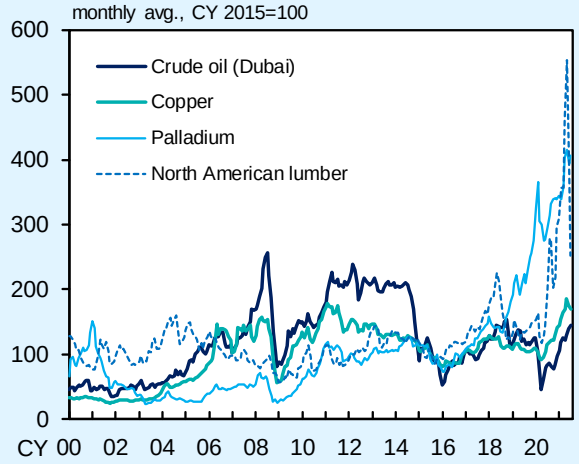
(Box 2) Effects of Rising International Commodity Prices on Corporate Profits

International commodity prices have risen significantly of late (Chart B2-1). While price rises have been seen for a wide range of commodities, a closer look shows that, to date, prices of crude oil -- which accounts for a large share in Japan's imports of raw materials -- have not reached the high levels seen in the final phase of the "commodity supercycle," when commodity prices rose significantly until immediately before the Global Financial Crisis (GFC). Instead, the current phase is characterized by particularly large increases in prices of commodities other than crude oil, such as of copper, lumber, and some precious metals. This box examines and describes how the rise in these international commodity prices affects Japan's economy through its impact on corporate profits, taking also into account unevenness across industries and firm sizes.

Chart B2-1: International Commodity Prices



Source: Bloomberg.

The rise in international commodity prices in the current phase is essentially due to the fact that supply has not kept pace with a surge in global demand. In more detail, such rise is attributable to a combination of the following three factors. First, the pace of the recent recovery in global demand for goods has been faster than most firms had anticipated, reflecting demand from China that has already started recovering ahead of other countries, progress with vaccinations in overseas advanced economies, fiscal stimulus measures, especially in the United States, and the acceleration in digitalization triggered by the COVID-19 pandemic. It seems that actual supply

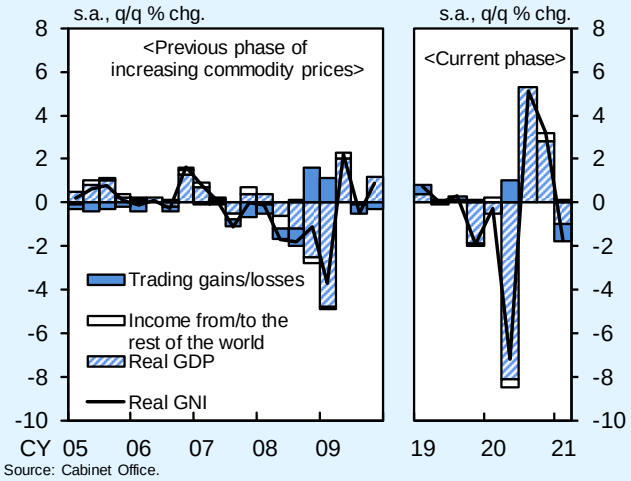
is not in the short run keeping up with the surge in demand. Second, the rise in commodity prices have further accelerated, partly because market participants have factored in a medium- to long-term uptrend in demand for some commodities due to the electrification of automobiles and environmental regulations. Examples of these commodities are copper, which is increasingly used for electric vehicle (EV) parts, and some precious metals such as palladium and rhodium, which are used for exhaust gas purification catalysts. Third, supply volume has decreased, directly affected by restrictions on activities and shipping container shortages, both continuing in various countries due to the pandemic, as well as by accidents such as sudden power outages and fires.

The effects of the rise in international commodity prices on Japan's economy through its impact on corporate profits may differ considerably depending on the underlying mechanisms. In particular, if the main reason for the rise in commodity prices is a recovery in overseas economies, as is the case in the current phase, it is necessary to take into account the following two channels through which Japan's economy is affected: an increase in external demand and deterioration in the terms of trade (i.e., the ratio of export prices to import prices). In other words, if the rise in international commodity prices is largely attributable to a positive demand shock associated with the expansion in overseas economies, exports will increase while the terms of trade will deteriorate in Japan. If the rise in international commodity prices is mainly caused by a supply shock similar to the first and second oil shocks of the 1970s, the contribution of the

income transfer from resource-importing countries to resource-exporting countries will be greater, meaning that Japan's economy will be affected by deterioration in the terms of trade to a larger degree.

In order to examine the impact of real income transfers between Japan and other countries due to such changes in global relative prices, it is useful to take a look at real gross national income (GNI).[22] Around the period of 2005-2008 -- which was during the "commodity supercycle," or the phase of rising commodity prices -- Japan's real GNI was relatively weak compared with the real GDP due to trading losses as a result of price rises in commodities, particularly crude oil (Chart B2-2). [23] Similarly, during the current phase, Japan's economy has started to experience trading losses due to rising international commodity prices. It should be noted, however, that the rise in international commodity prices in the current phase has been brought about mainly by the recovery in economies accounting for a large share of Japan's exports, such as the United States, China, and the NIEs. Given this, the impact of the increase in exports essentially is likely to outweigh that of trading losses, and thus, on a net basis, the rise in international commodity prices will likely have positive effects on Japan's economy overall. The baseline scenario in this Outlook Report also assumes that, although the

Chart B2-2: Real GNI Growth Rate



Source: Cabinet Office.

[22] Real GNI represents the total domestic and overseas income received by citizens (residents) and is calculated as follows: Real GNI = Real GDP + Trading gains/losses + Income from/to the rest of the world.

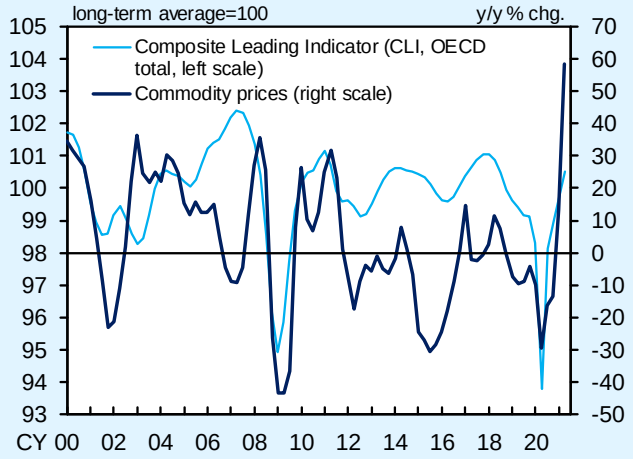
[23] Trading gains and losses represent the change in real income associated with changes in the terms of trade and are calculated as follows: Trading gains/losses = (Nominal net exports / Weighted average of export and import deflators) – Real net exports.

rise in international commodity prices to date is likely to produce a negative impact of trading losses for the time being, the positive effects of the increase in exports and the associated spillover effects, such as on business fixed investment, will likely exceed this negative impact. The following presents the results of the empirical analysis that underlie this assumption.

First, in order to empirically examine the determinants of fluctuations in international commodity prices and their effects, a simple sign-restricted vector auto-regression (VAR) model is estimated (Charts B2-3 and B2-4). The model consists of two variables: the OECD's Composite Leading Indicator (CLI, OECD total), which is used in this model as a proxy for the level of global economic activity, and the CRB Index, which is a widely used indicator of prices in international commodity markets. Specifically, two types of shocks to international commodity prices are identified: (1) demand shocks caused by the expansion in the global economy and (2) supply shocks caused by changes in the supply capacity, which are unique to primary commodities. Decomposing fluctuations in international commodity prices into these factors shows that, in the early stages of the COVID-19 pandemic since last spring, demand factors have pushed down commodity prices, mainly due to public health measures around the world, whereas supply factors have pushed them up. However, recently, demand factors instead of supply factors have started to substantially push up commodity prices.

Next, using the demand and supply shocks identified by the sign-restricted VAR model, the

Chart B2-3: International Commodity Prices and Composite Leading Indicator



Sources: OECD; Bloomberg.
Note: Figures for commodity prices are the CRB Index.

Chart B2-4: Examining the Causes of Changes in Commodity Prices

1. Analytical Approach

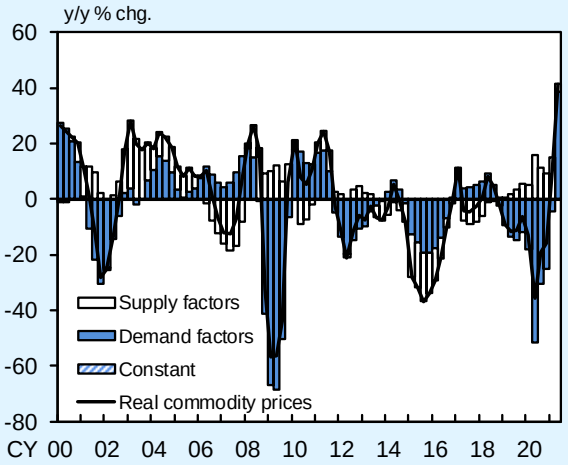
A two-period lag VAR model using the following two variables is estimated: the OECD's CLI (OECD total) and real commodity prices (the CRB Index deflated by the U.S. CPI; difference in logarithms). The estimation period is 1994/Q4-2021/Q1.

Demand and supply shocks are identified subject to the following sign restrictions:

-- Demand increase shocks: the responses of the CLI and real commodity prices are both positive.

-- Supply increase shocks: the response of the CLI is positive, while that of real commodity prices is negative.

2. Decomposition of Changes in Commodity Prices

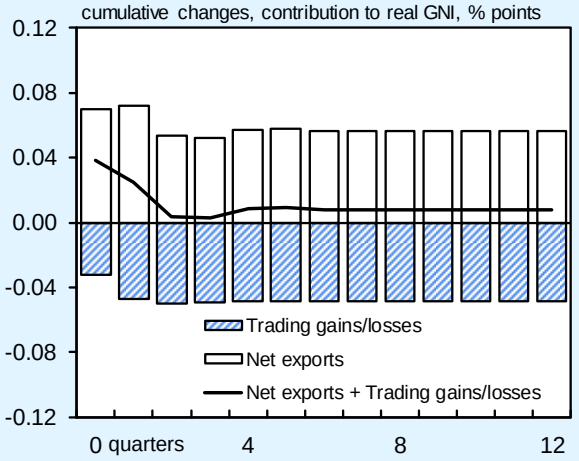


Sources: OECD; Bloomberg; Haver.
Note: The year-on-year rate of change is calculated as the 4-quarter moving sum of the log difference.

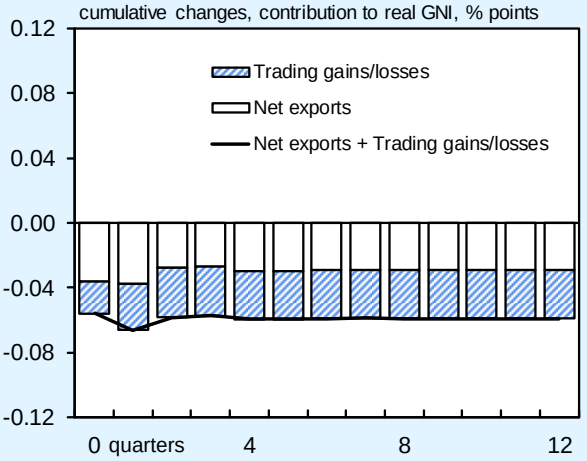
responses of Japan's net exports and trading gains or losses to these shocks are estimated (Chart B2-5). The estimation results show that, in the case of a positive demand shock, the positive contribution of net exports exceeds the negative contribution of trading losses, and thus their net impact on real GNI is positive. On the other hand, the results also show that a rise in international commodity prices due to a supply shock leads to a decrease in Japan's exports through an economic slowdown, mainly in advanced economies, many of which are resource importers, and also leads to trading losses, resulting in a clear negative impact on the economy through both channels. It should be noted that, while the analysis here focuses only on the direct effects of fluctuations in international commodity prices on exports and trading gains or losses, the spillover effects of these fluctuations on domestic demand, such as on business fixed investment, amplify the impact on the overall economy in practice. In sum, since the recent rise in commodity prices essentially is largely due to demand shocks, it will likely have positive effects on Japan's economy on a net basis.

Chart B2-5: Commodity Price Increases, Net Exports, and Trading Gains/Losses

1. Response to a 1% Increase in Commodity Prices Due to Demand Factors



2. Response to a 1% Increase in Commodity Prices Due to Supply Factors

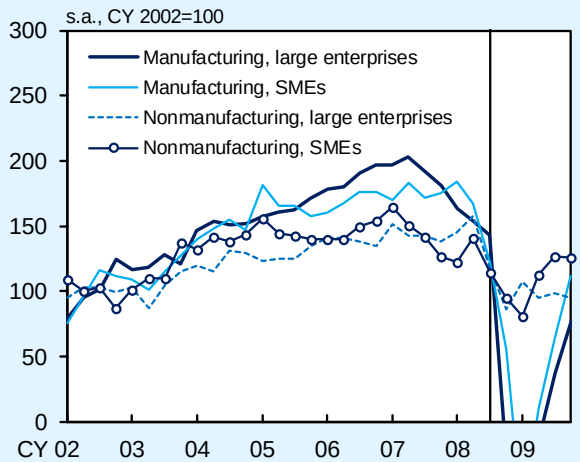


Sources: Cabinet Office; OECD; Bloomberg; Haver.
Note: The charts show the response to a shock obtained by regressing net exports and trading gains/losses (contribution to real GNI on a quarter-on-quarter basis) on 2-quarter lagged values of the dependent variable and demand and supply shocks. For demand and supply shocks, the shocks to real commodity prices identified in Chart B2-4 are used. The estimation period is 1994/Q4-2021/Q1.

However, there are several points to note regarding this analysis. First of all, even when the basic reason for a rise in commodity prices is a positive demand shock, it is possible for commodity prices to surge beyond supply and demand fundamentals, mainly due to excessive expectations of market participants. Additional rises in commodity prices in such a situation could, similar to a supply shock, have a stronger negative impact on Japan's economy due to the associated deterioration in the terms of trade. Moreover, the effects of the rise in international

Chart B2-6: Period of Increasing Commodity Prices in the 2000s

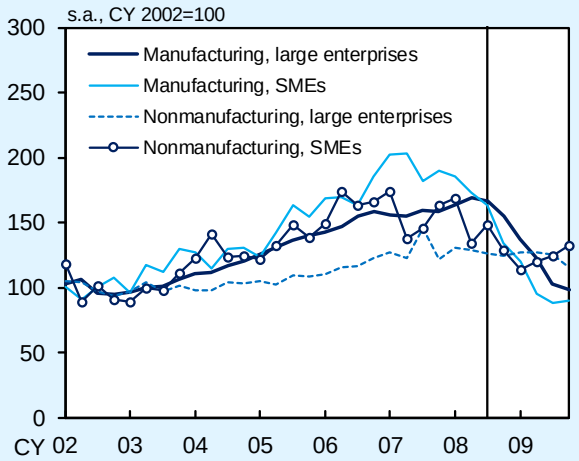
1. Operating Profits



commodity prices identified above are likely to be very uneven across industries and firm sizes, reflecting differences in input-output structures and the ability to pass on price increases. In fact, during the period from around the mid-2000s to immediately before the GFC, corporate profits and business fixed investment in Japan exhibited uneven developments across industries and firm sizes (Chart B2-6). Specifically, while fixed investment of large manufacturing firms remained steady until the start of the GFC, profits and fixed investment of small and medium-sized nonmanufacturing firms had already begun to show weakness from 2006 or 2007 -- that is, prior to the GFC -- due to the effects of deterioration in the terms of trade.

In order to empirically examine the uneven effects of the rise in international commodity prices in more detail, the responses of profit margins by industry and firm size to each of the demand and supply shocks are estimated (Chart B2-7). The estimation results show that, in the case of a positive demand shock, the positive effects on profit margins are higher for firms in the manufacturing industry -- more specifically, large firms in the industry -- which tends to receive greater benefit from increased exports, while such effects are smaller for firms in the nonmanufacturing industry, which comprises many domestic demand-oriented industries. In the case of price increases due to a supply shock, profit margins will be pushed down regardless of industry or firm size, but the negative impact on profit margins is particularly large for small firms in both industries. These variations across industries and firm sizes seem to be partly because small firms are less able to pass on cost

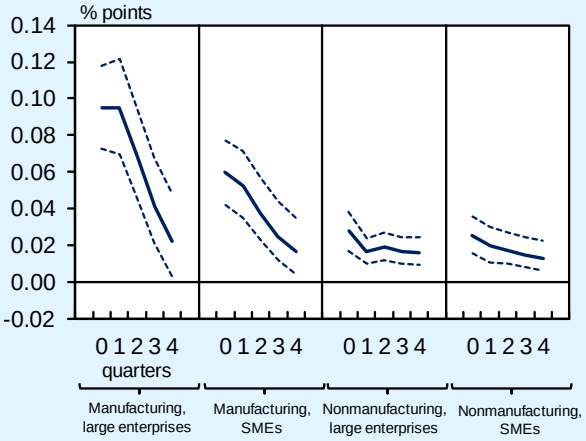
2. Business Fixed Investment



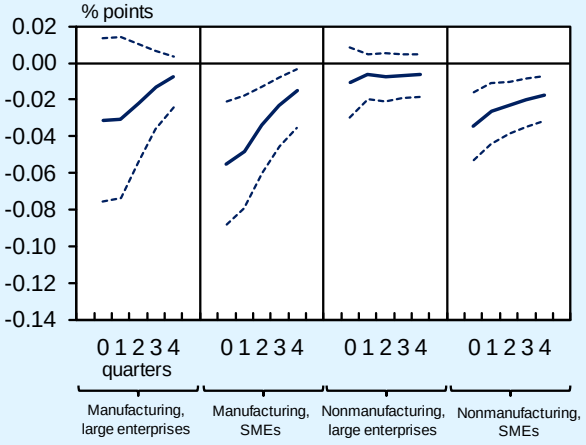
Source: Ministry of Finance.
Note: Based on the "Financial Statements Statistics of Corporations by Industry, Quarterly." Large enterprises are enterprises with a capitalization of 1 billion yen or more, while small and medium-sized enterprises (SMEs) are enterprises with a capitalization of 10 million yen or more but less than 1 billion yen. Enterprises in "finance and insurance" are excluded. Figures for business fixed investment exclude software investment; moreover, those before 2004/Q2 exclude "business services," while those from 2004/Q2 onward exclude "goods rental and leasing." Figures for operating profits from 2009/Q2 onward exclude pure holding companies. The vertical lines represent 2008/Q3.

Chart B2-7: Commodity Price Increases and Corporate Profits

1. Response to a 1% Increase in Commodity Prices Due to Demand Factors



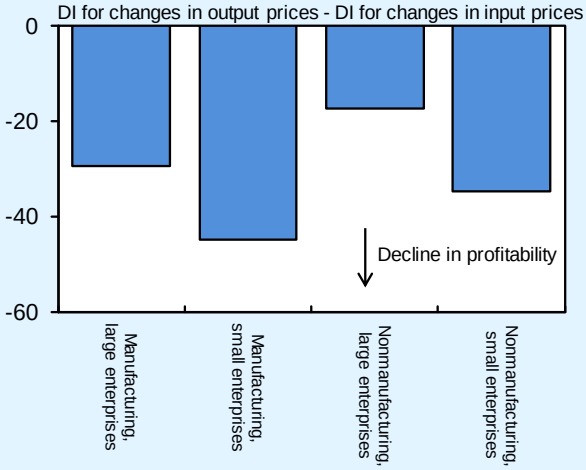
2. Response to a 1% Increase in Commodity Prices Due to Supply Factors



Sources: Ministry of Finance; OECD; Bloomberg; Haver.
Note: The charts show the response to a shock obtained by regressing the operating profit to sales ratio (based on the "Financial Statements Statistics of Corporations by Industry, Quarterly") on 2-quarter lagged values of the dependent variable and demand and supply shocks. For demand and supply shocks, the shocks to real commodity prices identified in Chart B2-4 are used. The estimation period is 1994/Q4-2021/Q1. The broken lines show the 95 percent confidence intervals (obtained using the bootstrap method).

increases to product prices than large firms due to such factors as the severe competitive environment (Chart B2-8). During the pandemic, as described in "The Background" section of this Outlook Report, profits in the manufacturing industry have recovered relatively quickly, whereas the recovery in profits in the nonmanufacturing industry, particularly in face-to-face services, has been slow. While the gap in profitability between these industries is expected to narrow as the impact of COVID-19 subsides, it is also important to keep in mind that this gap may even widen due to the effects of rising commodity prices.

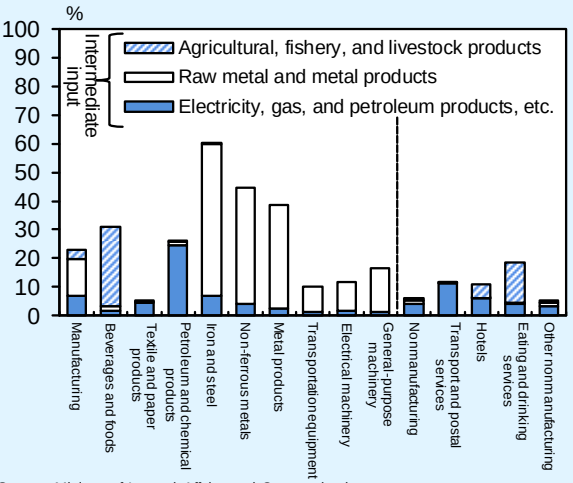
Chart B2-8: Profitability during Periods of Increasing Input Prices



Source: Bank of Japan.
Note: Based on the *Tankan*. Periods of increasing input prices are periods when the DI for changes in input prices (all industries and enterprises) was above the average for 2000/Q1-2021/Q2.

At a more granular, individual industry level, it is also possible that the impact of rising international commodity prices on corporate profits in the current phase -- where price increases have been particularly large for commodities other than crude oil, such as copper and lumber -- will differ from in the past, when commodity price increases were mainly brought about by high crude oil prices (Chart B2-9). This primarily reflects differences in intermediate input structures across industries. It is necessary to closely monitor the impact of rising international commodity prices by industry and firm size, including through anecdotal information from firms.

Chart B2-9: Intermediate Input Ratios by Industry



Source: Ministry of Internal Affairs and Communications.
Note: Intermediate input ratios are calculated by dividing the value of intermediate inputs by domestic output taken from the 2015 Input-Output Tables for Japan. "Electricity, gas, and petroleum products, etc." includes coal mining, crude petroleum, natural gas, petroleum and coal products, electricity, gas, and heat supply.