May 2026

Exchange Rate Shocks and Their Consequences in Pre-WWII Japan

Shingo Watanabe*

Abstract

Japan was one of the first countries to abandon the gold standard and one of a few to begin its recovery in 1932. This paper examines whether time-series data confirm that the yen depreciation stimulated the pre-WWII economy. In addition to foreign exchange intervention and control policy changes, since the exchange rate policy was often specific to political parties or ministers, the political leadership changes are identified as exchange rate shocks. While depreciation shocks were expansionary, the demand stimulus very likely operated through intertemporal substitution as well as expenditure switching. This paper also shows that Japan's recovery from the depression can be fully explained by the devaluation.

Keywords: exchange rate; real interest rate; intertemporal substitusion; great depression.

JEL classification: E5, F3, F4

* Bank of Japan (E-mail: shingo.watanabe@boj.or.jp)

1. Introduction

Just as in the modern era, there has long been a keen interest in how exchange rate fluctuations impacted the economy in the pre-WWII period. A well-known example is the "competitive devaluation" of the 1930s during the global depression, when countries tried to stimulate their economies by devaluing their currencies. Eichengreen and Sachs (1985) famously argued that countries that devalued earlier recovered earlier from their depressions. To the best of our knowledge, however, there are few formal econometric studies on how exogenous exchange rate changes affected the economy in the pre-WWII period, just as studies on this subject for the postwar period remain extremely limited. This is apparently because exchange rate fluctuations are caused not only by shocks directly changing actual or expected rates but also by other shocks that affect the economy and the identification of exchange rate shocks is very difficult. Eichengreen and Sachs (1985) just show a linear relationship between changes in exchange rates and in industrial production from 1929 to 1935 for 10 European countries.

The purpose of this paper is to study the extent to which exogenous exchange rate changes affected the pre-WWII Japanese economy and to identify specific channels through which these effects occurred. Although Japan is not included in Eichengreen and Sachs's (1985) samples, Japan was one of the first countries to abandon the gold standard in 1931 and one of a few to begin the recovery in 1932, as illustrated by industrial production data that Figure 1 shows.[1] The pace of recovery was relatively rapid. Thus, Japan's economic developments at that time were consistent with Eichengreen and Sachs's (1985) arguments. This paper examines whether time-series data confirm that the yen depreciation stimulated the pre-WWII Japanese economy.

Pre-WWII Japan provides a unique opportunity for studying the economic impact of exchange rate fluctuations. This is not only because these impacts appear to have been

[1] The source of data used in this paper is described in the appendix.

significant in the 1930s, but more importantly, because it is possible to identify exchange rate shocks that were highly likely orthogonal to other concurrent macroeconomic shocks. The main reason for it is that exchange rate policies in pre-WWII Japan depended largely on which party formed the cabinet or who was the finance minister and because the cabinet change occurred much more often than in the post-WWII period. At that time, political camps were polarized over the country's adherence to the gold standard. One party or financial minister prepared for or decided returning the gold standard and another party or financial minister stopped the preparation or decided to abandon it. Thus, cabinet changes due to political disruptions or finance minister changes affected expected or actual exchange rates. In addition, while the US and UK returned to the gold standard in 1919 and 1925 respectively, Japan waited its return until 1930. This lag led to an increased frequency of exchange rate policy change.

A compelling illustration of the political events would be indeed Japan's departure from the gold standard in the 1930s. In Japanese economic history, it is well known that the finance minister Korekiyo Takahashi, who was a former prime minister and returned to a cabinet as the finance minister in December 1931, rescued Japanese economy from the depression by implementing reflationary policies consisting of departure from the gold standard, monetary loosening, and fiscal expansions. Bernanke (2003) states:

> Finance Minister Korekiyo Takahashi brilliantly rescued Japan from the Great Depression through reflationary policies in the early 1930s, while President Franklin D. Roosevelt's reflationary monetary and banking policies did the same for the United States in 1933 and subsequent years.

Much less known today is the sequence of events that led Takahashi to adopt the reflationary policies. The Minseito party cabinet resigned due to internal discord on possible coalition with the opposition Seiyukai party and the Seiyukai took power on December 13. Takahashi was appointed the finance minister and decided to abandon the gold standard. Consequently,

the timing of the departure was determined independently of any concurrent economic shocks. By documenting the US and European experiences, Eichengreen (1992) asserts that their decisions to remain on or leave the gold standard in the 1930s were strongly influenced by political factors and prevailing economic and philosophical beliefs. Japan's departure from the gold standard was similar and caused by the political event and, as this paper argues, so were many other changes in exchange rate policy in pre-WWII Japan.

By using narrative evidences including contemporary newspaper articles, this paper identifies the events that affected expected or actual exchange rates and the dates when exchange rates actually responded. The exchange rates shocks are quantified by changes in daily exchange rate around the dates. Following Plagborg-Møller and Wolf (2021), this paper orders the shock series first in a vector autoregression (VAR) model and uses it as an instrument for the nominal effective exchange rate. As argued by them, such VAR model is equivalent to Jordà's (2005) local projection with the instrument. The VAR model allows us to straightforwardly assess the contribution of the shock to Japan's recovery from the depression through a historical decomposition.

This paper finds that the exchange rate shock had significant effects in pre-WWII Japan. The nominal effective exchange rate significantly falls in response to a depreciation shock. Exports and output increase over one year, suggesting that exchange rate fluctuations caused expenditure switching by changing export prices in terms of destination countries. Despite the export response, notably, decreases in imports are confined to a few months. While the import response could be attributed to either low substitutability between imported and domestic goods or an increase in domestic demand, the latter is highly likely to have occurred. This is evidenced by significant price increases alongside little nominal interest rate responses, presumably implying a fall in the ex-ante real interest rate that should have stimulated demand through intertemporal substitution. The possible presence of the intertemporal substitution

means that the depreciation at that time may not have been entirely a beggar-thy-neighbor policy. While this is in partial contrast to the prevailing notion of currency devaluation in the 1930s, Eichengreen and Sachs (1985) similarly challenge the view that the competitive devaluations were without mutual benefit by finding declines in real wages and increases in Tobin's q in the devaluing nations.[2]

Building on the result, this paper provides more direct evidence of intertemporal substitution through two approaches: first, by measuring inflation expectations, and second, by finding a proxy for monthly consumption. While methods typically used to measure postwar inflation expectations are not applicable to the prewar period due to data limitations, one viable approach is to utilize newspaper coverage, following Jalil and Rua (2016). They find that the number of inflationary articles significantly increased in spring 1933 in the US, viewing this as an indication of rising inflationary expectations. This paper counts not only inflationary articles but also deflationary articles and tries to capture two-way fluctuations in inflation expectations. Furthermore, by separately counting articles that reference both prices and exchange rates, this paper examines whether contemporaries recognized the link between the two. Using local projections, this paper confirms that the article counts for price and exchange rates and for inflation and deflation both responded significantly to the exchange rate shock. Regarding the analysis of the consumption response, this paper utilizes the monthly shipment volume of sake as a proxy for pre-WWII consumption, which was recorded for taxation purposes. At the time, sake consumption accounted for a significantly larger weight than it does today and its shipment volume was very highly correlated with overall consumption. This paper finds that the sake shipment responded significantly to the exchange rate shock, which is consistent with the intertemporal substitution hypothesis.

Finally, this paper applies a historical decomposition to Japan's recovery from the

[2] In light of the interwar experiences, League of Nations (1944) concluded that any country suffering depression should abstain from depreciation of exchange rates.

depression by employing the estimated VAR model. Despite the fame of Takahashi's reflationary policies, they have lacked rigorous empirical scrutiny, with Nanto and Takagi (1985) providing only a brief description. Thus, Bernanke's (2003) aforementioned statement has been essentially untested.[3] This paper fills this gap by demonstrating that Japan's recovery during the two years following Takahashi's appointment in December 1931 can be fully explained by the exchange rate devaluation, which involved a 54 percent decline within the first year. This result is consistent with Eichengreen and Sachs (1985) argument that devaluations led to recoveries from depressions in the 1930s, though they do not consider the intertemporal substitution channel. Boucasse (2024) applies both a difference-in-difference estimation and a combination of high frequency identification of exchange rate shocks and local projection both to cross-country data for the 1930s and shows that the devaluations were expansionary. He also demonstrates that in the devaluing countries, real interest rates declined and imports increased, arguing that the real interest rate channel was functioning in his 1930s country samples. Thus, Boucasse (2024) and this paper obtain similar findings by taking totally different approaches. Ellison, Lee, and O'Rourke (2024) provide another evidence for the real interest rate channel in the 1930s. By estimating expected inflation for 27 countries including Japan via nowcasting, they demonstrate that the abandonment of the gold standard led to a decline in real interest rates.

This paper proceeds as follows. Section 2 explains how to identify and quantify exchange rate shocks and shows the results. Section 3 explains econometric methodology and data used for estimation. Section 4 discusses the estimated effects of the exchange rate shocks. Section 5 provides evidences for the intertemporal substation. Section 5 assesses the

[3] Cha (2003) and Shibamoto and Shizume (2014) try to study the recovery by estimating VAR models, but they lack the theory for their identification of structural shocks. Cha's (2003) shocks are residuals obtained by regressing each reduced-form residual on residuals from other equations. Shibamoto and Shizume (2014) estimate a VAR model containing the rail freight volume, the wholesale price index, their inflation expectation measure, fiscal balances, the exchange rate, and money stock in this order and applies the Cholesky decomposition to reduced-form residuals.

contribution of the devaluation to Japan's recovery from the depression. Section 6 concludes.

2. Identifying and Quantifying Exchange Rate Shocks

This section begins by outlining why exchange rate policies in the pre-WWII era underwent frequent changes that were not driven by business cycles. It then details the method for identifying and quantifying exchange rate shocks and shows the results.

2.1 A Brief Background of Japanese Exchange Rate Policies since WWI

Japan suspended the gold standard in September 1917. After the end of WWI, the debate over the return to it and, following the 1930 return, its abandonment became a pivotal policy issue.[4] Since 1921, the yen had been below its old parity against the US dollar in most periods and expectations for a return to the gold standard implied that a certain degree of yen appreciation had been priced in. Indeed, Japan returned to the gold standard at the old parity in January 1930.

Adherence to the gold standard differed between the two major political parties, the Kenseikai (Constitutional Association, later the Rikken Minseito, Constitutional Democratic Party), which adhered to it, and the Rikken Seiyukai (Constitutional Association of Political Friends), which did not. There was such difference among individual politicians who served as the finance minister as well. Consequently, changes in the cabinet or the finance minister could lead to changes in exchange rate policies that affected expected or actual exchange rates.[5] This fact is extraordinarily valuable in assessing the macroeconomic effects of exchange rate shocks, since those were political and not endogenous responses to concurrent macroeconomic shocks. Furthermore, the opportunities for such changes in exchange rate policy increased for

[4] See, for example, Patrick (1971), for an English description of Japanese interwar economy and macroeconomic policies.

[5] In his book on Japanese economic history, Ohno (2006) characterizes the period as exchange rate instability, observing that while expectations drove up the yen each time the government announced its intention to return to the gold standard, the yen fell back whenever the policy failed to materialize.

the following two reasons. First, from the 1924 general election to 1931, the cabinet was formed by the leader of the political party having the largest number of parliamentary seats, instead of appointed elder statesmen or military generals, and, when there was a large political misstep, the leader of another major party replaced him as prime minister. This practice was called *Kensei no Jod*o (Normal Course of Constitutional Government) and changes in the cabinet due to the political missteps increased the frequency of exchange rate policy change (see, for an English description of *Kensei no Jodo*, Ohno 2006).[6] Second, while the US and the UK returned to the gold standard in 1919 and 1925 respectively, Japan's return was delayed until 1930. For instance, in 1923, although the yen rate had recovered to the old parity and the finance minister was seeking an opportunity to return to the gold standard, the process was stalled by the cabinet's resignation following the prime minister's death (Bank of Japan 1983). The delay also led to an increased frequency of exchange rate policy change.

In addition to the exchange rate policy changes arising from the differing adherence to the gold standard, in pre-WWII Japan after WWI, there were two abrupt changes in foreign exchange intervention or control policy. Together with these changes, this paper explains below how the events are identified and how the shocks are quantified.

2.2 Approach

This paper tries to identify the events of exchange rate policy change that was not an endogenous response to concurrent macroeconomic shocks and measure exchange rate change caused by the events. The events can be shocks on the actual rate, such as changes in foreign exchange intervention or control policy, or on the expected rate, since the covered interest rate parity implies that, given domestic and foreign interest rates, changes in the expected rate immediately affect the actual rate. The brief background described above implies that the

[6] While the cabinet change in 1924 was due to the result of the general election, the other cabinet changes in the *Kensei no Jodo* period were due to the political missteps. The *Kensei no Jodo* came to an end in 1932, following the assassination of the prime minister and the subsequent appointment of an admiral to the office.

events were after the end of WWI, which led to exchange rate polices becoming a pivotal policy issue. The event search covers the period prior to the fall of 1939, as price controls were implemented in October of that year.

This paper's approach to constructing the exchange rate shocks is the combination of a narrative method, which allows identifying the shock dates, and high-frequency identification, which allows quantifying the shock. Specifically, it consists of the following three steps.

1. Consult the Centennial History of Bank of Japan (1983,1984) and Miwa (2003), who was an economic historian and gave a description about Japanese interwar economic policies, in order to find events of or leading to changes in exchange rate policies.
2. Read contemporary newspapers on and before the event dates and find the first dates when the events, actual or foreseen, are linked to exchange rate developments by newspapers or in foreign exchange markets. The primary source is *Chugai Shogyo Shimpo*, which was the predecessor of the current Nikkei (*Nihon Keizai Shimbun*). It was established as the first newspaper in Japan to specialize in business issues and presumably paid more attention to exchange rate fluctuations than other papers.[7] Where available, other articles from the Kobe University Newspaper Clippings Collection are utilized to provide supporting context regarding the nature of the events.[8]
3. Measure changes in the yen-dollar exchange rate from the day before the events were linked to exchange rate developments to the day after the event dates, using *New York Times* data, and use these as shock variables.

This approach would be characterized by the following three features. First, reading the

[7] *Chugai* means "domestic and international", *Shogyo* means "commerce," and *Shimpo* translates to "news." Initially, the newspaper name was *Chugai Bukka Shimpo*, where *Bukka* means "prices". The Nikkei website states "In those days, newspaper publishing was dominated by major papers that focused on politics, or smaller papers that covered local affairs. An economic newspaper that reported solely on prices and business conditions was unprecedented" (https://www.nikkei.co.jp/nikkeiinfo/en/about/ourhistory/archives/19053102.html). This paper identified relevant newspaper articles using the Nikkei Telecom database.

[8] The collection covers articles in 1911-1945 and of numerous newspapers. The selection and classification of articles was done by contemporary specialists.

daily newspapers for the entire period is extremely time consuming and consulting Bank of Japan (1983, 1984) and Miwa (2003) facilitates the identification of events associated with exchange rate policy changes. Though this approach might involve the possible cost of losing several episodes valid for measuring the causal effects of exchange rate shocks, which leads to a reduction in the precision of the estimates, it does not imply that the estimates are biased.[9] Second, confirming that exchange rate fluctuations occurred at the time of the events proves that the events constituted exchange rate shocks. Third, the execution of the second step revealed that the events were priced into the exchange rate either on the day of the event, the following day, or, at the earliest, two days prior. This indicates that exchange rate shocks can be measured within a very narrow window, implying that they are highly unlikely to be contaminated by other shocks.

This paper's approach to measuring exchange rate shocks is closely aligned with that of Boucasse (2024), who first identifies periods with a high volume of news on the departure from the gold standard in the US and seven European countries, specify the dates of announcements relating to the departure by reviewing these articles, and use changes in forward exchange rates around those dates as devaluation shocks. This paper's approach replaces the mechanical news count employed in his first step with reading economic historians' descriptions of the history of Japanese exchange rate policy. As he argues, our approach is conceptually similar to the recently popular approach of using changes in federal fund futures on or around FOMC days as monetary policy shocks.[10] A key departure from such approach is that, unlike the FOMC, the timing of exchange rate events is not fixed beforehand and this missing information is supplemented by economic historians' descriptions in this paper and the article counts in Boucasse (2024).

[9] This discussion on the cost of narrative approaches follows Romer and Romer (2023).
[10] See Ramey (2016) for a survey of monetary policy shock identification.

2.3 Results

The outcome of the exercise is the identification of nine events as exchange rate shocks, ranging from the first in 1922 to the last in 1932. Table 1 presents these events, citing the first articles that linked them to exchange rate developments or articles on unanticipated foreign exchange intervention or control policy events, along with the dates, the magnitude of the shocks, the window to measure it (shown in parentheses), and the corresponding page references in Bank of Japan (1983, 1984) and Miwa (2003).

Of the nine events, six are appreciation shocks and three are depreciation shocks. The events are categorized into four types based on the reasons for the exchange rate policy changes. The first consists of cabinet changes stemming from political missteps or internal discord not on exchange rate issues and applies to five events in June 1922, September 1925, April 1927, July 1929, and December 1931. The 1925 event was the relaxation of embargo against gold exports, a move triggered by the previous month's dissolution of the coalition cabinet, which had included Seiyukai, and the establishment of the Minseito single-party cabinet. The second consists of a change in the finance minister not due to exchange rate issues and applies to September 1926, when the predecessor died. The third is a combination of the first and second and applies to September 1922, when the new finance minister signaled a clear shift toward exploring the return to the gold standard, following the 1922 cabinet change. The fourth is unanticipated changes in foreign exchange intervention or control policy and applies to December 1923 and December 1932. In December 1923, facing a rapid depletion of foreign reserves, the government abruptly halted the interventions that had supported private banks' foreign currency financing and sustained a de facto fixed exchange rate since the Great Kanto Earthquake in September. In December 1932, Finance Minister Korekiyo Takahashi hinted at a new foreign exchange control policy to address the sharp depreciation of the yen after the

departure from the gold standard in December 1931.[11] In terms of the magnitude of the shock, the 16 percent depreciation over three days following the abandonment of the gold standard in December 1931 stands out as particularly significant.

Figure 2 plots daily dollar-yen exchange rates from New York Times around the events. For four events, newspaper articles appeared in advance that linked anticipated political developments with exchange rate fluctuations or foreseeing exchange rate policy changes. Their timing is indicated in the panels. The other five events were unanticipated. The events of June 1922, December 1923, and April 1927 are somewhat anomalous, as the exchange rate fluctuated significantly on the next day. This could be because the market required time to interpret and price in the events, or alternatively, the data reported in the New York Times may not have reflected the prevailing market conditions in a timely manner.

Figure 3 plots monthly data for the nominal yen-dollar rate and the nominal effective exchange rate of yen, indicating months including the event dates with vertical lines. This paper constructs the effective exchange rate series by chain-linking the rates of US dollar, UK pence, French franc, German mark, Indian rupee, and Chinese tael with trade weights (i.e., the sum of exports and imports), excluding German mark from July 1922 to December 1925 to ensure that the hyperinflationary period does not skew the series.[12] Differences between the dollar rate changes and the effective rate changes are mostly due to silver price changes that affected the currency of China, which accounted for 22 percent of the sum of exports and imports in 1915. There were silver price surges beginning in August 1915 and its declines beginning in March 1920, which were driven in part by shifts in European coinage demand at

[11] Miwa (2003, p. 274) states that the exact reasons why the shift toward intense interventionism occurred when the exchange rate fell below 20 dollars per 100 yen remain unclear.

[12] Exchange rates since September 1926 are the market rates in New York and London for the dollar and the pound respectively, sourced from the annual publications of the Toyo Keizai Shinposha's economic year book, and telegraphic transfer selling rates quoted by the Yokohama Specie Bank for the other currencies. Those rates are linked to rates for demand draft, which was a bill of exchange paid in the foreign currency upon presentation at the place of payment. The latter two rate series is from the website of the Institute for Monetary and Economic Studies of the Bank of Japan.

the start and end of WWI. The figure shows that the event dates correspond to the timing of changes in or acceleration of exchange rate trend.[13] The magnitude of the depreciation following the abandonment of the gold standard in December 1931 was extremely large and, in terms of the nominal effective exchange rate, reached 54 percent in one year from November 1931.

3. Econometric Methodology and Data

This paper studies the effects of exchange rate shocks by using a VAR model containing the exchange rate shock, log output, log exports, log imports, log wholesale prices, the market discount rate, and the log nominal effective exchange rate. This paper uses monthly data and chooses the number of lags 12, following a standard practice in estimating VAR models with monthly data. Output, exports, and imports are converted to per capita values by using the population aged 15 and over, linearly interpolated on a monthly basis. The sample period is from January 1914 to August 1939. Its start is determined by the availability of export and import data and its end is set before the enforcement of wartime price controls in fall 1939. The innovation to the exchange rate shock equation is the exchange rate shock.

For the output series, since there do not exist monthly industrial production data that cover the whole sample period, this paper interpolates annual GDP data from Fukao, Nakamura, and Nakabayashi (2017) by following Fernàndez (1981).[14] Specifically, the coefficients estimated

[13] Grossman and Imai (2009) try to detect structural changes in the daily dollar-yen exchange rate change from 1922 to 1930 by using a structural break test and link the identified breaks to historical events by searching for the word "Japan" in articles from the *New York Times*, *Wall Street Journal*, and *The Economist* around those dates. Of the five break dates identified, September 8, 1922, April 21,1927, and July 1, 1929 coincide almost exactly with this paper's identified event dates, lagging by just one day. However, their linking the first break to Japan's troop withdrawal from Siberian intervention appears to be incorrect. Indeed, as shown in their figure, the withdrawal had already been announced in June. This suggests that this paper's reliance on economic historians' accounts of Japanese economic history is effective in identifying events changing exchange rate trend. Grossman and Imai's (2009) other two breaks are associated with the escalation of the Civil War in China in 1924, which they link to market speculation regarding Japan's possible interventions, and a conflict between Japanese and Chinese troops in China in 1928. They argue that these events led to the yen depreciation due to potential fiscal costs. If this were true, these exchange rate changes would be responses to fiscal shocks.

[14] There is the non-seasonally adjusted industrial production index constructed by Toyo Keizai Shinposha (1937, 1939), which covered 26 sectors. However, the sample period is limited to the period from January 1926 to June 1937.

by regressing GDP on annual average of monthly indicators are used for interpolations. This paper uses five monthly indicators from Fujino and Igarashi (1973) to quantify economic activity across various sectors: the freight volume of national railways, the passenger number of national railways, raw silk shipment volume, cotton yarn production, and rice trading volume. According to Estimates of Long-Term Economic Statistics of Japan (LTES, hereafter), which is a popular historical data set for the Japanese economy, the total output of the five specific sectors represents 27 percent of the combined output of the six industries for which gross output data are available (Agriculture, Forestry and Fisheries; Mining; Construction; Manufacturing; Railways; and Electric Power). Assuming that the output ratio between the six industries and the other ones (i.e., service industries) equals to the LTES added value ratio, these five sectors represent 18 percent of total output. The freight volume is an appropriate indicator for the interpolation also in the sense that it was the data that the Bank of Japan monitored at the time.[15] All the estimated coefficients for the five indicators from the annual data regression were statistically significant.

This paper also interpolates Ohkawa and Shinohara's (1979) annual commodity export and import data, which are consistent with national accounts, by using the monthly export and import quantity indices of Kobe University of Commerce from Fujino and Igarashi (1973).[16] Since the Bank of Japan's monthly wholesale price series before 1931 is a simple average, this paper constructs a weighted series by applying the 1919-1921 manufacturing weights from Ohkawa et al. (1967) to the Bank's individual item data. Given that discounted bills typically carried 60-day or 90-day maturities at that time (Nishino 1924, p.252, 256), this paper computes the ex-post real interest rate using three-month annualized inflation rates derived from the impulse response of prices.

[15] A reference to rail freight volume is seen, for example, in the Bank of Japan monthly research report in May 1929 (Bank of Japan 1963, p. 304).

[16] The indices extended to April 1938 and are linked to the Yokohama Specie Bank indices reported in the Toyo Keizai Shinposha's economic year book.

4. Results

Figure 4 plots impulse responses to a one-percent depreciation shock and 90 percent confidence bands computed by bootstrap with 2000 draws. The effective exchange rate depreciates and output increases. The response of exports is positive and evidences the expenditure switching effect due to lower prices in terms of destination currencies. In spite of the export response, periods in which imports decrease are very limited. The import response can be caused by a low substitution between imported and domestic goods, increases in domestic demand, or both. Wholesale prices increase, while the response of nominal interest rates is not significant, and these responses would imply decreases in real interest rates.[17] As shown in the last panel, real interest rates reach the bottom six months after the shock and are below the initial level for almost one year. This response suggests that intertemporal substitutions stimulated domestic demand, implying that exchange depreciations in the pre-WWII period were not entirely a beggar-thy-neighbor policy.

Table 2 shows the share of the forecast error variance attributable to the exchange rate shock up to the eight-year horizon. The shock accounts for 43-65 percent of the nominal effective exchange rates from the six-month to eight-year horizons and this suggests that the shock plays a large role in exchange rate fluctuations. The shock's contribution to the forecast error

[17] The question of what the monetary policy reaction function looked like in the pre-WWII period is likely an important topic that have lacked robust research. At least during the periods under the gold standard, prior to the departure in September 1917 and from January 1930 to December 1931, it would be natural to assume that monetary policy was more or less constrained by the interest rates of base countries, namely the United States and the United Kingdom, though this paper's exchange rate shocks occurred in the other periods. Estimating a reaction function according to specific rules for these periods presents several challenges. First, it is necessary to clarify what the Bank of Japan's objectives were at the time. While the Centennial History of the Bank of Japan (1983, 1984) attempts to describe the background of changes in the official discount rate based on narrative evidences, it is clear that many of these changes were not necessarily aimed at stabilizing prices or the economy. Second, even if we assume those were the objectives, one would need to estimate the function using variables related to the Bank of Japan's economic outlook at the time. Orphanides (2003, 2004) estimates the Taylor Rule in the postwar US using real time data or the Federal Reserve's forecasts and Orphanides (2003) relates the US monetary policy during the 1920s to the Taylor Rule by using the contemporary writings of officials, including the Federal Reserve's board members and economists, instead of estimating a rule directly. He concludes that the Federal Reserve's interest rate policy leading up to the Great Depression was conducted in a manner consistent with the Taylor Rule and aimed at economic stabilization based on their economic forecasts and their views on the normal level of economic activity.

variance of output is large, exceeding 20 percent at the one-year horizon and rising above 30 percent at the two-year horizon. The finding of such a large output effect of the exchange rate shock supports Eichengreen and Sachs's (1985) argument that countries that devalued earlier recovered earlier from their depressions. The shock's contribution to the forecast error variance of exports is smaller and below 20 percent at the maximum, suggesting that output would be raised not only by foreigners' expenditure switching to Japanese goods but also by other channels. Indeed, up to the one-year horizon, the shock's contribution of the forecast error variance of imports is below 3 percent, suggesting that the domestic expenditure switching effect was more or less offset. The possible offsetting factor was intertemporal substitution due to higher inflation expectations, which shifted consumption forward. The portion of the forecast error variance of prices explained by the shock is less than one percent on impact, reaches nearly 20 percent at the one-year horizon, and exceeds 30 percent at the two-year horizon, which corresponds to the finding of rising prices in response to the shock, while that of nominal interest rates explained by the shock is below three percent over almost all the horizons. Consequently, the shock's contribution to the forecast error variance of the ex-post real interest rate rises swiftly and reaches 16 percent at the six-month horizon.

The number of this paper's exchange rate shock is only nine and it is worth studying to what extent it explains historical fluctuations of macroeconomic and financial variables. For this purpose, this paper follows Fisher (2006), who study the role of his identified investment-specific technology shocks, by simulating the VAR model with the exchange rate shocks and the actual data in the first 12 months of the sample to initialize the simulation. The solid and dotted lines of Figure 5 indicate the percent deviations of the predicted time path and the actual series from each trend, which is extracted by the Hodrick-Prescott filter with the tuning parameter 14,400 as a standard for monthly data. The detrended series makes the figure more readable than the actual series. As shown in the upper left panel, in spite of such small number

of the shock, this paper's exchange rate shock explains a surprisingly large part of exchange rate fluctuations. This suggests that the number of unidentified episodes suitable for measuring the causal effects of exchange rate shocks is not large. It is also visible that the portions explained by this paper's shock in output and export fluctuations are larger than in import fluctuations. This is consistent with this paper's assertion that the domestic expenditure switching effect on imports was more or less offset by the front-loading of consumption driven by the intertemporal substitution of higher inflation expectations. In line with this interpretation, this paper's exchange rate shock clearly explains a larger portion of price fluctuations than interest rate fluctuations.

Table 3 quantifies the findings in Figure 5 by calculating the ratio of the variance of the exchange rate shock component to that of the actual data, both plotted in the figure. This paper's shock explains almost 50 percent of nominal effective exchange rate fluctuations. It explains 15, 13, and 22 percent of the variations of output, exports, and prices respectively, while it explains 8 and 7 percent of the variations of imports and interest rates.

5. Evidences for Intertemporal Substitution in Pre-WWII Japan

The finding that exchange rate shocks very likely affected demand by changing inflation expectations and real interest rates in pre-WWII Japan is of significant importance, as it challenges the prevailing notion of currency devaluation in the 1930s as a beggar-thy-neighbor policy. This section tries to show more direct evidences for the intertemporal substitution by following two approaches: measuring expected inflation and finding a proxy for consumption. This paper estimates those responses to the exchange rate shock.

5.1 Inflation Expectations in Pre-WWII Japan

5.1.1 Approach

Estimating expected inflation in the pre-WWII period is notoriously challenging due to severe

data constraints. The two most common modern approaches, which rely on yields from Treasury Inflation-Protected Securities (TIPS) and on survey data from professional forecasters, businesses, or households, utilize data that were non-existent in pre-WWII Japan. Ellison, Lee, and O'Rourke (2024) apply a nowcasting method to big data from 1919 for each of 27 countries including Japan and make out-of-sample forecasts of inflation from 1928. For Japan, they show that real interest rates declined by 17 percentage points in 12 months from Japan's departure from the gold standard in December 1931. Shibamoto and Shizume (2014) follow Hamilton (1992) and try to identify inflation expectation shocks by incorporating commodity futures spreads in their VAR model, presuming that positive spreads between forward and spot prices correspond to inflationary expectations and vice versa. However, referring to the theory of Working (1949), Ellison, Lee, and O'Rourke (2024) argue that the positive spreads are consistent with deflationary expectations and vice versa. They contend that the more the general price level is expected to fall, the more commodities are placed into storage, which in turn drives down spot prices, showing that the spreads of raw cotton prices were inflationary during the US Great Depression. Indeed, Shibamoto and Shizume's (2014) inflation expectation shocks obtained by applying the Choleski decomposition to their reduced-form errors are positive in the first half of 1930, when wholesale prices continued to decrease.

This paper assesses expected inflation by counting the number of newspaper articles on exchange rates and prices. The idea is inspired by Jalil and Rua (2016), who assess the US expected inflation in the recovery from the Great Depression by counting the number of newspaper articles with the term "inflation" in articles or article titles. They argue that a significant shift in inflation expectations would necessarily be reflected in the period's economic and financial press and that a time-series approach may fail to measure it around the regime shift that Temin and Wigmore (1990) characterize as central to the US recovery. Their series shows a dramatic spike in the news coverage in April 1933, when the US departed from

the gold standard. The same approach is taken by Daniel and ter Steege (2020) for German recovery from the depression and by Reis (2021) for the US in 1965-1975. Reis (2021) refers to Carrol (2003), who models that inflation expectations depend on past expectations and inflation forecasts reported in newspaper by assuming that people form their expectations by reading newspaper articles. Carrol (2003) states that the model implies that the speed of updating should be faster when there are more news stories on inflation and shows the regression result that differences between the US household and professional forecasts of inflation were smaller when there was more inflation coverage in newspapers in 1981-2000. Whether shifts in inflation expectations are reflected in news coverage or changes in news coverage drive inflation expectations, the two are very likely correlated.

This paper applies three extensions to the approach of Jalil and Rua (2016) and Daniel and ter Steege (2020) to studying inflation expectations during the recovery from the depressions. First, extending the sample period beyond the Great Depression, this paper counts the number of relevant articles from 1913 to 1939 in order to study its time-series relationship with this paper's exchange rate shock. Second, this paper counts the number of articles on deflation as well as on inflation and subtracts the former from the latter. The net count is expected to capture changes in inflation expectations in both directions. Third, this paper separately counts the number of articles that contain words for both prices and exchange rate or exchange rate regimes. This allows for an assessment of the extent to which contemporary observers associated exchange rate movements with price developments.

This paper counts the number of articles in *Asahi Shimbun*, where *Shimbun* means newspaper in Japanese. As of 1927, *Asahi Shimbun* was one of the two largest newspapers in terms of circulation (Yamamoto 1981). They provide the database named Asahi Shimbun Cross-Search that allows users to find articles by searching for specific terms within article

titles or keywords assigned to each article.[18] This paper first collects articles containing both of Japanese word *bukka* (price) and words representing exchange rate or exchange rate regimes in their titles or keywords. The latter consists of *kawase* (exchange) and 7 words representing exchange rate fluctuations, the gold standard, and its restoration or abandonment.[19] Second, this paper collects inflationary articles by searching for titles containing both the word *bukka* and any of 15 inflationary words identified within the titles found during the first search or the word *infure* (inflation). This paper also collects deflationary articles by searching for titles containing both the word *bukka* and any of 7 deflationary words identified within the titles found during the first search or the word *defure* (deflation) or *deisuinfure* (disinflation). This paper reads the article titles and, when necessary in the second search, the full texts of the articles and identifies the articles that should be excluded from the count, such as those on overseas or those where the movement-related words are not used to represent price changes. The second search is restricted to article titles, since there are keywords combining the movement-related words with words unrelated to prices.[20] Some of article titles mention price levels, but after looking at other articles or price trends in the same period, it is known that they are expressing the results of price changes. For this reason, this paper includes those in the article counts.

5.1.2 Results

The upper panel of Figure 6 plots the number of articles with words for both prices and exchange rates or exchange rate regimes in their titles or attached keywords. The vertical lines

[18] Another largest newspaper at that time was *Mainichi Shimbun*, of which title was *Tokyo Nichinichi Shimbun* in eastern Japan, and they also provide a similar database. However, as far as I tested, searching by words in article titles yielded apparently fewer articles than actually existed.

[19] The Japanese words are shown in an appendix. I leveraged the presence of non-abbreviated foreign geographical words such as names of countries, cities, and regions within the keywords by configuring the initial search to exclude articles with these identified words. This simplified the subsequent task of filtering out international news. The results of the first search appeared to show that, while articles with the words *kawase* or related to the gold standard were found, they did not feature words representing exchange rate fluctuations.

[20] For example, Japanese word *taka* (high) can be a part of the last names of Japanese names included in the keywords, such as Takada. The first search covers both titles and keywords, as the number of articles mentioning both prices and exchange rates in their titles alone is quite limited.

represent the timing of the exchange rate events identified in Section 2. There are the following three findings. First, there is a visible increase in the number or frequency of the articles following the events.[21] This provides striking evidence that contemporary observers were keenly aware of the link between exchange rate shocks and prices. Second, no articles are found prior to 1917, the year Japan departed from the gold standard. This is consistent with the Section 2's discussion that exchange rate policy emerged as a pivotal policy issue after the departure. Third, while it might be expected that inflationary periods attracted more media attention due to public aversion, the article counts also surge following deflationary events that triggered yen appreciation.

The lower panel presents the number of the inflationary articles with upward-facing bars alongside vertical lines indicating the depreciation events, while the number of the deflationary articles is presented with downward-facing bars alongside vertical lines indicating the appreciation events. The line is the net count calculated by subtracting the number of the deflationary articles from that of the inflationary articles, which is expected to be correlated to expected inflation. Following the depreciation events, the net count increases, with a lag of less than one year in the case of the 1923 and 1927 events. At the time of the devaluation triggered by the exit from the gold standard in December 1931, the net count rose concurrently, suggesting that the shock was potent enough to trigger an immediate surge in inflationary expectations. Following the appreciation events, the net count promptly either turns negative or begins to decline from positive territory, with the sole exception of the June 1922 event. When the movement to the return to the gold standard commenced following the cabinet change in July 1929, the net count immediately fell further into negative territory. Moreover, it remained negative for much of the subsequent period of over two years leading up to the exit

[21] There were increases in the number of the articles in 1937. This would be partly because increases in the military budget intensified downward pressure on the yen, leading to discussions on foreign exchange controls to prevent inflation (see, for example, Bank of Japan 1984, pp. 182-189).

from the gold standard in December 1931, suggesting that sustained deflationary expectations had taken hold.

This paper econometrically studies the causal relationship between the exchange rate events and the article counts. Specifically, this paper employs local projections and regresses the article count change from $t-1$ to $t+h$ on the current and lags of this paper's exchange rate shock and the controls constituting of the lags of the first differences of the article count, log output per capita, log wholesale prices, the market discount rate, and the log nominal effective exchange rate. The number of lags is 12, as in the VAR model estimation. The coefficient estimate for the current shock obtained by the estimation for each horizon h represents impulse responses. This paper uses Newey-West correction for the standard error to account for the error term's serial correlation due to the successive leading of the dependent variable.

The upper two panels of Figure 7 plot the impulse responses of the number of articles with price and exchange rate or regime words to a 1-percent absolute value shock and of the net count of inflationary and deflationary articles to a 1-percent depreciation shock. The former shock is the absolute value, because the article count as the dependent variable does not distinguish between inflationary and deflationary articles. Both counts increase to the exchange rate shock on impact. This suggests that exchange rate fluctuations due to the exchange rate shocks were immediately expected to impact prices and that depreciation shocks raised and appreciation shocks lowered inflation expectations. After diminishing subsequently, the article counts begin to rise once more, peaking around the 13th month. While examining reasons behind this double surge are beyond the scope of this paper, the direction of the responses is consistent with the interpretation that inflation expectations reacted to the exchange rate shock.

5.2 A proxy for Consumption

The second direct evidence for the intertemporal substitution is the response of consumption to

the exchange rate shock. As monthly overall consumption data for the pre-WWII period do not exist, a proxy is necessary. Specifically, this paper finds the volume of sake shipments to be a viable proxy for this analysis. Some might question the extent to which the individual item could represent overall consumption change. However, contrary to such potential skepticism, sake shipment data possess the following three useful characteristics for analyzing the intertemporal substitution effect caused by the exchange rate shock. First, the data were from a full census by the Ministry of Finance for taxation purposes and available on a monthly basis. Second, at the time when the variety of consumer goods was far more limited than it is today, sake was a dominant consumption item, accounting for 8.8 percent of spending on average in the period 1914-1938, which is 59 times its 2025 weight of 0.15 percent.[22] Consequently, the annual growth rate of sake shipments shows a correlation of 0.56 with private consumption from the LTES over the 1914-1938 period. Third, given that sake exports and imports relative to total production were a negligible 1.3 percent and 0.0 percent on average between 1914 and 1938, the response of its shipment to the exchange rate shock does not reflect the expenditure switching effect but is instead considered a result of the intertemporal substitution effect. Any multiplier effects due to the expenditure switching effect on other goods are expected to be controlled for by including lagged output in the controls.

This paper estimates the impulse response to the exchange rate shock with the local projection where the control variables additionally include the lags of the first difference of log sake shipments. The lower panel of Figure 7 plots the impulse response to a 1-percent depreciation shock and shows that sake shipments increase, consistent with the intertemporal substitution hypothesis.[23]

[22] The 2025 number is from the Family Income and Expenditure Survey. The 1914-1938 average is from the LTES. Imputed rents are excluded from total consumption to be consistent with the 2025 number and, if the own product consumption of food were excluded as well, the difference between the two years would be larger.

[23] An alternative approach to studying the intertemporal substitution effect would be to estimate the response of consumption to inflation expectations, using the inflation expectation variable from the previous section as an explanatory variable and the exchange rate shock as an instrumental variable. However, according to the F-

6. Japan's Recovery from the Interwar Depression

This section first studies the implications of the VAR results for Japan's recovery from the interwar depression, after briefly describing economic developments at that time using monthly data. Then, it presents narrative evidence for the intertemporal substitution effect during the recovery. Finally, given the possible regime-shift nature of Takahashi Korekiyo's policies, a potential caveat to this paper's analysis is discussed.

6.1 A Brief Description of the Recovery

The first panel of Figure 8 plots industrial production and monthly GDP. It appears that industrial production gained growth momentum shortly after the suspension of the gold standard in December 1931, whereas monthly GDP did so approximately half a year later, though both had bottomed out in the first half of 1931. Large increases in the former relative to the latter in 1931 and 1932 suggest a large contribution of goods exports to the recovery due to the expenditure switching effect caused by the devaluation. Indeed, trade data plotted in the second panel shows that the devaluation had positive effects on goods exports. At the same time, imports did not exhibit a declining trend and on balance, net exports fluctuated around zero. These trade developments appear to be consistent with the VAR results: Takahashi's devaluation may not have been entirely a beggar-thy-neighbor policy. The third panel shows that wholesale prices followed a clear downward trend until November 1931 and then began to increase, mirroring the exchange rate movements. The numbers of articles containing the words of prices and exchange rates in their titles or keywords and inflationary words in their titles both rose immediately in December 1931 and followed an upward trend through early 1933, despite some fluctuations. This suggests that rising inflation expectations caused by the devaluation could be a source of the recovery through the intertemporal substitution channel. Though Nanto and Takagi (1985) emphasize the role of nominal interest

statistic, the exchange rate shock proved to be a weak instrument for the inflation expectation variable.

rates lowered by the Bank of Japan since 1932, their story is unlikely, because there were two significant interest rate hikes in late 1931 intended to curb capital outflows amid expectations of devaluation. The bottom panel shows that the market discount rate was not lower than the mid-1931 level until mid-1933.

6.2 Historical Decompositions of the Recovery

In order to quantify the contribution of exchange rate fluctuations to the recovery, this paper simulates the VAR model with the devaluation shock in December 1931, the appreciation shock in December 1932, and the actual data from November 1930 to October 1931 to initialize the simulation. In Figure 9, the dotted line presents actual data, the gray line presents base projections derived from actual data for the initialization and the model's constant terms, which represent the path realized in the absence of additional shocks, and the solid black line presents the component due to the initial values, the constant terms, and the exchange rate shocks. The devaluation shock explains almost the entire depreciation, which reached over 70 percent in log levels during 12 months following December 1931.[24] Strikingly, until the beginning of 1933, the shock component of output increases more than the actual data, suggesting that the recovery up to that point is more than fully accounted for by the devaluation shock. In turn, this result implies that other shocks were dragging down output at the time and there were two likely candidates. The one is the two interest rate hikes in late 1931 mentioned above. The another is the continuing global depression and, as pointed out in Section 1, industrial production levels in major economies including the United States, Germany, and France declined further between

[24] By looking at the exchange rate developments in NY and Tokyo and reading contemporary newspaper articles, Ito, Okina, and Teranishi (1993) attributed the yen depreciation in early in 1932 and in the second half of 1932 to Japan's aggressions in China that drew criticism from the rest of the world and Japan's diplomatic isolation respectively. To reconcile this explanation with this paper's results, one would have to argue that at the time of the departure from the gold standard, the foreign exchange market had already anticipated that Takahashi would take the expansionary policies that would enable and realize military expansion. However, this is highly implausible. No such views appeared in the December 13th newspapers where ten business leaders presented their outlook on the new cabinet (*Osaka Mainichi Shimbun*, December 13. 1931). Furthermore, it is generally understood that fiscal policy only shifted toward expansion after the Seiyukai party won a majority in the general election in late February (Bank of Japan 1984).

1931 and 1932. The shock component of exports also increases more than the actual data and the discrepancy might again be explained by the global depression. The shock component for imports fluctuates without showing a sustained decline and, taken as a whole, the expenditure switching effect was canceled out by the intertemporal substitution effect. Aligning with this interpretation, the shock component for prices indicates inflation larger than the actual data. The extent to which the shock explains declines in the short-term interest rate is limited to at most 10 basis points from the baseline forecast, as already implied by its insignificant impulse response to the shock. If one wished an interpretation for the declines, it could be argued that the currency depreciation increased the degree to which accommodative monetary policy was permitted. In sum, Finance Minister Korekiyo Takahashi brilliantly rescued Japan by inducing the most significant exchange rate movement since the abandonment of the gold standard in 1917.[25]

6.3 Narrative Evidence for Intertemporal Substitution in Response to the Devaluation

Following the departure from the gold standard, the number of articles about prices and exchange rates and about inflation increased, suggesting a rise in inflation expectations. For this period, there is evidence that more directly points to a rise in inflation expectations and even demonstrates an increase in consumption resulting from the associated intertemporal substitution effect. Figure 10 shows two ads that appeared in *Tokyo Nichinichi Shimbun*, one of the largest newspapers of the era, just days after the gold standard was abandoned on December 13. To facilitate intuitive understanding, English translations are provided for keywords corresponding to the mechanism. The ad above was placed by Mitsukoshi, a department store still in operation today, and, summarized briefly, told consumers that while a

[25] Government purchases also likely contributed to the recovery, since monthly data from the annual report of the Ministry of Finance indicated that the central government's general account spending had increased since the end of the first half of 1932. It is difficult to assess those contributions to the recovery, because the modern fiscal shock analysis requires data on private agents' expectations concerning overall government purchases, which, to our knowledge, do not exist for this period. See Ramey (2016) for a survey of fiscal shock identifications.

rise in prices would be inevitable due to the yen's depreciation following the departure, the store would not raise prices on items already in stock for a while, concluding with a request for continued customer loyalty. The ad below was from Tenshodo, a jewelry and watch shop also in operation today, and conveyed a message essentially same as that of Mitsukoshi. Crucially, a subsequent newspaper article confirmed that consumption did indeed increase due to the intertemporal substitution effect. On December 25, *Tokyo Asahi Shimbun* reported on the year-end sales, stating that "following the departure from the gold standard by the new cabinet, the number of customers has surged in anticipation of the inevitable rise in prices and some have even gone as far as buying up summer goods."

6.4 Discussion

While this paper does not distinguish the December 1931 devaluation from other exchange rate shocks, it might be arguable that it is necessary to explore a different analytical approach by viewing Takahashi's policies as a regime change, analogous to how Temin and Wigmore (1990) and Eggertsson (2008) frame the President Roosevelt's 1933 macroeconomic policy shift in the US, given that the magnitude of the shock was especially large and the devaluation was coupled with other expansionary policies including fiscal expansion exceptionally accompanied by the Bank of Japan's underwriting of government bonds. Excluding the December 1931 shock, this paper found that, while the impulse responses to the exchange rate shock were broadly similar in qualitative terms and the mean responses of some variables were larger, the confidence bands widened. The results appear to suggest that the experience of the December 1931 devaluation is indispensable for measuring the impact of exchange rate shocks. And, in the literature on the US Great Depression, Hamilton (1992) and Cecchetti (1992) apply time-series methods to data in the pre-WWII period including the Roosevelt era to measure inflation expectations and Cecchetti and Karras (1994) estimate VAR models with such data to examine the causes of the depression. Ellison, Lee, and O'Rourke (2024) also make no distinction

between the period of the recovery and the other pre-WWII periods when estimating inflation expectations for 27 countries including Japan and the US. These studies suggest that no compelling a priori reason exists to treat the recovery from the depression as a unique period and this paper follows this premise.

7. Conclusion

Japan was one of the first countries to abandon the gold standard and one of a few to begin its recovery in 1932. This paper examines whether time-series data can confirm that yen depreciation stimulated the pre-WWII Japanese economy. Since exchange rate policy was specific to political parties or finance ministers, those changes can be identified as exchange rate shocks. Daily exchange rates allow quantifying the exchange rate shocks. Depreciation shocks were expansionary and this paper's exchange rate shocks explain 50 percent of the variation in exchange rates, 22 percent in prices, and 15 percent in output, suggesting that they played a crucial role in pre-WWII business cycles. Imports decrease little in response to the depreciation shock and narrative evidences derived from the frequency of newspaper articles suggest that people anticipated price fluctuations in response to the exchange rate shock. Thus, the shock very likely drove business cycles not only through the expenditure-switching effect but also through the intertemporal substitution effect, suggesting that currency depreciation was not a purely beggar-thy-neighbor policy. Japan's recovery from the interwar depression can be explained entirely by the currency devaluation and contemporary newspaper articles and advertisements provide direct evidence for rising inflation expectations following the devaluation and the subsequent increase in consumption.

It is interesting to note that while Watanabe (2026) recently argues that a significant part of the 7.9 percent decline in Japan's 1930 GDP can be explained by income redistributions from farmers to non-farmers and overseas with lower MPCs, triggered by the 1929-1930 collapse in farm prices, the recovery in 1932-1933 could occur without resolving the problem for farmers.

Indeed, the relative price of agricultural products to consumer prices did not return to its 1929 level until 1935.

REFERENCE

Bank of Japan, 1963. Documentary Collections on Japan's Financial History: Showa Era, Volume 7 (*Nippon Kinyushi Shiryo Showa-hen Dai-7-kan*), Tokyo: Ministry of Finance.

Bank of Japan, 1983. Centennial History of Bank of Japan Volume 3 (*Nippon Ginko Hyakunenshi Dai-3-kan*).

Bank of Japan, 1984. Centennial History of Bank of Japan Volume 4 (*Nippon Ginko Hyakunenshi Dai-4-kan*).

Bernanke, Ben S., 2003. "Some Thoughts on Monetary Policy in Japan," remarks before the Japan Society of Monetary Economics, Tokyo, Japan, May 31, 2003.

Boucasse, Paul, 2024. "Canst Thou Beggar Thy Neighbour? Evidence from the 1930s," mimeo.

Carroll, Christopher D. 2003. "Macroeconomic Expectations of Households and Professional Forecasters," *The Quarterly Journal of Economics* 118(1), 269-298.

Cecchetti, Stephen G, 1992. "Prices during the Great Depression: Was the Deflation of 1930-1932 Really Unanticipated?," *American Economic Review* 82(1), 141-156.

Cecchetti, Stephen G and Georgios Karras, 1994. "Sources of Output Fluctuations during the Interwar Period: Further Evidence on the Causes of the Great Depression," *The Review of Economics and Statistics* 76(1), 80-102.

Cha, M. S., 2003. "Did Takahashi Korekiyo Rescue Japan from the Great Depression?," *Journal of Economic History* 63(1), 127-144.

Daniel, Volker and Lucas ter Steege, 2020. "Inflation Expectations and the Recovery from the Great Depression in Germany," *Explorations in Economic History* 75.

Eggertsson, Gauti B. 2008. "Great Expectations and the End of the Depression," *American Economic Review* 98(4), 1476-1516.

Eichengreen, Barry, 1992. *Golden Fetters*, New York and Oxford: Oxford University Press.

Eichengreen, Barry and Jeffrey Sachs, 1985. "Exchange Rates and Economic Recovery in the 1930s," *The Journal of Economic History* 45(4), 925-946.

Ellison, M., S. S. Lee, and K. H. O'Rourke, 2024. "The Ends of 27 Big Depressions," *American Economic Review* 114(1), 134-168.

Fernàndez, Roque B, 1981. "A Methodological Note on the Estimation of Time Series," *The Review of Economics and Statistics* 63(3), 471-476.

Fisher, Jonas D. M. 2006. "The Dynamic Effects of Neutral and Investment-Specific Technology Shocks," *Journal of Political Economy* 114(3), 413-451.

Fujino, Shozaburo and Fukuo Igarashi, 1973. "Business Cycle Indexes, 1888-1940 (*Keiki Shisu, 1888-1940*)," Institute of Economic Research, Hitotsubashi University.

Fukao, Kyoji, Naofumi Nakamura, and Masaki Nakabayashi, 2017b. A History of Japanese Economy 4 (*Nihon Keizai no Rekishi 4)*, Tokyo: Iwanami Shoten.

Grossman, Richard S. and Imai, Masami, 2009. "Japan's Return to Gold: Turning Points in the Value of the Yen during the 1920s," *Explorations in Economic History* 46(3), 314-323.

Hamilton, James D, 1992. "Was the Deflation during the Great Depression Anticipated? Evidence from the Commodity Futures Market," *American Economic Review* 82(1), 157-178.

Ito Takatoshi, Okina Kunio, and Teranishi Juro, 1993. "News and the Dollar/Yen Exchange Rate, 1931-1933: The End of the Gold Standard, Imperialism, and the Great Depression,"

Journal of the Japanese and International Economies 7(2), 107-131.

Jalil, Andrew J. and Rua, Gisela, 2016. "Inflation Expectations and Recovery in Spring 1933," *Explorations in Economic History* 62, 26-50.

Jordà, Oscar, 2005. "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review* 95(1), 161-182.

League of Nations, 1944. International Currency Experience: Lessons of the Inter-War Period. Geneva.

Miwa, Ryoichi, 2003. The History of Economic Policies in Interwar Japan (*Senkanki Nihon no Keizai Seisakushiteki Kenkyu*). Tokyo: University of Tokyo Press.

Nanto, Dick K and Shinji Takagi, 1985. "Korekiyo Takahashi and Japan's Recovery from the Great Depression," *American Economic Review* 75(2), 369-374.

Nishino, Kiyosaku, A Guide to Financial Markets (Kinyu no Mikata). Tokyo: Nippon Hyoron sha.

Ohkawa, Kazushi, Tsutomu Noda, Nobukiyo Takamatsu, Saburo Yamada, Minoru Kumazaki, Yuichi Shionoya, and Ryoshin Minami, 1967. *Estimates of Long-Term Economic Statistics of Japan since 1868, 8, Prices*, Tokyo: Toyo Keizai Shinposha.

Ohkawa, Kazushi and Miyohei Shinohara, 1979. *Patterns of Japanese Economic Development, A Quantitative Appraisal*, New Heaven and London: Yale University Press.

Ohno, Kenichi, 2006. The Economic Development of Japan: The Path Traveled by Japan as a Developing Country. Tokyo: GRIPS Development Forum.

Orphanides, Athanasios, 2003. "Historical Monetary Policy Analysis and the Taylor Rule," *Journal of Monetary Economics* 50(5), 983-1022.

Orphanides, Athanasios, 2004. "Monetary Policy Rules, Macroeconomic Stability, and Inflation: A View from the Trenches," *Journal of Money, Credit and Banking* 36(2), 151-175.

Patrick, Hugh T., 1971. "The Economic Muddle of the 1920's," in: James William Morley (ed.), *Dilemmas of Growth in Prewar Japan*, 211-266. Princeton: Princeton University Press.

Plagborg-Moller, Mikkel and Christian K. Wolf, 2021. "Local Projections and VARs Estimate the Same Impulse Responses," *Econometrica* 89(2), 955-980.

Ramey, V. A., 2016. "Macroeconomic Shocks and Their Propagation," in: J. B. Taylor & Harald Uhlig (ed.), *Handbook of Macroeconomics*, 71-162. Amsterdam: Elsevier.

Reis, Ricardo, 2021. "Losing the Inflation Anchors," *Brookings Papers on Economic Activity* 52(2), 307-379.

Romer, Christina D. and David H. Romer, 2023. "Presidential Address: Does Monetary Policy Matter? The Narrative Approach after 35 Years," *American Economic Review* 113(6), 1395-1423.

Shibamoto, Masahiko and Masato Shizume, 2014. "Exchange Rate Adjustment, Monetary Policy and Fiscal Stimulus in Japan's Escape from the Great Depression," *Explorations in Economic History* 53, 1-18.

Toyo Keizai Shinposha, 1937. The 21st Toyo Keizai Economic Yearbook (*Dai-21-kai Toyo Keizai Keizai Nenkan*), Tokyo: Toyo Keizai Shinposha.

Toyo Keizai Shinposha, 1939. The 23rd Toyo Keizai Economic Yearbook (*Dai-23-kai Toyo Keizai Keizai Nenkan*), Tokyo: Toyo Keizai Shinposha.

Watanabe, Shingo, 2026. "The Hidden Driver of Japan's Interwar Depression: Farm Price Collapse and Redistribution," mimeo.

Working, Holbrook 1949. "The Theory of Price of Storage," The American Economic Review 39(6), 1254-1262.

Yamamoto, Taketoshi, 1981. The Newspaper Reader in Modern Japan (*Kindai Ninon no Shimbun Dokushaso*), Tokyo: Hosei University Press.

Table 1 Exchange Rate Policy Events

Date	Event	Articles on exchange rate policies	ΔUS$/Yen	Reference
June 12, 1922	Non-partisan cabinet formed, following the resignation of Takahashi's Seiyukai cabinet	Prime Minister and Finance Minister Korekiyo Takahashi publicly opposed the return to Gold (for example, at the Diet on February 6, as reported by the *Osaka Asahi Shimbun* on February 7). The Takahashi cabinet submitted its resignation on June 6 due to internal discord, followed by a launch of the non-partisan cabinet on the 12th. Between the dates, expectations for the return to Gold intensified. On the 11th, *Naigai Shogyo Shimpo* reported "The debate over the return Gold, which had been dormant for some time, has resurfaced following the recent collapse of the Takahashi cabinet."	+0.26% (Jun. 10-13)	Bank of Japan 1983, p.142, Miwa 2003, p.166
September 7, 1922	Meeting of FM and businesses on the gold standard	On September 4, *Naigai Shogyo Shimpo* reported "According to reports attributed to Finance Minister Ichiki, the return to Gold is considered a matter of time and must be realized in the near future; however, there remains room for further study regarding the specific timing and the necessity of a prior announcement." On the 7th, Ichiki invited business leaders to hear their views on the return to Gold.	+0.78% (Sep. 2-8, Sun. on 3rd)	Bank of Japan 1983, p.142
December 5, 1923	De facto devaluation	While the government had kept a de facto dollar peg, the trade deficit triggered by the Great Kanto Earthquake in September caused a sharp depletion of gold reserves, forcing a sudden devaluation against the dollar on December 5. On the 7th, *Naigai Shogyo Shimpo* reported "The policy to peg the exchange rate against the US dollar collapsed." The policy change was described as a "sneak attack without notice" (*Osaka Mainichi Shimbun*, December 6).	-0.98% (Dec. 4-6)	Bank of Japan 1983, p.145
September 16, 1925	Relaxation of embargo against gold exports, following the formation of the single-party cabinet	The coalition cabinet including Seiyukai was broken because of disagreements on tax policy and the Kenseikai formed the single-party cabinet in August. The Ministry of Finance began to prepare for the return to Gold and, on September 16, announced gold reserve shipments abroad. On the 17th, *Naigai Shogyo Shimpo* reported "The ultimate goal is the return to Gold at the earliest possible date."	+1.23% (Sep. 15-17)	Miwa 2003, p.169
September 14, 1926	Kataoka appointed FM	Naoharu Kataoka of the Kenseikai was "unexpectedly" appointed Finance	+0.48% (Sep.	Bank of Japan 1983, p.149,

		Minister on September 14 (*Naigai Shogyo Shimpo* on 15th), following the death of his predecessor on the 13th. He was regarded as a figure capable of preparing the nation for the return to Gold (ibid.).	13-15)	Miwa 2003, p.169
April 20, 1927	Seiyukai cabinet formed and Takahashi appointed FM	The Kenseikai cabinet and Kataoka stepped down to take responsibility for the financial crisis. The Seiyukai cabinet was formed and Korekiyo Takahashi was appointed the finance minister on April 20. On the day, *Naigai Shogyo Shimpo* reported "Since the Seiyukai's stance is that the return to Gold is premature, many believe that not only will it not happen within this year, but it is also unlikely to occur in the near future."	-4.24% (Apr. 19-21)	Bank of Japan 1983, p.151, Miwa 2003, p.170
July 2, 1929	Minseito cabinet formed	The Seiyukai cabinet decided to step down on June 29, due to mounting criticism of its explanation regarding the military's involvement in the assassination of a Chinese warlord. On the 30th, *Naigai Shogyo Shimpo* reported "The Imperial mandate to form the cabinet would go to the Minseito" and "their goal is the return to Gold." On July 2, the Minseito cabinet was formed. Japan returned to Gold in January 1930.	+1.35% (Jun. 29 -Jul. 3)	Bank of Japan 1983, p.380
December 13, 1931	Seiyukai cabinet formed and Takahashi appointed FM	The Minseito cabinet decided to step down because of internal discord on possible coalition with Seiyukai on December 11. On the foreign exchange market of the day, *Naigai Shogyo Shimpo* reported "Yen plunge triggered by anticipation of the departure from Gold." (on the 12th). On the 13th, the Seiyukai cabinet was formed, Korekiyo Takahashi was appointed Finance Minister, and the departure was decided.	-16.36% (Dec. 10-14)	Bank of Japan 1983, p.511-513
December 2, 1932	Foreign exchange control hinted	The yen had declined massively since the inauguration of the Seiyukai cabinet and, on November 30, fell below 20 dollars per 100 yen. On the foreign exchange market of December 1, *Naigai Shogyo Shimpo* reported in the evening "The rate recovered slightly as markets awaited the government's action." On the 2nd, *Naigai Shogyo Shimpo* reported that Takahashi told "The government is fully determined to implement foreign exchange controls."	+0.65% (Nov. 30 -Dec.3)	Bank of Japan 1984, p.68, Miwa 2003, p.273-274

Note: The figures in parentheses below the exchange rate change indicate the window used for the calculation.

Table 2. Forecast Error Variance Decomposition

Horizon (months)	0	6	12	24	48	96
Exchange rate	0.6 (0.0,2.9)	42.7 (10.7,63.6)	60.0 (18.4,75.5)	65.0 (17.4,72.9)	61.3 (14.7,67.9)	55.5 (13.1,65.3)
Output	1.4 (0.0,5.3)	8.1 (1.2,20.3)	22.1 (3.1,40.6)	30.3 (3.7,46.4)	31.8 (3.7,46.0)	29.5 (3.1,45.5)
Exports	0.7 (0.0,3.0)	9.1 (0.9,22.6)	15.5 (1.4,33.6)	18.2 (1.5,36.6)	15.8 (1.5,33.2)	11.0 (1.3,30.8)
Imports	2.2 (0.2,5.4)	1.5 (0.9,6.9)	2.6 (1.89,11.3)	5.6 (2.6,17.1)	12.5 (3.5,25.0)	20.5 (3.5,32.3)
Price	0.8 (0.0,3.3)	4.5 (0.4,14.6)	18.6 (2.4,38.5)	34.2 (4.2,52.6)	33.9 (4.1,50.4)	34.2 (4.6,49.0)
Short-term interest rate	3.1 (0.0,10.0)	0.8 (0.3,6.2)	1.6 (0.4,12.1)	1.7 (0.7,15.2)	2.8 (1.1,19.0)	2.0 (1.4,20.3)
Real short-term interest rate	10.2 (0.1,34.7)	16.4 (2.9,32.0)	22.6 (4.5,36.5)	23.6 (5.5,36.7)	23.5 (5.6,36.5)	23.3 (5.9,36.3)

Note: The unit is percent. The forecast horizon is in months. Numbers in parenthesis represent the 5th and 95th percentile confidence intervals generated by bootstrap with 2,000 draws.

Table 3. Contribution of Exchange Rate Shocks to Macroeconomic Fluctuations

	Exchange rate	Output	Exports	Imports	Price	Short-term interest rate
$\frac{\sigma^2_{x,Exchange\ rate\ shock}}{\sigma^2_{x,Actual\ data}}$	49.0	14.5	13.0	7.8	22.3	7.2

Note: The ratio of the variance of data driven only by exchange rate shocks to that of actual data. The data are deviations from trend extracted by HP-filter. The unit is percent.

Figure 1 Recovery from Interwar Depressions

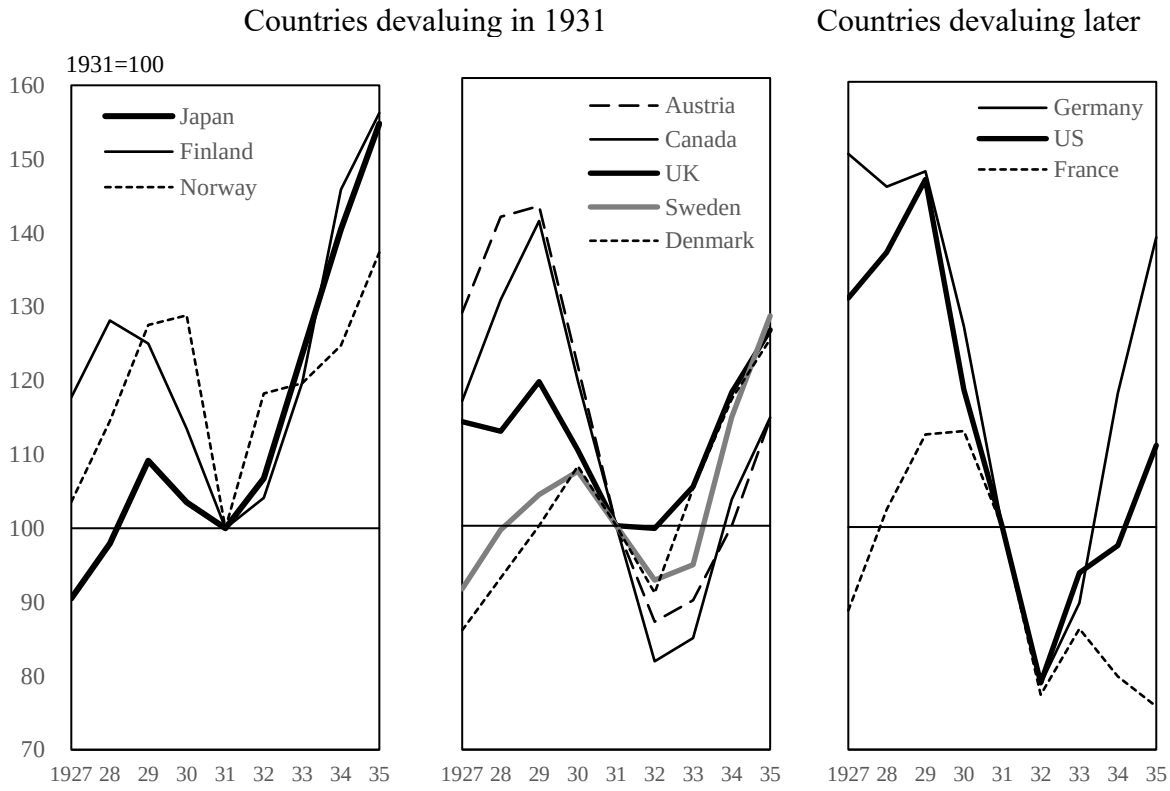
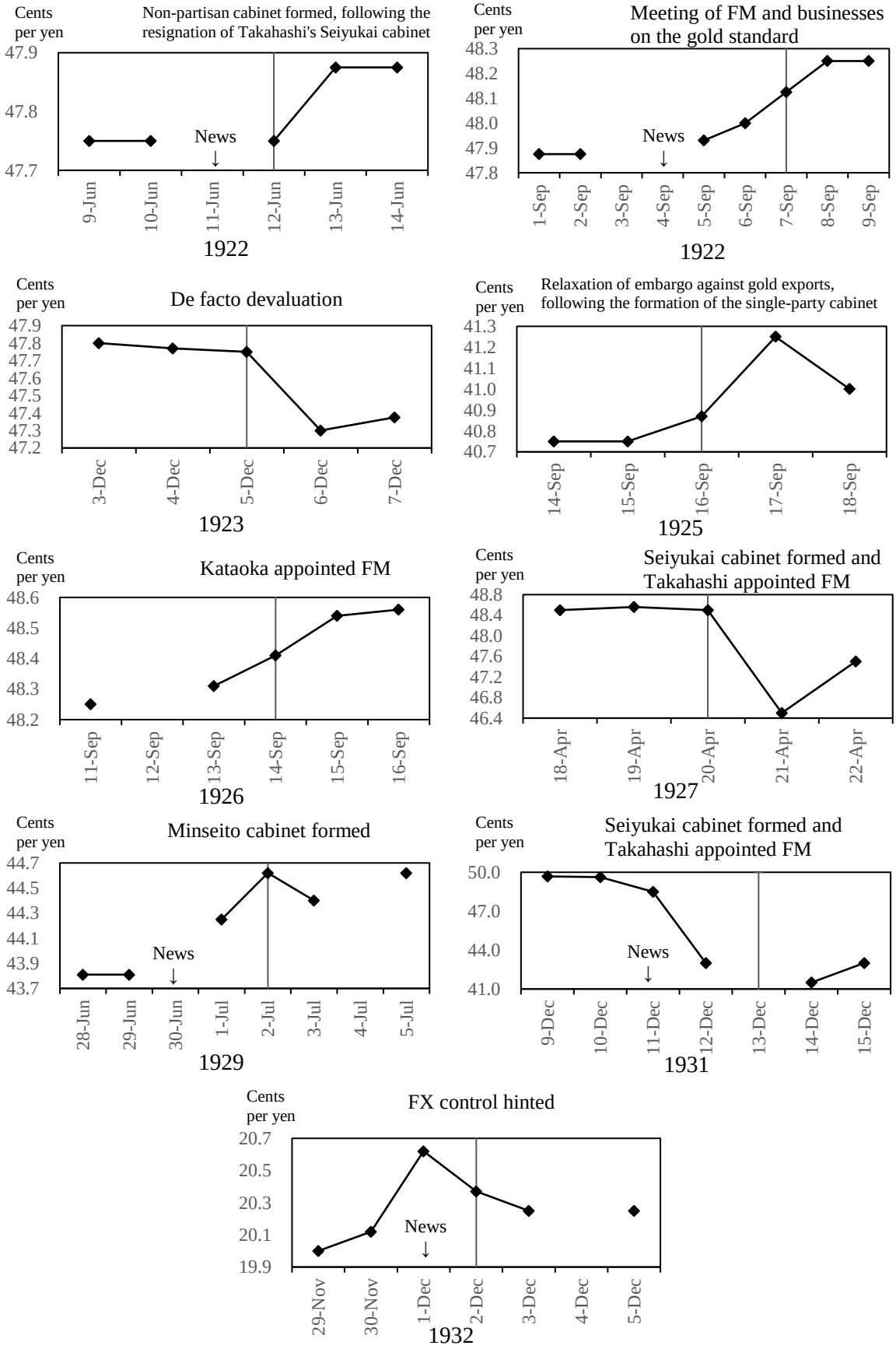


Figure 2 Daily Exchange Rates around Exchange Rate Events



Note: “News” indicate the timing of advance articles concerning exchange rate policy changes, where applicable.

Figure 3 Monthly Exchange Rates

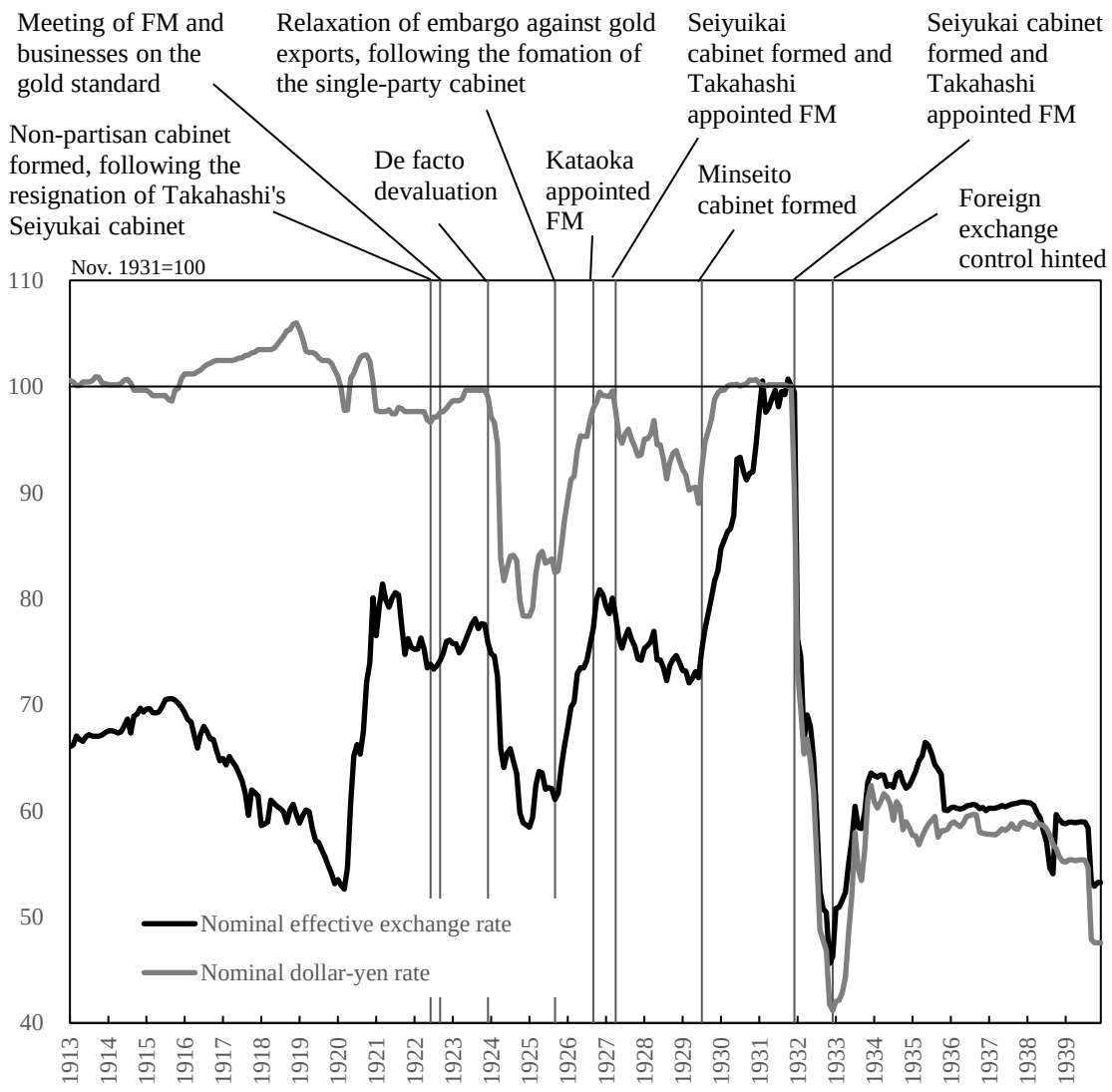
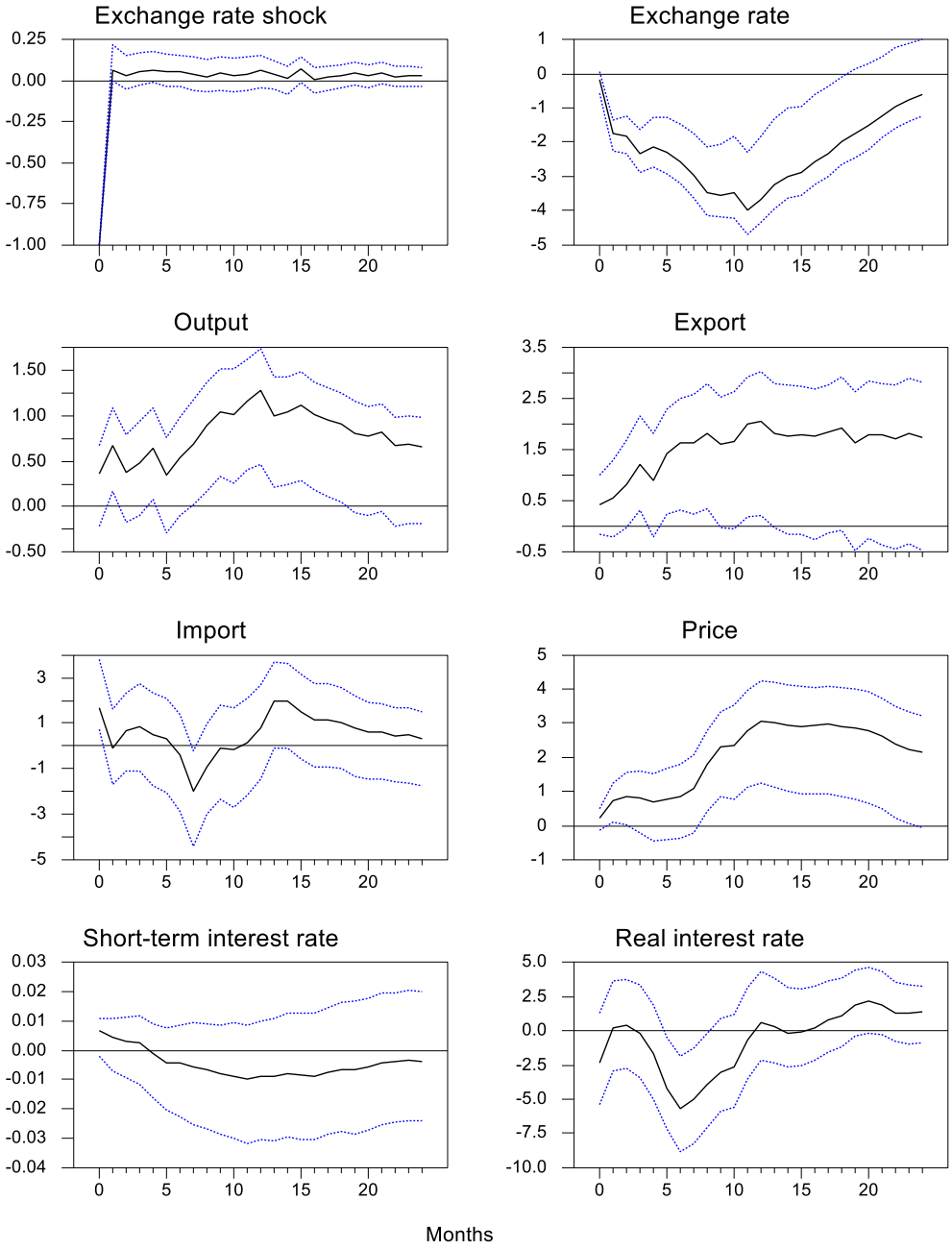
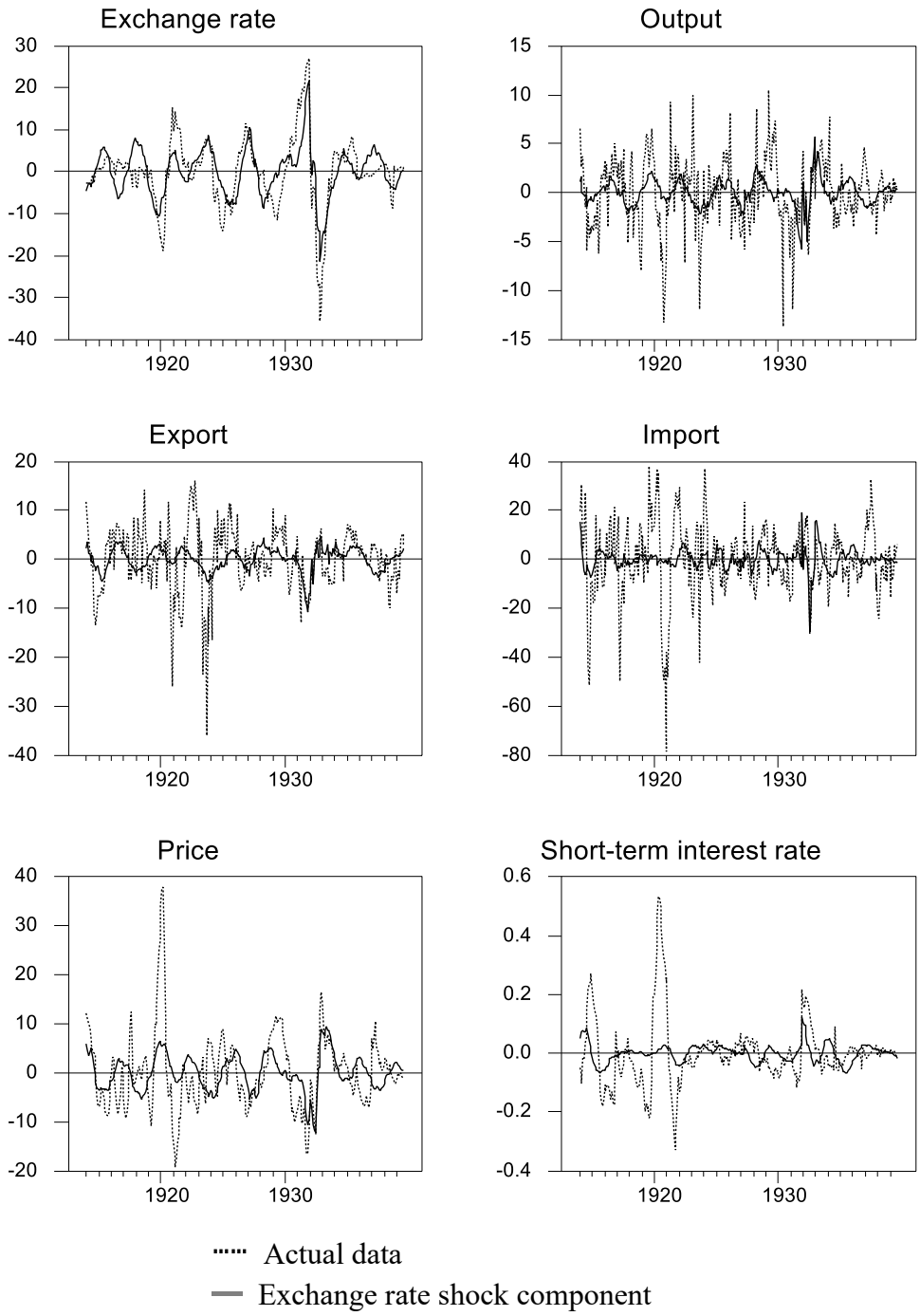


Figure 4 Exchange Rate Shock



Note: The unit of the vertical axis is percent. Dotted lines indicate the 5th and 95th percentile confidence intervals generated by bootstrap with 2,000 draws.

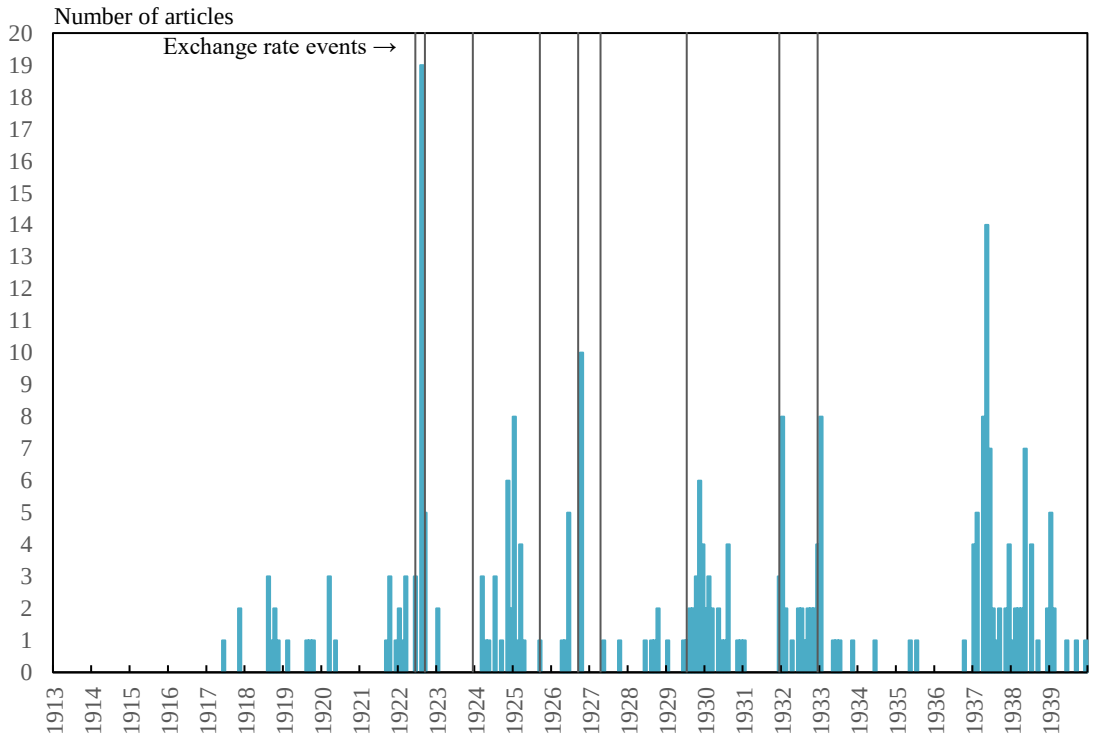
Figure 5 Contribution of Exchange Rate Shocks to Macroeconomic Fluctuations



Note: Dotted lines indicate data driven only by exchange rate shocks and solid lines indicate actual data. The data are deviations from trend extracted by HP-filter. The unit is percent.

Figure 6 News Coverage

Articles with words for prices and exchange rates or regimes in titles or keywords



Articles with words for price movements in titles

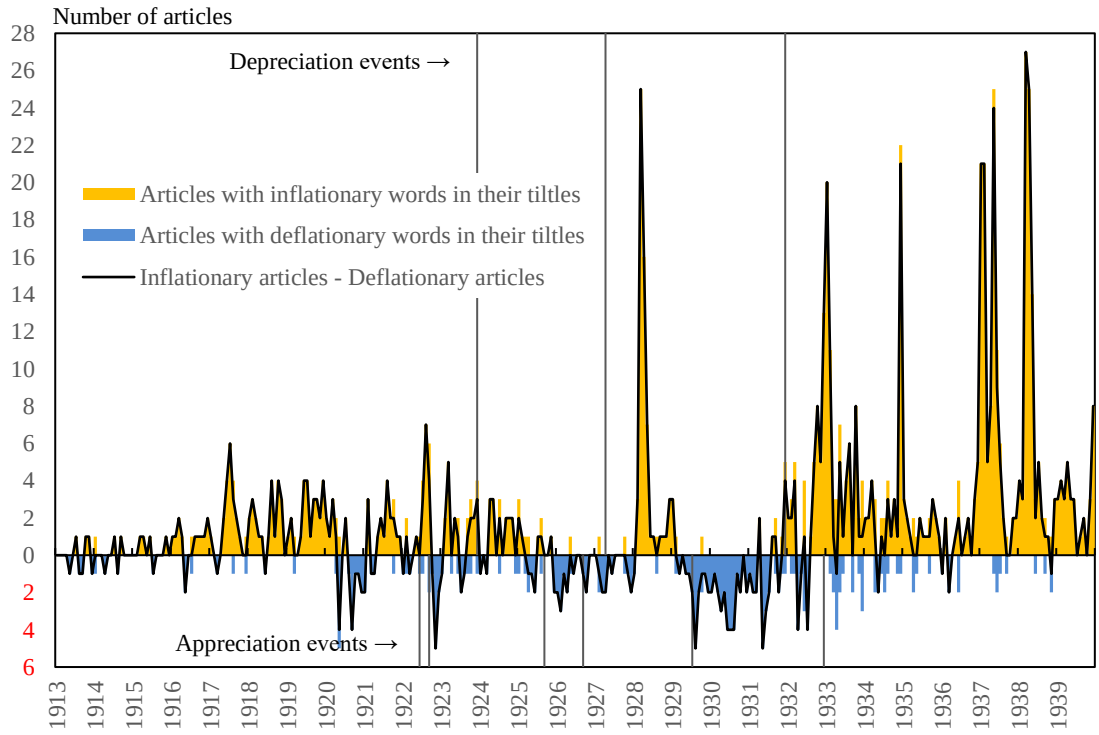


Figure 7 Impulse Responses to Exchange Rate Shocks

Note: The responses of the net count and sake shipments are those to a 1-percent depreciation shock and the response of the number of articles with price and exchange rate words is that to a 1-percent absolute value shock. Dotted lines indicate the 5th and 95th percentile confidence intervals generated by bootstrap with 2,000 draws.

Figure 8 Economic Developments during Japan's Interwar Depression

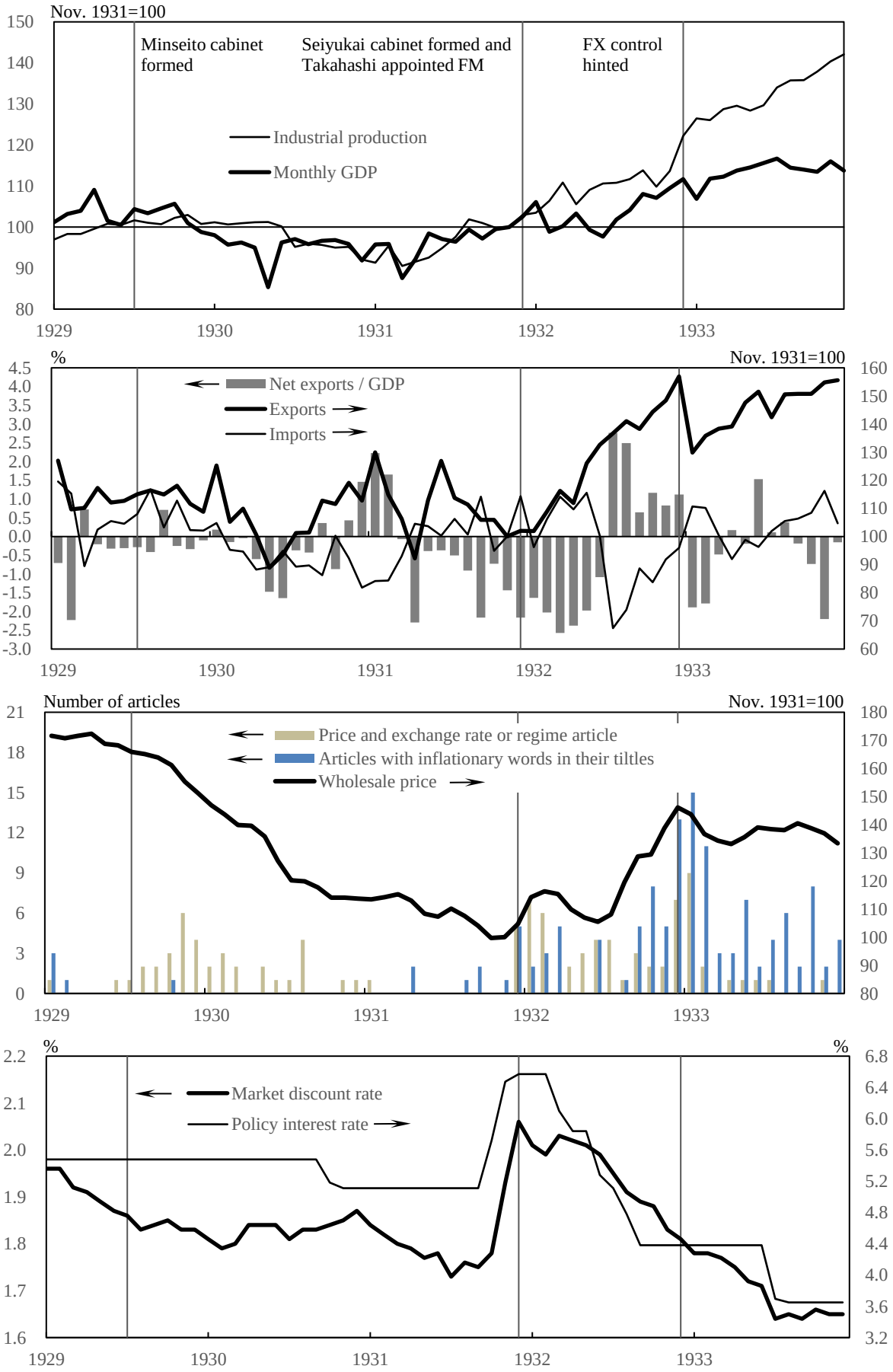
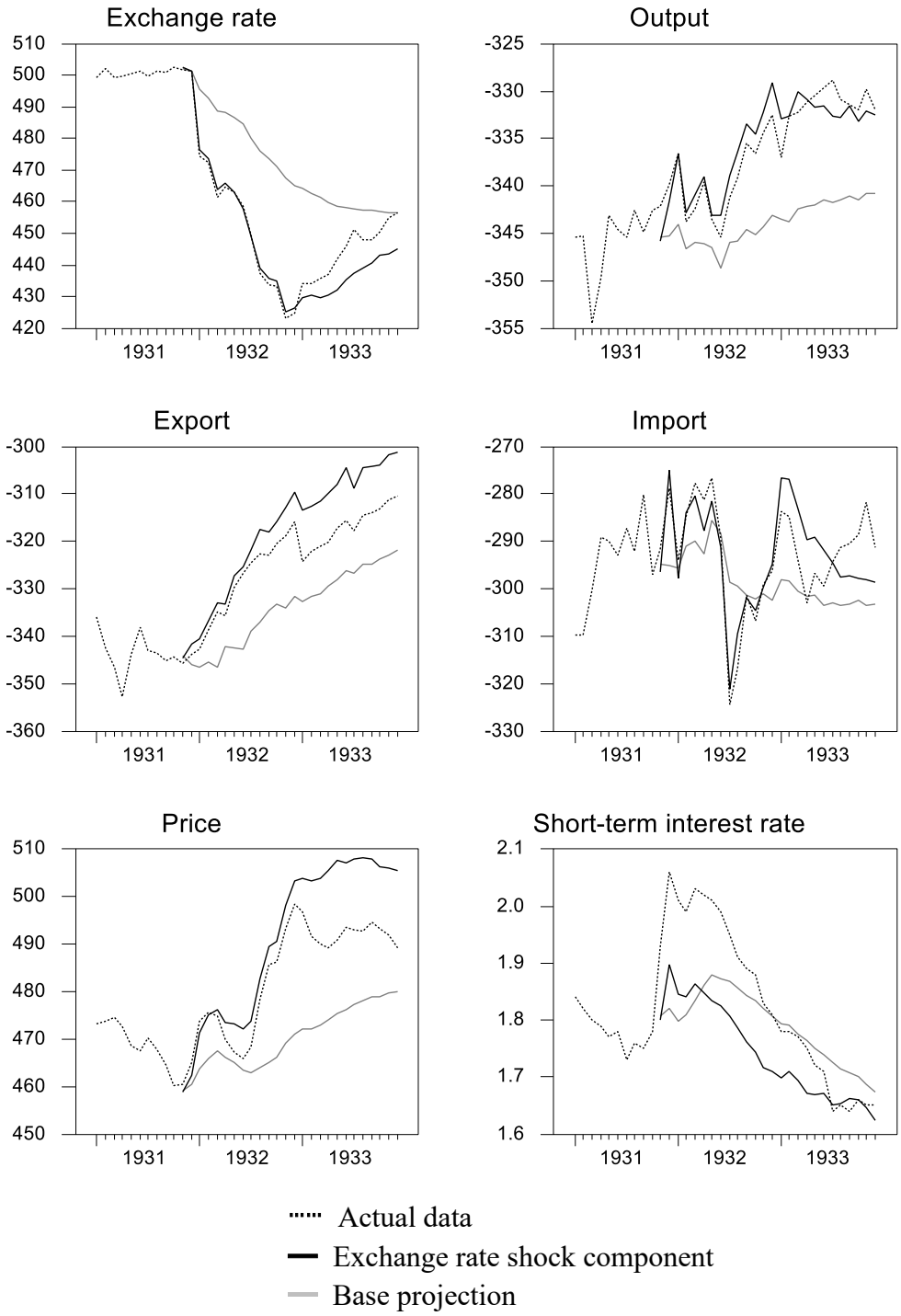


Figure 9 Contribution of Exchange Rate Shocks to Japan's Recovery from the Depression



Note: The unit is log levels multiplied by 100.

Figure 10 Expected Price Increase

Department store, December 15, Tokyo Nichinichi Shimbun

Jewelry and watch shop, December 16, Tokyo Nichinichi Shimbun

Note: English translations are provided for keywords corresponding to the intertemporal substitution mechanism.

APPENDIX

A. Words for Article Counts

Exchange rate or regime words: *kawase* (exchange), *en-yasu* (weak yen), *en-daka* (strong yen), *en-bouraku* (plummeting yen), *en-boutou* (skyrocketing yen), *kin-hon-i* (the gold standard), *kaikin* (removal of an embargo), and *saikin* (re-banning).

Inflationary words: *toki* (appreciation), *yakuto* (jump), *josho* (rise), *koto* (sharp rise), *zento* (gradual rise), *boto* (skyrocketing), *kyuto* (sudden surge), *honto* (rocketing), *agatta* (rose), *taka* (high), *noboru* (ascend), *tosei* (upward momentum), *kyocho* (strong), *sakidaka* (bullish outlook), and *sokushin* (acceleration).

Deflationary words: *gekiraku* (plummeting), *teiraku* (fall), *teika* (drop), *kudaru* (descend), *zokuraku* (continued fall), *kyuraku* (sudden plunge), and *hanraku* (pullback).

B. Data

Exchange rate: Daily data are from New York Times. Monthly data since September 1926 are market rates in New York and London for the dollar and the pound respectively, which were reported in annual publications of Toyo Keizai Shinposha's *Keizai Nenkan* (economic year book), and telegraphic transfer selling rates quoted by the Yokohama Specie Bank for the other currencies. Those rates are linked to rates for demand draft, which was a bill of exchange paid in the foreign currency upon presentation at the place of payment. The latter two rate series is from the website of the Institute for Monetary and Economic Studies of the Bank of Japan. Trade weights for computing the effective rates are from Table 117, p.290-297, of Bank of Japan (1966).

Export and import: For VAR analysis, annual data for commodity exports and imports from Table A28 and A29, p.323-330 of Ohkawa and Shinohara (1979) are interpolated by monthly export and import quantity indices of Kobe University of Commerce from Table 21-3 and 21-4, p.394-397, of Fujino and Igarashi (1973), linked to the Yokohama Specie Bank indices reported in the Toyo Keizai Shinposha (1940), p.235, in May 1938. The monthly data are seasonally adjusted by X-12-ARIMA. For a description of the recovery from the depression, the seasonally adjusted monthly series are used. Monthly net exports relative to nominal gross domestic output are computed by using nominal export and import data of Kobe University of Commerce from Table 21-1 and 21-2, p.3904-393, of Fujino and Igarashi (1973), seasonally adjusted by this paper. The monthly nominal gross domestic product series is computed by using the real series explained below and the deflator series obtained by interpolating annual deflator series computed by using nominal and real gross domestic product series from Table 2, p.276, of Fukao, Nakamura, and Nakabayashi (2017a) and Table 2, p.282, of Fukao, Nakamura, and Nakabayashi (2017b) with this paper's monthly wholesale price series explained below.

Monthly gross domestic product: Annual series from Table 2, p.276, of Fukao, Nakamura, and Nakabayashi (2017a) and Table 2, p.282, of Fukao, Nakamura, and Nakabayashi (2017b) is interpolated by the monthly series of the freight volume of national railways, the passenger number of national railways, cotton yarn production, raw silk shipment volume, and rice trading volume from Table 21-26, 21-27,21-31,21-32, and 21-33, p. 440-443 and 450-455, of Fujino and Igarashi (1973). The interpolated series is seasonally adjusted by X-12-ARIMA. The share of total gross output of the five specific sectors are computed by using data for national railway revenue (Table 1, p.174-177, of Minami 1965), cotton yarn production, raw silk production (both from Table 14, p.188-189, of Shinohara 1972), and rice production (Table 1, p.146-147, Umemura et al 1966), data for gross output in the agriculture, forestry, and fishery sector (Table 15, p.209, of Ohkawa et al 1974), the mining sector , the construction sector (both from Table 16, p.210, of Ohkawa et al 1974), the manufacturing sector (Table 17, p.211-212,

of Ohkawa et al 1974), the railway sector, and the electric sector (both from Table 1, p.174-177, of Minami 1965), and data for net domestic product of the whole economy excluding imputed rents and of services (Table 9, p.202, of Ohkawa et al 1974).

Industrial production: Annual data for international comparisons are from Table 106, p.164, of the League of Nations (1937) and Table 110, p.176, of the League of Nations (1938). Data for Sweden in 1927-28 are from Table D1, p.421-426, of Mitchell (2003). Monthly data for Japan are from Table 6, p.8, of Toyo Keizai Shinposha (1937) and Toyo Keizai Shinposha (1939), p.4. The data are seasonally adjusted by X-12-ARIMA.

Market discount rate: The Institute for Commercial Research, the Kobe University of Commerce (1935), p.162-163, and the Institute for Commercial Research, the Kobe University of Commerce (1938), p.119.

Population equal to or above 15 years old: Fukao, Makino, and Settsu (2019).

Sake shipment: Annual publications of the Statistical Yearbook of the Taxation Bureau, Ministry of Finance. Data for domestic consumption, exports, and imports of sake are from Table 58, p.208, of Shinohara (1967). The consumption share is computed by using total consumption data minus imputed rent data, each from Table 1, p.132-135, and Table 86, p.234-235, of Shinohara (1967). The correlation is computed with the real consumption series from Table 18, p.213, of Ohkawa et al (1974). The consumption share in 1925 is computed by using data from annual results of the Family Income and Expenditure Survey by the Statistics Bureau of Japan.

Wholesale prices: From January 1931, Tokyo whole sale price index (1933 base). The index is linked to the series constructed by weighting the individual item series of Tokyo whole sale price index (1900 base) with Ohkawa et al's (1967) 1919-1921 weights for annual manufacturing product prices (Table 16, p.201-203). Tokyo whole sale price indices are from the website of the Institute for Monetary and Economic Studies of the Bank of Japan.

REFERENCE

Bank of Japan, 1966. Hundred-Year Statistics of the Japanese Economy. Tokyo: Bank of Japan.

Institute for Commercial Research, the Kobe University of Commerce, 1935. The Tenth Annual Bulletin of the Financial and Economic Statistics of Nippon. Osaka Hobunkan: Osaka.

Fukao, Kyoji, Tatsuji Makino, and Tokihiko Settsu, 2019. "Structural Change, Capital Deepening, and TFP Growth in Japan: 1885-1970," Discussion Paper Series A No.692, Institute of Economic Research, Hitotsubashi University.

Fukao, Kyoji, Naofumi Nakamura, and Masaki Nakabayashi, 2017a. A History of Japanese Economy 3 (*Nihon Keizai no Rekishi 3)*, Tokyo: Iwanami Shoten.

Fukao, Kyoji, Naofumi Nakamura, and Masaki Nakabayashi, 2017b. A History of Japanese Economy 4 (*Nihon Keizai no Rekishi 4)*, Tokyo: Iwanami Shoten.

Institute for Commercial Research, the Kobe University of Commerce, 1938. The Eleventh Annual Bulletin of the Financial and Economic Statistics of Nippon. Osaka Hobunkan: Osaka.

League of Nations, 1937. Statistical Year-Book of the League of Nations 1936/37. Geneva.

League of Nations, 1938. Statistical Year-Book of the League of Nations 1937/38. Geneva.

Minami, Ryoshin, 1965. *Estimates of Long-Term Economic Statistics of Japan since 1868, 12, Railroads and Electric Utilities*, Tokyo: Toyo Keizai Shinposha.

Mitchell, B. R., 2003. International historical statistics, Europe, 1750-2000. New York: Palgrave Macmillan.

Ohkawa, Kazushi, Tsutomu Noda, Nobukiyo Takamatsu, Saburo Yamada, Minoru Kumazaki, Yuichi Shionoya, and Ryoshin Minami, 1967. *Estimates of Long-Term Economic Statistics of*

Japan since 1868, 8, Prices, Tokyo: Toyo Keizai Shinposha.

Ohkawa, Kazushi and Miyohei Shinohara, 1979. *Patterns of Japanese Economic Development, A Quantitative Appraisal*, New Heaven and London: Yale University Press.

Ohkawa, Kazushi, Nobukiyo Takamatsu, and Yuzo Yamamoto, 1974. *Estimates of Long-Term Economic Statistics of Japan since 1868, 1, National Income*, Tokyo: Toyo Keizai Shinposha.

Shinohara, Miyohei, 1967. *Estimates of Long-Term Economic Statistics of Japan since 1868, 6, Consumption*, Tokyo: Toyo Keizai Shinposha.

Shinohara, Miyohei, 1972. *Estimates of Long-Term Economic Statistics of Japan since 1868, 10, Mining and Manufacturing*, Tokyo: Toyo Keizai Shinposha.

Toyo Keizai Shinposha, 1937. The 21st Toyo Keizai Economic Yearbook (*Dai-21-kai Toyo Keizai Keizai Nenkan*), Tokyo: Toyo Keizai Shinposha.

Toyo Keizai Shinposha, 1939. The 23rd Toyo Keizai Economic Yearbook (*Dai-23-kai Toyo Keizai Keizai Nenkan*), Tokyo: Toyo Keizai Shinposha.

Toyo Keizai Shinposha, 1940. The 24th Toyo Keizai Economic Yearbook (*Dai-24-kai Toyo Keizai Keizai Nenkan*), Tokyo: Toyo Keizai Shinposha.

Umemura, Mataji, Saburo Yamada, Yujiro Hayami, Nobukiyo Takamatsu, and Minoru Kumazaki, 1966. *Estimates of Long-Term Economic Statistics of Japan since 1868, 9, Agriculture and Forestry*, Tokyo: Toyo Keizai Shinposha.