# (Box 3) Link between a Rise in Intermediate Input Costs
and the CPI: Focusing on Food

This Outlook Report projects that higher raw material costs will be passed on to the CPI, particularly to energy and food. Looking at recent developments, especially after Russia's invasion of Ukraine, the costs of imported raw materials such as energy, food, and nonferrous metals have risen even more substantially, and the pass-through of cost increases to food at the final demand stage also appears to be accelerating. This box outlines and examines developments in costs such as of raw materials in areas other than energy, as well as the pass-through of such costs, focusing on food (for the impact of the rise in energy costs, see Box 2).

Chart B3-1: Goods Prices (Less Fresh Food and Energy)
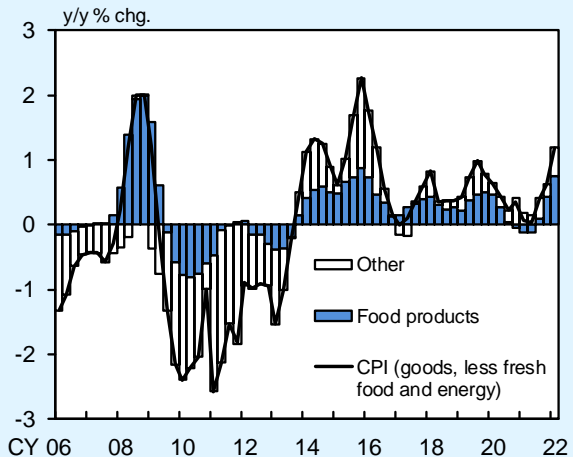
Source: Ministry of Internal Affairs and Communications.
Note: Figures exclude the effects of the consumption tax hikes.

Developments in goods prices in the CPI (all items less fresh food and energy) show that the rate of change has steadily increased, mainly for food (less fresh food), suggesting that costs are being passed on to retail prices (Chart B3-1).

In order to quantify the upward pressure on prices from the cost side, an intermediate input cost index for the production of various consumer goods is estimated, based on the transaction structure in the input-output tables.[25] The index

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[25] The intermediate input cost index is calculated by multiplying the rate of change in the prices of various intermediate goods by their respective intermediate input shares (share in domestic output) and then taking the weighted average using the personal consumption expenditure shares as weights. In order to more accurately assess input costs of services, the coverage of the input services that are aggregated for the index has been expanded from that in Box 3 in the July 2021 Outlook Report.
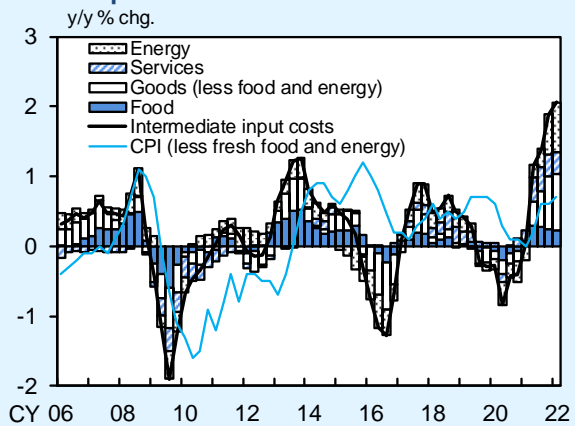
takes into account the impact of rising raw material costs, such as for crude oil and other energy, some grains (e.g., wheat), and nonferrous metals (e.g., aluminum and nickel), as well as the impact of rising input costs for various parts and components and for services such as logistics.

The intermediate input cost index corresponding to Japan's CPI (all items less fresh food and energy) shows that, (1) in the past, the index has tended to lead the CPI, and (2) the current year-on-year rate of increase in the index has already exceeded that in the 2008 and 2013 phases (Chart B3-2). On the other hand, (3) when the index is constructed for the United States using the same method, the rate of increase in Japan has been only modest compared with that in the United States. The reason appears to be that, while there have been no substantial differences between the two countries in the rate of increase in commodity prices, the input costs of services have risen significantly in the United States due to rising personnel expenses, logistics disruptions, and other factors.

Next, looking at the intermediate input costs for food, which has seen a notable increase in consumer prices recently, the rate of increase in the costs has been relatively higher than that in the intermediate input costs for the overall CPI (Chart B3-3). Considering that import costs, including prices of grains such as wheat, have risen further, reflecting the situation surrounding Ukraine, upward pressure on food costs is very likely to remain at a high level for the time being and the cost increases are projected to be passed on to consumer prices with a time lag.
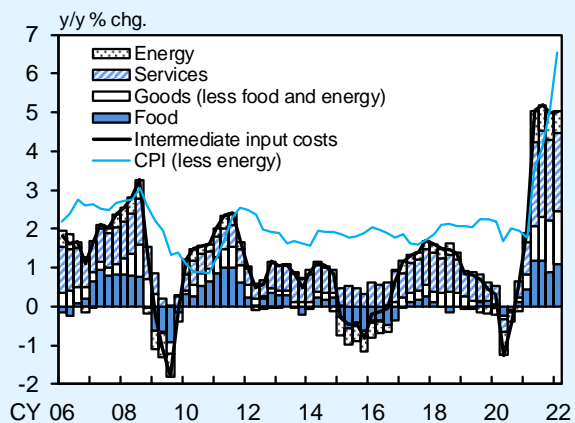
Chart B3-2: Intermediate Input Costs

1. Japan

y/y % chg.

Legend:
- Energy
- Services
- Goods (less food and energy)
- Food
- Intermediate input costs
- CPI (less fresh food and energy)

Sources: Ministry of Internal Affairs and Communications; Bank of Japan.
Note: The CPI figures are staff estimates and exclude mobile phone charges and the effects of the consumption tax hikes, policies concerning the provision of free education, and the "Go To Travel" campaign, which covers a portion of domestic travel expenses. Intermediate input costs are calculated by multiplying the intermediate input ratio of each sector in the *2015 Input-Output Tables for Japan* by price data from the corporate goods price index (CGPI) or the services producer price index (SPPI) and then taking the weighted average using consumption expenditure shares as weights.

2. United States

y/y % chg.

Legend:
- Energy
- Services
- Goods (less food and energy)
- Food
- Intermediate input costs
- CPI (less energy)

Sources: BEA; BLS.
Note: Intermediate input costs are calculated by multiplying the intermediate input ratio of each sector in the input-output tables for the United States for 2015 by price data from the producer price index (PPI), etc. and then taking the weighted average using consumption expenditure shares as weights.

Chart B3-3: Intermediate Input Costs for Food

y/y % chg.

Legend:
- Overall (less fresh food and energy)
- Food
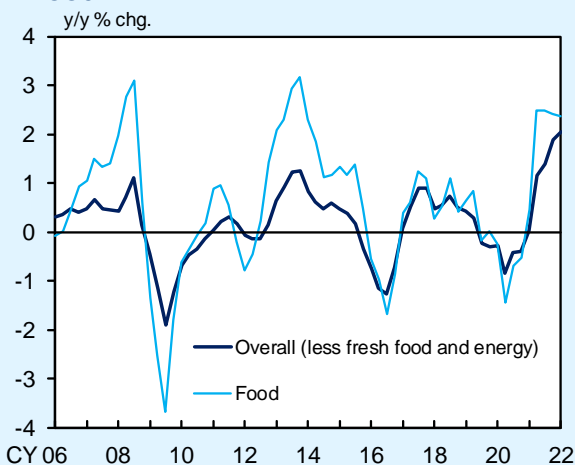
Sources: Ministry of Internal Affairs and Communications; Bank of Japan.
Note: The ratio of intermediate inputs to gross domestic output is used for calculating intermediate input costs. Therefore, intermediate input costs are relatively irresponsive to price changes in intermediate inputs in categories with a low intermediate input ratio (Intermediate inputs / Gross domestic output).

Moreover, with regard to food, there have been cases in the past phases where firms started to rapidly change their selling prices after limiting such changes for a long time. In fact, estimating the frequency of price changes for food using the Ministry of Internal Affairs and Communications' *Retail Price Survey*, which provides the source data for the CPI, shows that, (1) while until around the end of 2007 the frequency of price changes had remained low even as costs had continued to rise for a prolonged period, (2) the frequency of changes rapidly increased after the turn of 2008 (Chart B3-4).[26] Moreover, a calculation of the FK index, which represents the synchronization in the timing of price changes, following studies abroad, shows that such synchronization in the direction of price rises rapidly increased after the turn of 2008 (Chart B3-5).[27] As suggested by these factors, it should be noted that, once some food prices start to rise, the rate of increase in the CPI for food tends to accelerate.

Looking at developments in the diffusion index (DI) for firms' output prices in the *Tankan* (Short-Term Economic Survey of Enterprises in Japan) to examine their recent price-setting

Chart B3-4: Frequency of Price Changes in Food Products

based on regular prices, %/month
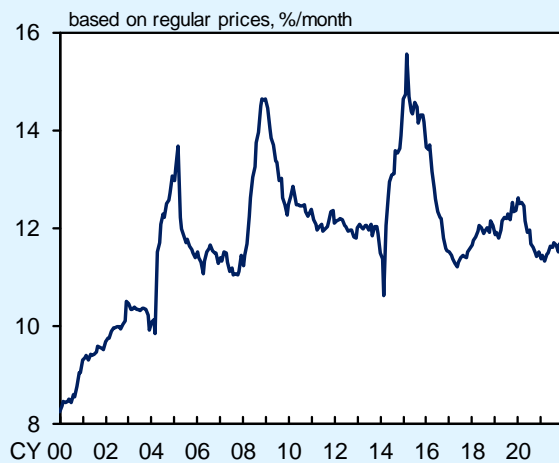
Source: Ministry of Internal Affairs and Communications.
Note: Figures are the frequency of price changes calculated by considering the most frequent prices in the 2 months before and after the month as the regular price (12-month backward moving averages).

Chart B3-5: Synchronization of Price Changes in Food Products

based on regular prices, FK index

— FK index (price increases)
— FK index (price decreases)
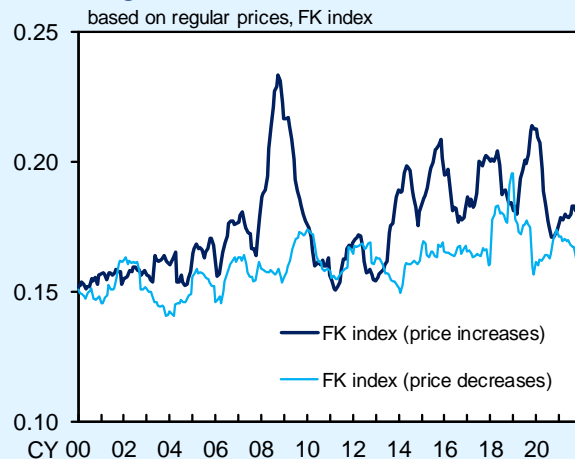
Source: Ministry of Internal Affairs and Communications.
Note: Figures represent the synchronization (FK index) of price changes calculated by considering the most frequent prices in the 2 months before and after the month as the regular price (12-month backward moving averages).

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[26] With regard to the method of calculating the frequency of price changes, see "Price Setting in Japan: Evidence from CPI Micro Data," *Bank of Japan Working Paper Series*, no. 07-E-20, August 2007.

[27] The FK (Fisher-Konieczny) index is an indicator of the degree of synchronization of price changes of products, with a value close to 1 indicating a strong tendency for price changes to take place at the same time, and a value close to 0 indicating a strong tendency for price changes to take place at separate times. For details, see Fisher, T. and Konieczny, J., "Synchronization of Price Changes by Multiproduct Firms: Evidence from Canadian Newspaper Prices," *Economics Letters*, vol. 68, issue 3 (2000): 271-277; and Dias, D. et al., "On the Fisher-Konieczny Index of Price Changes Synchronization," *Economics Letters*, vol. 87, issue 2 (2005): 279-283.

stance, although not quite at the level of the input prices DI, it has reached the highest level since 1991 (i.e., at the end of the bubble period) for the nonmanufacturing industry and the highest level since 1980 (i.e., just after the second oil shock) for the manufacturing industry (Chart B3-6). Against this background, it needs to be borne in mind that the pass-through of cost increases may become more widespread for some goods that have seen substantial increases in costs, particularly food.

Chart B3-6: Output and Input Prices (*Tankan*)

1. Manufacturing

DI ("rise" - "fall"), % points
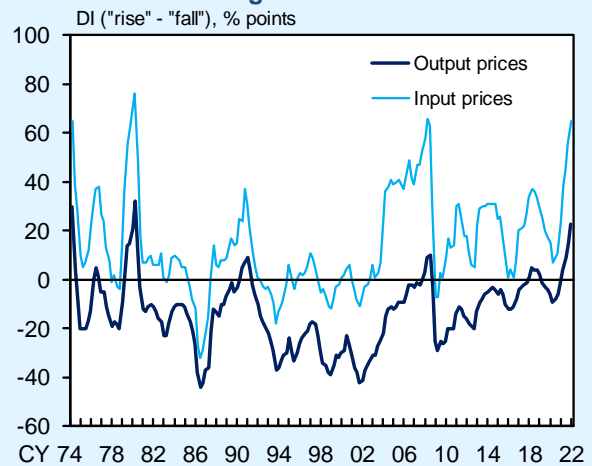
2. Nonmanufacturing

DI ("rise" - "fall"), % points
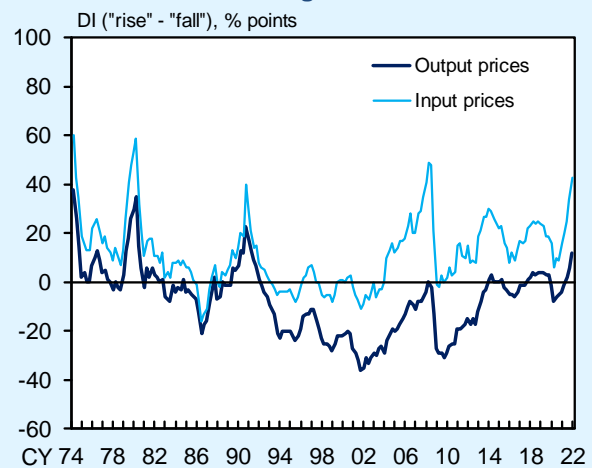
Source: Bank of Japan.
Note: Figures are for all enterprises.