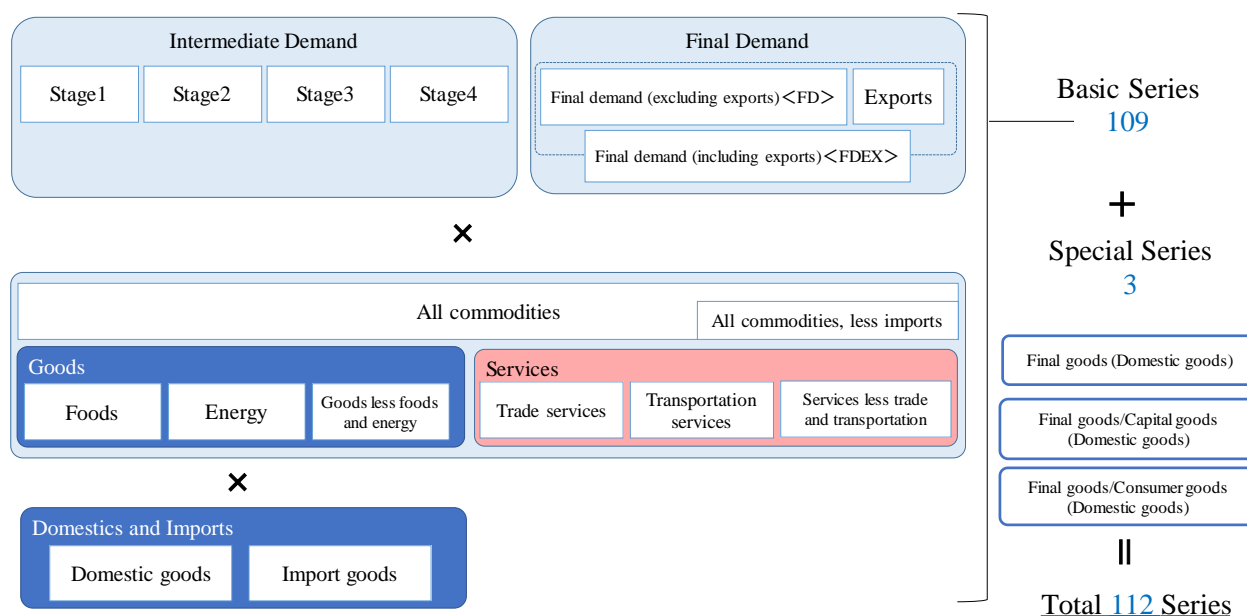
(1) Basic Series

There are 109 indexes classified (i) by type of goods/services and (ii) by domestics/imports with respect to each of the ID Indexes for Stage 1 to Stage 4 and the FD index.

(2) Special Series

With respect to the three final goods indexes within the ISDU in the CGPI ("Final goods," "Final goods/capital goods," and "Final goods/consumer goods," all of which cover domestic goods), the Bank publishes linked indexes using indexes within the FD index as substitutes.

Chart 3. Index Series Classification



At present, the Bank does not compile or publish indexes classified by demand sector (e.g., personal consumption and capital investment) within the FD price index. As the development of the FD-ID price indexes is still ongoing, closer examination is required before preparing and publishing more detailed indexes. Going forward, the Bank will flexibly consider revising the classification of the FD-ID indexes in light of revisions of the underlying data, such as the I-O table, and changes in future user needs.

4. Stage assignments

In the process of compiling the FD-ID price indexes, the I-O table (2015 base) is used for the assignment of sectors to demand stages and the calculation of aggregation weights. The I-O table is a matrix of rows and columns that shows in which stages of intermediate demand or final demand (column sectors of the I-O table) outputs of goods and services (row sectors of the I-O table) are consumed. For the FD-ID price indexes, the classification of sectors at the commodity-level based on the I-O table is used in order to precisely identify the input-output structure in Japan by classifying sectors in the greatest possible detail.⁶

When sectors are classified at the commodity-level and import commodities are included in the coverage as described above, there are a total of 1,016 sectors (508 sectors each of domestics and imports) on the production side and 390 sectors on the demand side (intermediate demand).⁷

In order to compile the FD-ID price index, it is necessary to assign 390 sectors on the demand side to four stages of intermediate demand. The assignment of sectors is conducted in such a way that the value of net forward flow, which represents the value of transactions that flow from upstream to downstream (forward flow) in the production flow minus the value of transactions that flow from downstream to upstream (back flow) is maximized.

More specifically, the maximization of the value of net forward flow is pursued through the following three stages: (1) provisional assignment of sectors to stages, (2) additional optimization, and (3) judgment-based adjustments.

(1) Provisional assignment of sectors to stages

(i) Definitions of stages

First, the four stages of intermediate demand are defined as follows.

⁶ As a result, the calculation of the value of inputs for "petroleum products" includes only input factors necessary for production of petroleum products (e.g., gasoline and naphtha) and excludes input factors related to goods and services produced as by-products in the petroleum refining industry (e.g., chemical products).

⁷ Excluding "Activities not elsewhere classified." In practical, 394 sectors are treated in the process of stage assignments in order to match the sectors on the production and demand side. Specifically, three sectors ("Vegetables," "Inland water fishery and inland water aquaculture," and "Electricity") are integrated, three sectors ("Used paper," "Scrap iron," and "Non-ferrous metal scrap") are added, and "Wholesale trade" is divided into the five sectors corresponded to the SPPI.

Chart 4. Definition of Stages of Intermediate Demand

Stage 4: Sectors in which X% or more of the value of output is sold to final demand.

Stage 3: Sectors in which Y% or more of the value of output is sold to final demand or Stage 4 and which are not included in Stage 4.

Stage 2: Sectors in which Z% or more of the value of output is sold to final demand, Stage 4 or Stage 3 and which are not included in Stage 3 or Stage 4.

Stage 1: Sectors which do not meet either of the above definitions.

As can be seen from the above, Stage 4 is the closest to final demand, namely the most downstream stage of intermediate demand. Stage 4 is preceded by Stage 3, Stage 2, and Stage 1 in that order, with Stage 1 as the most upstream stage of intermediate demand.⁸ The values "X," "Y," and "Z" in the above chart are cut-off variables used to determine the boundaries between the stages. Regarding cut-off variables, a grid search is conducted in increments of 5 points within the preset search range of $50 \leq X, Y, Z \leq 90$, with 729 combinations of the values of cut-off variables (X, Y, and Z) set up. From among those combinations, the one that achieves the greatest possible consistency with the production flow in the I-O table is searched.

(ii) Setting the criteria for evaluating the production flow

The I-O table covers a multitude of sectors of goods and services. When assigning those sectors to the four stages of intermediate demand, it is necessary to use some criteria for conducting comprehensive evaluation as to whether the assignment of sectors to stages is consistent with the production flow in the I-O table. For the FD-ID price indexes the Bank uses an indicator called "net forward flow (NFF)," following the example of the United States. More specifically, NFF is defined as the value obtained by subtracting the total value of inter-sector transactions that flow from downstream to upstream demand stages (back flow) from the total value of inter-sector transactions that flow from upstream to downstream demand stages (forward flow). In the calculation of the value of NFF, only the value of transactions for domestics is used (the value of imports is not included) in order to ensure an assignment of sectors to stages of demand that is consistent with the production flow in Japan.

⁸ The stages may be intuitively expressed as follows: Stage 1: the most upstream stage in the production flow; Stage 2: the stage that is within midstream and relatively closer to upstream; Stage 3: within midstream and relatively closer to final demand; Stage 4: the stage that is the closest to final demand.

Chart 5. Definition of Net Forward Flow (NFF)

Net forward flow (NFF)

= total value of inter-sector transactions that flow from upstream to downstream demand stages (forward flow)

– total value of inter-sector transactions that flow from downstream to upstream demand stages (back flow)

The calculation method of NFF is as shown in Chart 6.

Chart 6. Calculation Method of Net Forward Flow

		Demand Sector				
		Stage 1	Stage 2	Stage 3	Stage 4	FD
Production Sector	Stage 1	A	B	C	D	E
	Stage 2	F	G	H	I	J
	Stage 3	K	L	M	N	O
	Stage 4	P	Q	R	S	T

Net forward flow = total value of inter-sector transactions that flow from upstream to downstream demand stages

- total value of inter-sector transactions that flow from downstream to upstream demand stages

= (the value of output upstream sector provides to downstream + the value of input downstream sector receives from upstream)

- (the value of output downstream sector provides to upstream + the value of input upstream sector receives from downstream)

= {(B+C+D+E+H+I+J+N+O+T)+(B+C+H+D+I+N)}

- {(F+K+L+P+Q+R)+(F+K+P+L+Q+R)}

As a result of the calculation of the value of NFF, around 10 cases are selected as candidates from among the 729 provisional assignment cases. In this process, in addition to the top five cases in terms of the value of NFF, the top five cases in terms of the value of forward flow (ranked within the top 20 or so in terms of the value of NFF) are selected as candidates for optimizing the provisional assignment. Not only NFF but also forward flow is used as criteria for selecting candidates in order

to prevent the risk that the range of selection options may be limited if emphasis is placed exclusively on NFF when conducting a grid search regarding the cut-off variables (X, Y, and Z).

(2) Additional optimization

With respect to each candidate case selected through the provisional assignment, sectors of goods and services are moved, one by one, from their original stages under the provisional assignment to new stages, and the impact on NFF is measured. By repeatedly implementing this procedure, assignment cases that achieve a marginal improvement of NFF below a certain threshold are identified. From among assignment cases selected through this additional optimization procedure, those which are ranked high in terms of the value of NFF are adopted as final candidates.

(3) Judgment-based adjustments

With respect to the final candidate cases selected through additional optimization, adjustments are made based on judgments. For example, sectors where the upstream/downstream relationship in the production flow is clear but the respective stages are assigned in reverse should be corrected (e.g., the relationship between hot rolled steel and cold rolled steel in the production flow of steel products). Meanwhile, sectors for which the export ratio is high tend to be assigned to Stage 4, but even among those sectors, the ones whose commodities are mostly intermediate goods in nature should be transferred to a different stage on condition that the value of NFF increases (e.g., iron scrap).

As a result of the optimization procedures described in (1) to (3), the values of the cut-off variables were fixed at: $X=70$, $Y=65$, and $Z=60$.

As for the shares of inter-stage transactions regarding the ID indexes calculated as a result of the optimization, forward flow accounts for 84.5 percent of the overall output value, while the share of back flow is only 4.3 percent. On the whole, our assessment is that the Japanese FD-ID price indexes can capture net forward production flow accurately. The share of internal flow, which represents trade within the same stage, is 11.2 percent. Internal flow is excluded from the final calculation of aggregation weights in order to avoid the multiple counting problem. However, our findings show that even if internal flow is excluded, around 90 percent of the overall value of transactions is covered.

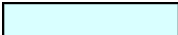
Chart 7. Shares of Transactions between Stages of Demand


(%)


		Demand Sector				
		Stage 1	Stage 2	Stage 3	Stage 4	FD
Production Sector	Stage 1	2.4	5.1	1.4	2.2	2.5
	Stage 2	1.5	4.3	4.6	6.4	6.0
	Stage 3	0.7	0.8	2.9	6.4	9.2
	Stage 4	0.3	0.5	0.4	1.6	40.6


(%)

Forward Flow			Back Flow	Internal Flow
	Next Stage	Skip		
84.5	56.8	27.7	4.3	11.2

 Next Stage: The percent of total shipments sold by sectors to sectors classified in the next forward stage of production

 Skip: The percent of total shipments sold by sectors to sectors classified in forward stages of production other than to the next stage

 Back Flow: The percent of total shipments sold by sectors to sectors classified in earlier stages of production

 Internal Flow: The percent of total shipments sold by sectors to sectors classified within the same stage of production

Note: These are calculated based on domestic transactions.

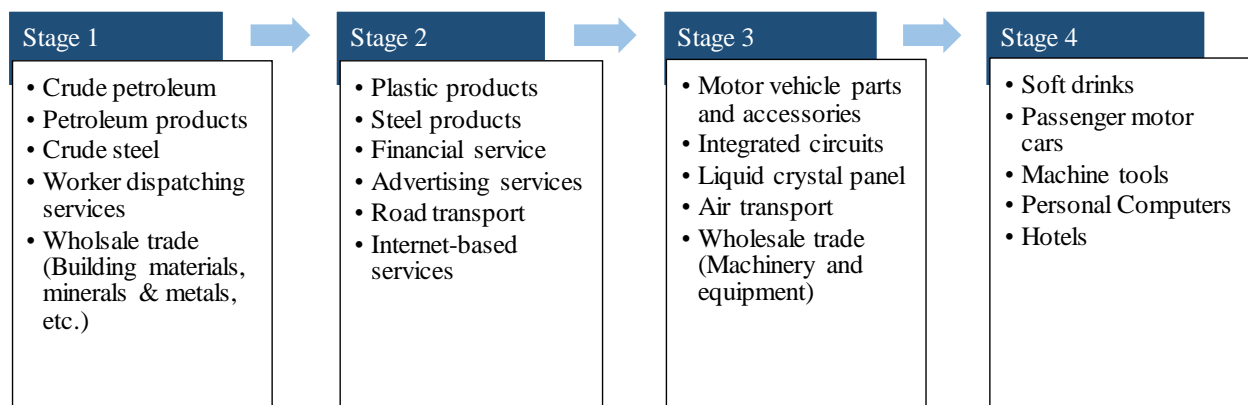
Let us look at which representative sectors have actually been assigned to which stages. Stage 1, the most upstream stage of intermediate demand, includes raw materials, such as crude petroleum, commodities directly using raw materials as input factors, such as petroleum products and crude steel, and, among services, worker dispatching services. Worker dispatching services were assigned to a relatively upstream stage presumably because they themselves do not require much input from other sectors while being used as an input factor in a broad range of industries.

Stage 2, one level further downstream than Stage 1, includes plastic and steel products, which are manufactured by processing commodities included in Stage 1, such as petroleum products and crude steel. This captures the structure of production flow in manufacturing industries. As for services, Stage 2 includes those which are used in a relatively broad range of industries, such as advertising, road transport and internet-based services.

Stage 3 includes motor vehicle parts, which are manufactured by processing plastic and steel products, integrated circuits and liquid crystal panels as well as services which are close to final demand, such as air transport and wholesale trade of machinery and equipment.⁹

Stage 4 includes final demand goods, such as soft drinks, passenger motor cars, machine tools, and personal computers, and services for which sales to households have a large share, such as hotels.

Chart 8. Assignment of Goods and Services Sectors to Stages: Major Sectors



Looking at the lineup of sectors thus assigned to the stages of demand, we can see that the above classification is presumed to appropriately capture the supply chain structure. The detailed results of the stage assignments are published as the “FD-ID Stage assignments” via the website of the Bank.

5. Calculating Weights

(1) Calculating the transaction value

After the assignment of sectors of goods and services to stages, the next step is to calculate weights used for aggregation to compile the FD-ID price index.

The calculation of weights for aggregation to compile the ID indexes must be implemented stage by stage. In principle, the value of inputs to goods and services sectors that belong to each stage (the value of intermediate inputs from the row sectors on a producer price base in the 2015 I-O table, Ministry of Internal Affairs and Communications) is used in the calculation. In the case of the ID

⁹ As for air transport, the share of transactions conducted at a relatively downstream stage of demand is high compared with road transport. More specifically, in the case of goods, air transport is used in industries manufacturing precision capital goods, such as semiconductor-making equipment and molds. In the case of services, it is used in the medical services and in research and development activities. Such industrial sectors have been assigned to Stage 4.

indexes, in order to avoid the multiple counting problem, the value of internal flow is excluded from the weight calculation. This means that internal flow, which represents the trade of inputs within the same stage, is nothing more than intra-stage horizontal trade, and therefore, it is not regarded as the flow that may cause price pass-through from upstream to downstream stages of demand.¹⁰

For aggregation to compile the FD index, the value of inputs for final demand by sector in the I-O table (the value of sales by row sector on a producer price basis in the I-O table) is used as the weight of each sector.

When calculating the weights, the Bank makes some practical adjustments, such as subdividing the "wholesale trade" sector in the I-O table into five subsectors in line with the classification within the Services Producer Price Index (SPPI).

After the calculation of the sector weights, in cases where multiple price indexes correspond to a single row sector following the weights of those indexes are calculated dividing the sector weights by the respective weights of the CGPI, SPPI and CPI. In cases where there is any row sector to which no price index corresponds, the weight of that sector is deemed to be zero.

(2) Calculation of the percentage ratio

The percentage ratios of the weights of sectors and indexes calculated in (1) to the total value of inputs into each stage of demand are calculated down to the third decimal point. Regarding final demand sectors, the calculation is made in such a way that the total weight of "Final demand (including exports)" is 100. As a result, the weights of the indexes for "Final demand (excluding exports)" does not add up to 100, and neither do the weights of the special series of indexes.

The weights of sectors are published in the "FD-ID Weights" on the website of the Bank.

6. Matching of Price Data (Commodity-level indexes)

Commodity-level indexes within the Corporate Goods Price Index (CGPI), the Services Producer Price Index (SPPI), and the Consumer Price Index (CPI) that correspond to the row sectors in the I-O table are used as price data. As the FD-ID price indexes exclude the consumption tax, indexes excluding the consumption tax (yen-based indexes for exports and imports) are used for the CGPI

¹⁰ With respect to imports, the value of transaction is not excluded from aggregation even if the trade is within the same stage because imports are equivalent to input factors actually allocated from foreign sectors to domestic sectors and because the domestic and foreign sectors may be different in substance.

and the SPPI. As CPI includes consumption tax, it is used adjusting so as to exclude it.

In 2015, the number of commodities used was 743 for the Producer Price Index (PPI), 256 for the Import Price Index (IPI), 207 for the Export Price Index (EPI), 151 for the Services Producer Price Index (SPPI), and 126 for the Consumer Price Index (CPI).¹¹

Chart 9. Number of Commodities Used for FD-ID price indexes

Number of Commodities	Intermediate Demand				FD (including exports)	FD+ID
	Stage 1	Stage 2	Stage 3	Stage 4		
PPI	559	396	437	523	459	743
IPI	205	199	202	203	169	256
EPI	0	0	0	0	207	207
SPPI	108	82	117	143	54	151
CPI	38	41	31	8	126	126
Total	910	718	787	877	1,015	1,483

With respect to goods, although the CGPI is used in principle, the CPI is used in the case of products not covered by the scope of the CGPI (fresh food, etc.). Regarding services, although the SPPI is used in principle, the CPI is used in the case of services for personal consumption.

7. Calculation of Indexes

The fix-weighted Laspeyres formula, which represents a weighted arithmetic mean based on the value weights fixed at the levels in the base year, is used.

8. Linked Indexes

A linked index, which is compiled with due consideration given to the convenience of users of long time series data, dates back to a past period on the same basis as a new index.

¹¹ As a result of the rebasing of the price indexes, the number of commodities used for the indexes in the period since 2020 is different.

For the special series, the three final goods indexes within the ISDU in the CGPI ("Final goods," "Final goods/capital goods" and "Final goods/consumer goods," all of which cover domestic goods), which are substituted for by indexes within the FD index, the linked indexes are compiled and published, with historical data dating back to January 1970. More specifically, the ISDU in the period before December 2014 is linked with the FD-ID indexes (final goods: the index for domestic goods used as inputs in final demand sectors; final goods/capital goods: the index for domestic goods used as inputs in capital investment sectors; final goods/consumer goods: the index for domestic goods used as inputs in personal consumption sectors) in the period from January 2015.

<Calculation method of the 2015 base linked index>

(Linkage coefficient)

$$\text{2015 base linked index} = \text{2010 base index} \times \frac{\text{2015 annual average index with the base year 2015 (= 100)}}{\text{2015 annual average index with the base year 2010}}$$

9. Release and Correction of Indexes

In principle, the FD-ID indexes in a certain month are released at 2 p.m. on the 20th business day of the following month (two business days after the release of the SPPI).

Correction is made as necessary in accordance with the correction of commodity-level indexes used as price data (the CGPI and the SPPI).

10. Revisions Resulting from the Rebasing of underlying Data

As the 2015 I-O table is used for the stage assignments and the calculation of weights, 2015 is used as the base year of the current FD-ID price indexes. The rebasing of the FD-ID price indexes to 2020 is scheduled to be implemented after the publication of the 2020 I-O table, separately from the rebasing of price statistics (the CGPI and the SPPI).

The FD-ID price indexes are compiled using the CGPI, the SPPI, and the CPI. When those underlying price indexes have been rebased, price data are replaced. More specifically, the following two procedures are implemented: (1) updating of commodity-level indexes corresponding to row

sectors of the I-O table; and (2) linkage with indexes before replacement of price data. Replacement of price data is retroactively reflected in the FD-ID indexes, starting with indexes in January in the new base year.

(1) Updating of commodity-level indexes corresponding to row sectors of the I-O table

When price indexes have been rebased, revisions are made in accordance with commodity amendment (adopting new commodities; deleting, splitting, and consolidating existing commodities), with the weights of row sectors fixed. In other words, in and after January in the base year, commodity-level indexes and the weights of commodities with the new base year are used for the calculation.

In the case of newly adopted commodities, if the corresponding row sectors in the I-O table have their own weights, price data are reorganized. When commodities have been deleted, price data for the corresponding row sectors are also reorganized. In that case, if there is no corresponding price index with the new base year for the row sectors, the last indexes are carried forward, with the weight of the sectors fixed.

(2) Linkage with indexes before replacement of price data

Even if existing commodity-level indexes used for the calculation of the FD-ID price indexes are replaced by indexes with a new base year, the base year of the FD-ID price indexes, i.e., 2015, remains unchanged. As a result, commodity-level indexes with a new base year cannot be used without modification. Therefore, for the period since January 2020, when price data are replaced, the levels of the new base commodity-level indexes are adjusted to the levels in January on the old base. More specifically, the linkage coefficient is calculated based on commodity-level indexes before and after replacement of price data, and indexes are compiled by multiplying the new base indexes by the coefficient.¹²

<Calculation method of the 2015 base linked index>

$$\text{Index for the period from January 2020} = \text{New base index} \times \frac{\text{January 2020 index with the base year 2015}}{\text{January 2020 index with the base year 2020}} \quad (\text{Linkage coefficient})$$

¹² Therefore, weighted average of commodity-level indexes that correspond to each series based on its weights doesn't coincide with each series data released officially. With due consideration given to the convenience of users of long time series data, "All commodities" is weighted average of "Goods" and "Services," and "All commodities, less imports" is weighted average of "Domestic goods" and "Services." In addition, "Goods," "Domestic goods," and "Import goods" are weighted average of "Foods," "Energy" and "Goods less food and energy." "Services" is weighted average of "Trade services," "Transportation services" and "Services less trade and transportation."

1. Basic series

Intermediate demand / Final demand	Series	Series No.
Stage 1	All commodities	1
	All commodities, less imports	2
	Goods	3
	Foods	4
	Energy	5
	Goods less foods and energy	6
	Services	7
	Trade services	8
	Transportation services	9
	Services less trade and transportation	10
	Domestic goods	11
	Domestic foods	12
	Domestic energy	13
	Domestic goods less foods and energy	14
	Import goods	15
	Import foods	16
	Import energy	17
	Import goods less foods and energy	18
Stage 2	All commodities	19
	All commodities, less imports	20
	Goods	21
	Foods	22
	Energy	23
	Goods less foods and energy	24
	Services	25
	Trade services	26
	Transportation services	27
	Services less trade and transportation	28
	Domestic goods	29
	Domestic foods	30
	Domestic energy	31
	Domestic goods less foods and energy	32
	Import goods	33
	Import foods	34
	Import energy	35
	Import goods less foods and energy	36
Stage 3	All commodities	37
	All commodities, less imports	38
	Goods	39
	Foods	40
	Energy	41
	Goods less foods and energy	42
	Services	43
	Trade services	44
	Transportation services	45
	Services less trade and transportation	46
	Domestic goods	47
	Domestic foods	48
	Domestic energy	49
	Domestic goods less foods and energy	50
	Import goods	51
	Import foods	52
	Import energy	53
	Import goods less foods and energy	54

1. Basic series (continued)

Intermediate demand / Final demand	Series	Series No.
Stage 4	All commodities	55
	All commodities, less imports	56
	Goods	57
	Foods	58
	Energy	59
	Goods less foods and energy	60
	Services	61
	Trade services	62
	Transportation services	63
	Services less trade and transportation	64
	Domestic goods	65
	Domestic foods	66
	Domestic energy	67
	Domestic goods less foods and energy	68
	Import goods	69
	Import foods	70
	Import energy	71
	Import goods less foods and energy	72
Final demand (excluding exports)	All commodities	73
	All commodities, less imports	74
	Goods	75
	Foods	76
	Energy	77
	Goods less foods and energy	78
	Services	79
	Trade services	80
	Transportation services	81
	Services less trade and transportation	82
	Domestic goods	83
	Domestic foods	84
	Domestic energy	85
	Domestic goods less foods and energy	86
	Import goods	87
	Import foods	88
	Import energy	89
	Import goods less foods and energy	90
Final demand (including exports)	All commodities	91
	All commodities, less imports	92
	Goods	93
	Foods	94
	Energy	95
	Goods less foods and energy	96
	Services	97
	Trade services	98
	Transportation services	99
	Services less trade and transportation	100
	Domestic goods	101
	Domestic foods	102
	Domestic energy	103
	Domestic goods less foods and energy	104
	Import goods	105
	Import foods	106
	Import energy	107
	Import goods less foods and energy	108
	Export goods	109

2. Special series

Series	Series No.
Final goods (Domestic goods)	110
Final goods/Capital goods (Domestic goods)	111
Final goods/Consumer goods (Domestic goods)	112

Note: Special series are compiled using indexes within the FD index.