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Black Market Prices during World War II in Japan: An Estimate Using the Hedonic Approach

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Abstract

This paper constructs a time series of data related to black-market prices of five goods (rice, sweet potatoes, potatoes, chicken eggs and sugar) during World War II (WWII) in Japan. It is the first attempt to capture the actual price fluctuation trends for individual products throughout the period during and after WWII. To this end, I have employed the hedonic approach, which is a methodology used to adjust for the quality of goods including the characteristics of counterparties and places of transaction in constructing the price data, to obtain estimates that are as unbiased as possible. The data reveals that 1) black-market prices of these goods soared during WWII to post 40-80 percent inflation on a quarterly basis toward the end of the war, 2) by the end of the war, black-market prices had already increased by over 50 times (in the case of sweet potatoes) or 700 times (in the case of sugar) compared with 1934 levels, prior to wartime inflation, indicating more severe inflation during the war than after the war, 3) the most severe period of inflation varied by product, peaking during the war for rice and sugar and after the war for sweet potatoes, potatoes and chicken eggs, and 4) black-market prices were generally higher in urban areas than in rural areas.

Keywords: Price Formation; Black Markets; World War II; Hedonic Approach; Economic Controls

JEL classification: E31, N15, N45

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1. Introduction

This paper derives data related to the black-market prices of goods during World War II (WWII) in Japan. It is the first attempt to compile a dataset that enables us to explore the actual trend of prices of goods in free markets during and immediately after the war.

During and after WWII, the Japanese economy experienced its worst inflation in modern history. The official retail price index based on the unit of average prices during 1934-1936 recorded 243.4 in 1949.[1] To deal with the price hike, the government imposed direct control measures on the distribution processes and prices both during and after the war. However, the measures were quite ineffective in terms of achieving their objectives. As time went by, goods distributed via formal routes became increasingly scarce, and most consumers in urban areas bought their daily necessities in the black markets. In the end, even the government had to purchase goods in the black markets for substantially higher than the official prices.[2]

Although the official price index, which comprised official prices in the formal distribution routes, showed higher inflation after the war than during the war, the figures did not represent the actual trend.[3] Since most commercial transactions were executed not in the formal markets but in the black markets, we need to know prices in the black markets to look at actual trends in the prices of goods.

In September 1945, the Bank of Japan (BOJ) started collecting real-time data of the Tokyo black-market prices of 50 items, including food items, clothes and other daily necessities. It conducted an extensive survey with brokers/retailers in the black markets every month. It published index numbers of the prices of each item in the black-market compared to their official prices as of September 1945. As for raw data, the BOJ Archives hold original survey documents containing raw prices in the black markets.[4]

After the war ended, brokers, who had conducted transactions covertly during the war,

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[1] The Bank of Japan (1986), p.438. The second worst inflation occurred after the opening of the treaty ports in 1859 through Meiji Restoration in 1868. During that period, a price index constructed by Shinbo (1978) showed 8 times as high in 1867 as of the average prices in 1854-1856 in silver denomination, substantially lower than that during and after WWII. Shinbo (1978), p.247, p.282.

[2] Ministry of Finance (1956), p.355, pp.371-377; Nishida (2002), pp.9-23.

[3] The official price index (unit of average prices in 1934-1936) was 2.098 in 1944, or +12.0 percent increase from the previous year; 3.084 in 1945, or +47.0 percent increase from the previous year; 18.9 in 1946, or 6.2 times of the previous year; 50.99 in 1947, or 2.7 times of the previous year; 149.6 in 1948, or 2.9 times of the previous year.

[4] For time series index data, please see Statistics Department of the Bank of Japan (various issues). For raw data, please see the Research and Statistics Department's "Prices of consumer goods in the black and free markets," BOJ Archive No. 11524. According to Ministry of Finance (1978), the BOJ compiled data based on reports by 150 employees engaged in research on foot in addition to regular reports from 25 designated brokers. Representative data for each item was derived based on all collected data. The survey date was the 15th day of each month. Ministry of Finance (1978), pp.64-65.

emerged and opened shops on the streets of cities, without fear of arrest and harsh punishment.[5]

Data availability during the war was limited compared with the post-war period because admitting to black-market transactions was a crime against the national goal of war, and participants in such transactions had good reason to hide the fact from the authorities. As a result, records of such transactions quickly disappeared, and even in cases where some evidence was left, it was often piecemeal.

As of the current time, the most comprehensive dataset of black-market prices during the war is a report of prices by item in the United States Strategic Bombing Survey (USSBS; 1946).[6] The report says that the BOJ provided raw data but offers no description of the methodology. Also, the National Agricultural Association (NAA: *Zenkoku Nogyo Kai*) researched the purchase of materials by farmers from July 1943 to December 1947 and published "A Study on Black-Market Prices in Agricultural Villages" (*Noson Yami Bukka ni kansuru Chosa*) in 1948.[7] However, the NAA data pertained to rural areas by nature, not urban areas where the main black markets were located.

Another source of data, which is more relevant to our interest, could be a survey by the Central Committee for Cooperation in Price Control (CCCPC: *Chuo Bukka Tosei Kyoryoku Kaigi*). The CCCPC was established in 1940 by the Ministry of Agriculture, Forestry and Fisheries and existed until February 1946 to research and study distribution, prices and other related issues concerning materials controlled by the ministry. The CCCPC conducted a survey (the CCCPC survey, hereafter) on the black-market prices of daily necessities from October 1943 to June 1945 in cooperation with other organizations such as women's associations. Though the data was scattered in time and space, it includes prices and quantities, the characteristics of the participants (sellers and buyers), the places of transaction, and the corresponding official prices of individual transactions. Though the existence of the survey had been known and Morita (1963) provided a brief glimpse into some data from it, the data provided by Morita has not been fully integrated with the existing postwar black-market data compiled by the BOJ. Detailed data of individual transactions was discovered when Mr. Narikazu Seki, a former CCCPC official, provided the original documents to Takafusa Nakamura, a statistician and economic historian. Nakamura and his colleague, Toshiyuki Mizoguchi, published them with the

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[5] Hatsuda (2011), pp.83-131; Ishigure and Aoi (2013), pp.2629-2630; Nishida (2002), pp.23-24.

[6] USSBS (1946), p.225. It reports formal and black-market prices of 42 items in December 1943, March, June, September, and November 1944, and March, June, July and November 1945. Apart from USSBS (1946), Morita (1963) estimated indexes for "actual wholesale" and "actual retail" prices for 1936-1944 in terms of the unit of average prices in 1936. However, Morita's indexes, rather than being derived from empirical research on individual transactions of goods, were hypothetical indexes assuming the quantity theory of money. The "actual wholesale price index" was calculated using the nominal value of total annual transactions of bills of exchange divided by the number of transactions of bills of exchange, and the "actual retail price index" was calculated using the nominal value of cash transactions divided by the number of such transactions.

[7] The NAA was an entity for controlling agricultural activities based on the government's guidelines.

permission of Mr. Seki, the owner of the original documents.[8]

To date, there have been very few empirical studies of black markets, perhaps due to the paucity of available data.

In the case of the United States, Rockoff (1981, 1984) argues that extensive black markets existed during WWII, imposing a cost on the whole economy. However, he notes that the size and extent of black markets are yet to be explored due to a scarcity of statistical records of black-market transactions.[9]

In the case of Japan, Hara (1995) argues that the supply of food was essential even during wartime, and that "the Japanese government lowered people's living standards to the extreme during WWII," including in terms of the supply of food, compared with other countries at that time. He concludes that the Japanese government sacrificed people's lives in order to continue the long war from 1937 to 1945.[10]

Kase (1995) explores the effectiveness of controls on food supply mainly from a quantitative point of view. He shows that 1) the effectiveness of controls varied substantially based on the nature of the goods (especially the storability of goods), 2) the "self consumption" allowance for producers, intended to maintain the motivation for production, ended up encouraging black-market transactions by giving producers the opportunity to sell their products on the sly, 3) as production decreased further during the last stage of the war, the quantity of goods flowing into urban areas fell to a greater extent than the quantity of "self-consumed" goods, which included goods sold in the black markets, leading to vacuums in food supply in urban areas.[11]

Koike (2018) makes a new estimate of household consumption data during the 1940s and concludes that consumption in 1945 dropped to around 45 percent of 1940, i.e., to similar levels as during the early Meiji period (late 19th century), in real terms, adjusting for price fluctuations. He also claims that the level of consumption fell to 30 percent of 1940 in urban areas, where severe shortages of materials and rampant inflation emerged, while consumption in rural areas also fell to 60-70 percent of 1940, despite the self-consumption allowance given to producers.

In his recent works, Yamazaki (2011) looks at the emergence and transformation of the national mobilization system from the outbreak of total war with China in 1937 through the end of WWII in 1945. He works through primary sources and shows that market and planned economies co-existed and changed along with changes in the external conditions of Japan. Yamazaki (2016) focuses on the period of the Pacific War (1941-1945) and explores the government's Goods Mobilization Plans and their outcomes in detail. He finds that the Greater East Asia Co-prosperity Sphere, established under Japanese leadership, was doomed to collapse due to the deteriorated conditions of wartime.

[8] Nakamura and Mizoguchi (1994), p.3.
[9] Rockoff (1981), p.397; Rockoff (1984), p.10, pp.238-240.
[10] Hara (1995), p.20.
[11] Kase (1995), pp.283-297.

These works by Yamazaki mainly focus on the production side centered on the industrial sector and the distribution side centered on maritime transportation.

Huff and Majima (2013) analyze extraction of physical resources from territories of Japanese occupation during WWII and conclude that Japan failed to absorb resources from these areas mainly due to the lack of transportation. At the same time, they observed that, though the Japanese occupational administrations printed massive volumes of unconvertible paper money, hyperinflation was largely under control due to transaction demand for money and strict monetary control by the Japanese administrations.

Bahmani-Oskooee and Goswami (2006) explore the relationship between military spending and black-market premiums in the foreign exchange market and the deviation of black-market exchange rates from official exchange rates during the 1985-1998 period in 61 developing countries. They conclude that higher military spending led to high black-market premiums.

In light of difficulties preventing previous studies from conducting thorough empirical research, this paper intends to provide a basis for investigating the reality of the distribution of daily necessities through black markets, thereby the production and consumption of these goods associated with massive demand for military use and the deterioration of the national industrial production and transportation systems.

In this paper, I construct data related to the black-market prices of goods during WWII by compiling price data from individual transactions, which are connectable to the existing black-market price data compiled by the BOJ. To this end, I estimated a new series of black-market prices of individual goods from the archives of the CCCPC. The data is comparable with black-market price data after WWII, which was compiled by the BOJ. By doing the above, I will obtain time series data that will, for the first time, enable us to analyze the actual price trends both during and after the war. At the same time, I intend to obtain less biased data by using the hedonic approach, which is commonly used for adjusting the quality of commodities. This will allow us to adjust for various factors such as the characteristics of the participants in the transactions and the location of the transactions.

I choose five goods: rice, sweet potatoes, potatoes, chicken eggs, and sugar, for which the CCCPC survey contains a sufficient number of samples to estimate data with statistical significance.

The data indicates that 1) price inflation during WWII accelerated to the extent of a 40-80 percent increase on a quarterly basis toward the end of the war, 2) the most severe period of inflation was different for different sets of products, with rice and sugar inflation being the most severe during the war, and inflation in the prices of sweet potatoes, potatoes, and chicken eggs being most severe after the war, 3) around the end of the war, price levels were 700 times (for sugar) or 50 times (for sweet potato) higher than those in 1934, indicating that the degree of increase in price was larger during the war than after, 4) prices were generally higher in urban areas than in rural areas.

The structure of the rest of this paper is as follows: Section 2 discusses the grounds for using

the hedonic approach for estimating the prices of goods during WWII. Section 3 describes the details of the data and methodology used to estimate individual goods prices. Section 4 reports the estimation results. Section 5 discusses the realities of black-market transactions during WWII based on our estimation results as well as other existing research and contemporary documents. Section 6 concludes.

2. The Grounds for Using the Hedonic Approach for Estimating the Prices of Goods during WWII

The hedonic approach is a method of adjusting the quality of goods and/or services when an observer estimates the prices of such items from individual transactions. In general, participants in transactions evaluate the quality of items subjectively. When an observer employs the hedonic approach, he/she assumes that the prices reflect the participants' subjective evaluation of the various characteristics of the items, which represents their quality. He/she employs regression analysis of observed prices as the dependent variable, with independent variables representing various characteristics that may affect the quality of traded items, a constant, and the error term.[12]

The original price data I use in this paper are prices that sellers and buyers agreed on for individual transactions, not prices presented at windows of shops. At each transaction, prices may have varied based on buyer and seller characteristics, place of transaction, and other aspects of the transaction even if the physical features were the same. Standard assumed retail prices were the ones offered at retail shops near the consumption site. On the one hand, if the seller and the buyer knew each other, and/or the buyer traveled to the production site to buy the item so that transportation costs and the risk of prosecution were borne by the buyer, the prices could be lower than ordinary retail prices. On the other hand, if the buyer faced constraints such as an urgent need for a given item or difficulty finding another opportunity, he/she may have had to yield to the seller's demands and buy at a premium. We need to adjust for such biases not only in terms of the physical characteristics of items but also in terms of the features of a transaction that may affect pricing of each item.[13]

It is more important to use the hedonic approach to adjust for such non-physical aspects of transactions for wartime than for peacetime. This is because, during wars, there are more severe constraints on transportation and larger information asymmetry, which may widen price variations resulting from non-physical aspects of transactions. When prices are presented in a public space, as in the case of the post-war black markets, buyers are able to compare prices of items in the same category, causing them to converge more easily. During war, however, buyers and sellers are most likely to meet and trade in secret places and even items in the same category may see greater price variance than in peacetime.[14]

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[12] See Shiratsuka (1995) for a detailed explanation of the hedonic approach.

[13] There is a possibility of differences in physical quality, especially due to the supply shortage under deteriorating war conditions. However, we are not able to adjust for such differences due to the lack of information.

[14] As for postwar black-market prices, prices presented at shop windows may have differed from

3. Details of the Data and Methodology Used to Estimate Black-Market Prices Based on the Hedonic Approach

(1) Details of the Data

The CCCPC report, the original source of our data, contains 549 transactions of 21 items that were in same categories as postwar black-market statistics. I selected 5 items – rice, sweet potatoes, potatoes, chicken eggs, and sugar – which had more than 50 samples and were easily connectable in terms of the unit of transaction for our estimation. These items assured a degree of freedom in the regression equal to or more than 40 (Table 1).

[Table 1]

The source has data for ten months: October, November and December 1943, January, February, March, July, August and September 1944, and June 1955. The number of samples varies by month from 1 to 33.[15] I compiled monthly data into quarterly data in order to obtain data for the fourth quarter of 1943, the first and third quarters of 1944, and the second quarter of 1945 (Table 2).[16]

[Table 2]

(2) The Estimation Methodology Based on the Hedonic Approach

I set the fourth quarter of 1943 as the base period and estimated coefficients of dummy variables for the later periods for each product. I used control variables of dummies for the seller, buyer, place of transaction, and statistical source. I also included a log-transformed unit of transaction. For seller dummies, I set the producer as the base and used dummies for broker, retailer and acquainted person.[17]

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actual transaction prices. In this regard, our data does not contain such biases because we use actual transaction prices.

[15] The numbers of samples are one for sweet potato in January and July 1944, for potato from December 1943 to March 1944, and for sugar in January 1944. That is 33 for sweet potato in September 1944. There is no data for sweet potato in June 1945.

[16] The data for the second quarter of 1945 is compiled solely from the data for June 1945.

[17] I used prices at which producers sold directly to consumers as consumer prices though I noticed that standard consumer prices in peacetime were prices presented at retailer windows. I chose unconventional data because I recognized that, as the war caused commercial activity to deteriorate, most city residents were not able to buy the daily necessities in retail shops and increasingly depended on purchasing directly from producers. Though it was difficult to capture the exact share of these direct purchases, there was a lot of evidence pointing to city residents' heavy dependence on direct purchases. For example, a study done on the criminal aspects of the reason for Japan losing the war reported, "Consumers traveled to the suburbs to seek daily necessities and bought them at black-market prices in general; residents in big cities could no longer live without black markets" (Kikuchi 1947). Criminal statistics estimated the number of daily travelers to South Saitama, an

For buyer dummies, I set the consumer as the base and used dummies for farmer, broker, and retailer. For the place of transaction dummy, I set consumption site as the base and used a dummy for places other than consumption sites, presumably production sites. For the dummy for statistical source, I set data collected directly by the CCCPC as the base and used a dummy for data collected by women's associations. For the unit of transaction, I set one *sho* for rice, one *kan* for sweet potatoes, potatoes and sugar, and one chicken egg as the base units of transaction, and included variables with different units of transaction by transforming the numbers into the natural log-form.[18] Then, I got equation (1):

$$\mathrm{Ln}P_t = \alpha + \sum_{t=1}^{T} \beta_t \cdot D_t + \sum_{j=1}^{n} \gamma_j \cdot C_j + \varepsilon_{t,j} \qquad (1),$$

where α stands for the base price at time 0 (the fourth quarter of 1943), D_t stands for the dummy variables for each quarter representing a price deviation from time 0, C_j stands for the control variables representing participants' evaluation of the characteristics of a transaction (dummies for characteristics of the transaction and the log-transformed unit of transaction). I regard the coefficients of the time dummies as a deviation from the base price in the fourth quarter of 1943 after adjusting for participants' evaluation of the characteristics of a transaction[19].

4. A Summary of the Estimation Results

(1) Coefficients of Control Variables and their Statistical Significance

Table 3 shows the results of the estimation using the data in Section 3 based on the hedonic approach.

[Table 3]

First, price variances caused by participants' evaluation of the characteristics of a transaction are properly controlled since the coefficients are statistically significant as a whole, and adjusted R^2

agricultural area located on the outskirts of Tokyo, at 1,500-3,000 based on inspections in October 1943 (Urawa District Court 1943). Also, a collection of witness reports by ordinary persons contained information that rice distributed through the official route suffered severe supply shortages with merely 5-6 days a month's worth being available, and that people regularly visited farmers to buy food to fill the gap (Kurashi no Techou 1969).

[18] One *sho* is the equivalent of 1.8 liters, and one *kan* is the equivalent of 3.75 kilograms.

[19] Likelihood tests of functions with Box-Cox transformation reject the likelihood of linear form of prices of dependent variables and unit of transaction of independent variables for all five goods with a significance level of 1 percent. The tests do not reject the likelihood of dual-log linear form with 5 percent significance level for sweet potatoes and potatoes, and with 1 percent significance level for rice and chicken eggs. However, they reject it with 5 percent significance level for rice and chicken eggs, and with 1 percent significance level for sugar. When testing the half-log function with the log-transformed dependent variable of price and the linear form of the independent variable of the unit of transaction, the tests do not reject the likelihood with a 5 percent significance level for rice, sweet potatoes, potatoes and sugar, while they do reject it with 1 percent significance level for chicken eggs.

are as high as 0.838 (for chicken eggs) or 0.616 (for potatoes).

Second, to explore the effects of the characteristics of a transaction, such as differences in terms of participants and location on black-market prices, I looked at statistical significances, and the signs and absolute values of the coefficients of dummy variables. Since the dependent variable, price, has been transformed to log form in equation (1), I expressed the relative magnitude of these effects as a ratio of the base price by transforming the coefficients in the upper columns in Table 3 with an exponential function. The lower columns in Table 3 show rates of change only for coefficients with statistical significance.

To look at the effect of a difference in the seller, cases of producers selling their own products are chosen as the base. When brokers sold sweet potatoes, prices jumped by 2.5 times compared with when producers sold it.[20] When brokers sold rice, potatoes, chicken eggs or sugar, prices did not differ from producers' price with statistical significance. When retailers sold chicken eggs, the price was significantly higher by 1.9 times, while the price of sweet potatoes was significantly lower by 0.3 times. When retailers sold rice, potatoes or sugar, the prices did not significantly differ from producers' price. When buyers purchased goods from acquainted persons, the price of rice was lower by 0.5 times, that of sweet potatoes was higher by 3.5 times, while those of potatoes, chicken eggs and sugar did not change significantly.

To look at the effect of a difference in the buyer, cases of consumers buying goods that are assumed to be for their own consumption were chosen as the base. When retailers bought goods, the price of rice was significantly lower by 0.6 times. There was no significant effect on the price of other goods.

To look at the effect of a difference in the place of transaction, cases of purchase at the consumption site were chosen as the base. When the transaction occurred in other places than consumption site, presumably at or near the production site, the prices of rice and potatoes were significantly lower by 0.7 times. The prices of sweet potatoes, chicken eggs and sugar were not significantly affected.

When we compare statistical sources, the price of sweet potatoes collected by women's associations was significantly higher by 1.3 times than that of prices directly collected by the CCCPC. There was no significant difference in the prices of rice, potatoes, chicken eggs and sugar collected by women's associations and those collected by the CCCPC.

When the unit of transaction increased by 1 percent, the prices of rice and sweet potatoes rose by 1.1 percent respectively while the prices of potatoes, chicken eggs and sugar did not change significantly.[21]

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[20] Exp (0.918)=2.504.

[21] The result, which indicates an increase in the price of goods with an increase in volume of transaction, contradicts conventional observations of volume discounts during peacetime. However, this may reflect an increasing risk of black-market transactions being detected by the authorities

(2) Trends in Black-Market Prices

I have derived data for the price levels of individual goods per unit, which are comparable with pre- and post-WWII retail prices (or controlled prices when price controls were in place) and post-WWII black-market prices compiled by the BOJ.

Table 4 and Figure 1-5 show trends in black-market prices for five goods I calculated using the hedonic approach for the period before and after September 1945, when the BOJ started collecting black-market price data. I standardized the monthly average prices in 1934 to 1. Price inflation in the black markets began accelerating toward the end of WWII and reached quarterly increases of 40-80 percent during the second quarter of 1945 (through September 1945 in case of sweet potatoes). Price inflation peaks differed for the different products; the peak came during the war for rice and sugar, and after the war for sweet potatoes, potatoes and chicken eggs. Price levels in the black market hit 57 for sweet potatoes in September 1945 and 744 for sugar in June 1945.

[Table 4]

Compared to black-market prices in rural areas, black-market prices in urban areas (Tokyo, for instance) were higher in general. This is consistent with witness reports that black-market prices soared with shortages in inflow of materials from rural to urban areas mainly due to the deterioration of distribution networks.

Price discrepancies between urban and rural areas differed by product. Among others, the discrepancy in sugar prices between urban and rural areas was the biggest, with the urban price hitting 14.3 times the rural price in June 1945. Meanwhile the discrepancies for other goods were smaller, reaching 3.8 times for rice, 2.3 times for potatoes, and 1.7 times for chicken eggs in June 1945, and 1.5 times for sweet potatoes in September 1945. During 1944, the black-market price of potatoes was higher in rural areas than in urban areas, and that of sweet potatoes was almost the same in the two areas (Figure 1-5).

[Figure 1-5]

When I derive 95-percent confidence intervals of urban black-market prices for five goods, they indicate that black-market prices of rice and sugar remained higher in urban areas than in rural areas from the fourth quarter of 1943 through the end of the war with statistical significance. The black-market prices of potatoes, sweet potatoes and chicken eggs in urban areas were *not* different from those in rural areas with statistical significance until the third quarter of 1944. In the case of

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along with an increase in the volume of a transaction.

potatoes and chicken eggs, black-market prices in urban areas were higher than in rural areas in the second quarter of 1945. We lack data for sweet potatoes for the second quarter of 1945.

Next, I look at trends in prices of individual goods throughout the war and post-war inflation periods.

Rice was traded in the black market in the fourth quarter of 1943 at a price 14.0 times that in 1934. The price rose by 38 percent on a quarterly basis thereafter through the third quarter of 1944, by 49 percent from the third quarter of 1944 through the second quarter of 1945, by 33 percent from the second quarter of 1945 through September 1945, by 20 percent from September 1945 through February 1946, and by 16 percent from February 1946 through July 1948, when the price level hit a peak at 924 times the 1943 price level. The rate of inflation peaked from the third quarter of 1944 through the second quarter of 1945.

Sweet potatoes were traded in the black market in the fourth quarter of 1943 at a price 4.7 times that recorded in 1934. The price increased by 31 percent (on a quarterly basis) from the fourth quarter of 1943 through the third quarter of 1944, by 52 percent from the third quarter of 1944 through September 1945, by 69 percent from September 1945 through February 1946, and by 16 percent from February 1946 through July 1948, when the price level peaked at 567 times the 1943 price level. The rate of inflation peaked from September 1945 through February 1946.

Potatoes were traded in the black market in the fourth quarter of 1943 at a price 9.3 times that recorded in 1934. The price increased by 3 percent (on a quarterly basis) from the fourth quarter of 1943 through the third quarter of 1944, by 84 percent from the third quarter of 1944 through the second quarter of 1945, by 7 percent from the second quarter of 1945 through September 1945, by 133 percent from September 1945 through February 1946, and by 12 percent from February 1946 through June 1948, when the price level peaked at 818 times the 1943 level. The rate of inflation peaked from September 1945 through February 1946.

Chicken eggs were traded in the black market in the fourth quarter of 1943 at a price 10.0 times that in 1934. The price increased by 47 percent (on a quarterly basis) from the fourth quarter of 1943 through the third quarter of 1944, by 41 percent from the third quarter of 1944 through the second quarter of 1945, by 9 percent from the second quarter of 1945 through September 1945, by 55 percent from September 1945 through February 1946, and by 16 percent from February 1946 through November 1948, when the price level peaked at 824 times that in 1943. The rate of inflation peaked from September 1945 through February 1946.

Sugar was traded in the black market in the fourth quarter of 1943 at a price 33.0 times that in 1934. The price increased by 80 percent (on a quarterly basis) from the fourth quarter of 1943 through the third quarter of 1944, by 57 percent from the third quarter of 1944 through the second quarter of 1945. The price decreased by 16 percent from the second quarter of 1945 through September 1945, and increased again by 20 percent from September 1945 through February 1946, and by 13

percent from February 1946 through October 1947, when the price level peaked at 2,717 times that in 1943. The rate of inflation peaked from the fourth quarter of 1943 through the third quarter of 1944.[22]

5. Discussion

In this section, I will explore the realities of black-market transactions during WWII using the estimation results of the previous section as well as existing studies and archival materials.

In wartime Japan, the government introduced controls on prices of various goods, starting with voluntary ceilings for the standard prices of raw cotton and cotton yarn in November 1937.[23] In October 1939, it promulgated and implemented the Ordinance for Controls on Prices in response to the German attack on Poland (the outbreak of WWII in Europe), in accordance with the National Mobilization Law of 1938. By the ordinance, all goods prices were to be frozen officially at their level as of September 18, 1939.[24] It is conjectured that black markets prevailed after the implementation of the ordinance, under which all goods came under official control.

A pamphlet of the CCCPC, which was presumably published in 1940, revealed that at the time of its publication, transactions in black markets already existed.[25]

> While our Imperial Army has demonstrated its great power in the (Chinese) Continent since the (Marco Polo Bridge) Incident three years ago, the biggest concern for Japan is the threat of rampant inflation. Since the incident, goods have been consumed on a large scale, causing shortages in supply of goods, thereby forcing stringency in people's lives. Furthermore, the outbreak of the war in Europe ignited inflation in international prices and accelerated the trend of domestic inflation here in Japan. To tackle the dire economic conditions, the government has employed various measures from time to time, but the price inflation trend seems to outmaneuver every policy effort, running to extremes. The government anticipated the trend and tried to prevent inflation to its best capacity by promulgating the Ordinance for Controls

[22] I used the price of "white sugar" as representative of sugar prices. However, the price data for "white sugar" does not exist for the July-December 1945 period while price data for "rough-refined red sugar" (*aka-zarame*) exists for the January 1946-September 1950 period. Accordingly, I regressed "white sugar" prices by employing the hedonic approach using the price of "rough-refined red sugar" for the May 1948-September 1949 period, for which both "white sugar" and "rough-refined red sugar" prices could be obtained. As a result, I estimated $P_{w,t}=241.74+1.158P_{r.t}+e_t$, where $P_{w,t}$ is the price of "white sugar" at period t, $P_{r,t}$ is the price of "rough-refined red sugar" at period t, and e_t is the error term.

[23] MOF (1956), pp.239-277.

[24] The controlled prices of five goods for which I have derived the black-market prices first appeared in the government gazette in May 1939 for sugar, in October 1939 for rice and chicken eggs, and in September 1940 for sweet potatoes and potatoes.

[25] CCCPC (date unknown), pp.1-2. Though the pamphlet lacked a date of issue, it contained the expression, "the Ordinance for Controls on Prices was promulgated last fall," indicating that the publication year was 1940.

on Prices last fall. However, price (inflation) can not be prevented merely by the efforts of the authorities. It can only be prevented if businesses also understand the need for it and devote themselves to maintaining (price stability) accompanied by an adjustment in supply and demand.

Since the incident, the government has devoted tremendous efforts to designing a price policy. However, the effect of the efforts has not necessarily been obvious due to a lack of cooperation between the government and private sectors. Private sector participants have tended to escape the controls because they felt that they were being compelled against their wishes to follow them. Due to the malfunctioning of the official distribution system, consumers are in hurry to buy even at higher prices, facilitating black-market transactions. If only some materials were subject to price control, laws and economic police could achieve price controls. However, when the price controls are extended to virtually all goods and services related to the lives of people, the controls can not be effective unless the people as well as the parties directly involved cooperate.

Though it is difficult to specify the dates when the inflation of individual goods accelerated in the black markets, anecdotal evidence suggests black-market prices increased at least in 1942. Ministry of Finance (1956) refers to contemporary articles describing black-market activities related to vegetables, liquor, *miso* (bean paste), soy sauce, soap, coal briquette, charcoal and other products in 1942.[26] It also cites abstracts from a series of surveys conducted by the CCCPC from December 1942 to May 1943. The CCCPC collected data from another survey regarding the purchasing prices of agricultural, forestry and fishery products from about two thousand households nationwide (Seikatsu Hitsuju Busshi Haikyuu Jittai Chousa: A Survey of the Distribution of Daily Necessities). The CCCPC conducted this survey via self-reporting prior to the survey I have used in this paper. According to this self-reporting survey, respondents bought goods at higher prices than the official prices on 36 occasions out of 100 in December 1942. On average, they paid 22 percent higher than the official price.[27]

[26] Ministry of Finance (1956), pp.304-307.

[27] Ministry of Finance (1956), pp.307-309. When the CCCPC initiated this survey in December 1942, it planned to conduct the survey for one year. However, the data exists only up to May 1943. The survey data for May 1943 indicated that respondents had bought goods at higher prices than official prices on 30 occasions out of 100, and paid 14 percent higher than the official price on average, indicating inflation had subsided within half a year. Though the CCCPC said nothing about the relation between the previous self-reporting survey and the survey I have used, it is conceivable that it cut short the self-reporting survey for some reason and started another survey from scratch in October 1943, masking respondents' IDs. In this regard, Nakamura and Mizoguchi (1994) suggest the possibility of under-reporting in the previous survey, saying "we can imagine that, under the social atmosphere during the war, people might have hesitated to report purchasing goods in the black markets."

Archival documents suggest the spread of black-market activities in 1943-1944 as supply shortages accelerated. The government responded by enacting Emergency Price Measures (Kinkyuu Bukka Taisaku Youkou) in April 1943, which did not work properly. Ministry of Finance (1956) summarizes the situation in the black markets during this period:[28]

> Difficulties in the acquisition of staple foods, rice and wheat, became evident; urban residents often lived on alternative foods even though rice and wheat were available in the rural areas. As the acquisition and distribution of accompanying foods was even more disastrous, urban residents could no longer rely on distribution systems run by the government. Not just the ordinary people, but even the government itself depended on necessities directly purchased at (black) market prices. In general, the government paid black-market prices for weapons, raw materials and intermediate items for immediate use. These transactions were initially conducted covertly but gradually became widespread as air raids intensified. When Japan surrendered in August 1945, the black markets were virtually unleashed to the public.

The NAA also wrote about the malfunctioning distribution system:[29]

> In a nutshell, the official prices were determined in a bureaucratic manner in accordance with retail prices of daily necessities and strategically important items. As a result, the prices of essential goods were kept relatively lower than those of non-essential goods. As official prices were introduced to a wider range of items, the implementation of these prices became impossible; people could not obtain items even when they had distribution tickets, and consumers and brokers eventually traded goods at black-market prices. During the first half of 1943, quasi-idle labor induced by the Enterprise Disposition Ordinance (Kigyou Seibi Rai) of 1942 flew into the black markets in various places as brokers and engaged in free-market transactions. The government did not have a proper understanding of the situation and tried to strengthen controls by revising the official prices. As a result, agricultural goods remained at the production sites as inventory and items for agricultural production and daily necessities virtually disappeared from the official distribution routes. Goods were located eccentrically, and the supply and demand of various goods were in disequilibrium. Producers and merchants made, bought and held goods off the markets or offered tied-in sales. Merchants shifted from underweighted transactions in the initial stage to overpriced (based on black-market prices) transactions eventually.

[28] Ministry of Finance (1956), pp.355-356.
[29] National Agricultural Association (1948), p.3.

To sum up, anecdotal evidence is consistent with the results of our econometric analysis in the previous section. They indicate that black-market prices emerged sometime after the introduction of overall price controls in 1939. Around 1942, the gap between the official and black-market prices widened. From 1943 onward, the gap widened further as wartime conditions deteriorated.

6. Conclusion

I have constructed time-series of data related to black-market prices of individual goods during World War II (WWII) in Japan. The data enables us to capture actual trends in price fluctuations throughout the period during and after WWII. I found that the black-market prices of goods soared during WWII to hit 40-80 percent inflation on a quarterly basis toward the end of the war. Black market prices had already increased by over 50 times (in the case of sweet potatoes) to 700 times (in the case of sugar) compared to the 1934 price level prior to wartime inflation, indicating more severe inflation during the war than after it. Inflation peaks differed for different products, with the peak rate of inflation for rice and sugar coming during the war, while the peak rate of inflation for sweet potatoes, potatoes and chicken eggs came after the war. Black-market prices were higher in urban areas than in rural areas in general. These results are consistent with witness reports, with witnesses attributing the source of accelerated inflation in black markets to the shut-down of material inflows to urban areas due to the deterioration of distribution systems.

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Table 1. Number of samples by item and dummy variable

Item			Rice	Sweet potatoes	Potatoes	Chicken eggs	Sugar
Number of samples							
Transactions between a producer and a consumer*			33	69	54	31	14
With seller/buyer dummy variables	Seller dummies	Broker	25	7	12	16	35
		Retailer	3	3	2	1	1
		Acquintant	10	2	1	2	2
	Buyer dummies	Farmer	1	3	0	0	0
		Broker	0	0	0	1	0
		Retailer	2	4	0	0	0
With other dummies	Outside of consumption site		40	77	48	28	2
	Women's Associations data		12	24	7	8	12
Total			74	88	69	51	52
Reference	Number of quarterly data samples		4	3	4	4	4
	Degree of freedom		62	77	59	40	42

* Samples without seller/buyer dummies.

Table 2. Number of samples by month

Month	Rice	Sweet potatoes	Potatoes	Chicken eggs	Sugar	Total
Oct. 1943	8	16	8	13	10	55
Nov. 1943	11	23	10	12	13	69
Dec. 1943	7	5	1	2	3	18
1943/4Q	26	44	19	27	26	142
Jan. 1944	2	1	1	3	1	8
Feb. 1944	4	4	1	2	3	14
Mar. 1944	6	3	1	5	3	18
1944/1Q	12	8	3	10	7	40
Jul. 1944	11	1	17	2	4	35
Aug. 1944	12	2	18	5	3	40
Sept. 1944	7	33	4	3	9	56
1944/3Q	30	36	39	10	16	131
Jun. 1944	6	0	8	4	3	21
Total	74	88	69	51	52	334

Table 3. Estimation results using the Hedonic Approach (coefficients of independent variables)

			Rice	S.E.		Sweet potatoes	S.E.		Potatoes	S.E.		Chicken eggs	S.E.		Sugar	S.E.	
Constant	1943/4Q		1.445	0.17	***	0.335	0.21		0.515	0.20	**	-1.236	0.10	***	3.858	0.13	***
Time dummies	1944/1Q		0.064	0.16		0.195	0.19		0.194	0.35		0.476	0.17	***	0.573	0.41	
	1944/3Q		0.970	0.18	***	0.801	0.12	***	1.021	0.20	***	1.151	0.14	***	1.759	0.13	***
	1945/2Q		2.174	0.19	***	-	-		1.929	0.20	***	2.179	0.17	***	3.118	0.09	***
Other dummies	Saler	Broker	-0.082	0.14		0.918	0.20	***	0.263	0.21		-0.089	0.10		-0.149	0.22	
		Retailer	-0.361	0.25		-1.193	0.09	***	-0.060	0.26		0.639	0.10	***	-0.389	0.23	
		Acquintance	-0.735	0.36	**	1.263	0.18	***	-0.048	0.11		-0.048	0.21		-0.208	0.18	
	Buyer	Farmer	0.058	0.20		-	-		-	-		-	-		-	-	
		Broker	-	-		-	-		-	-		-0.024	0.07		-	-	
		Retailer	-0.552	0.21	**	-	-		-	-		-	-		-	-	
	Outside of consumption sites		-0.399	0.14	***	0.115	0.19		-0.389	0.13	***	-0.125	0.11		0.105	0.40	
	Women's Association data		0.079	0.18		0.251	0.11	**	0.027	0.19		0.146	0.14		-0.068	0.24	
Unit of transaction (logarithmic scale)			0.116	0.04	***	0.110	0.05	**	-0.015	0.18		-0.014	0.08		-0.028	0.07	
Adjusted R2			0.643			0.619			0.616			0.838			0.819		

Fn. * represents significance with robust standard error; ***: 1 percent significance level, **: 5 percenrt significance level, *: 10 percent significance level.

(Reference) Price changes by characteristics of transaction derived from coefficients of dummy variables (only those that are statistically significant)

			Rice	Sweet potatoes	Potatoes	Chicken eggs	Sugar
Price level in 1943/4Q			4.242 yen/sho	1.398 yen/kan	1.674 yen/kan	0.291 yen/piece	47.371 yen/kan
Price change by							
characteristics	Saler	Broker	-	150.4	-	-	-
of transaction		Retailer	-	-69.7	-	89.5	-
(percent)		Acquaintance	-52.0	253.6	-	-	-
	Buyer	Farmer	-	-	-	-	-
		Broker	-	-	-	-	-
		Retailer	-42.4	-	-	-	-
	Outside of consumption sites		-32.9	-	-32.2	-	-
	Women's Association data		-	28.5	-	-	-
Unit of transaction (logarithmic scale)			1.123	1.116	-	-	-

Table 4. Black-market price index (1934 average retail price=1)

		Rice	Sweet potatoes	Potatoes	Chicken eggs	Sugar
1943/4Q		13.994	4.725	9.341	10.001	32.953
1944/1Q		14.919	5.743	11.341	16.098	58.445
1944/3Q		36.915	10.527	25.931	31.617	191.348
1945/2Q		123.053	-	64.292	88.385	744.784
Sept. 1945		163.394	56.871	68.874	96.727	1297.489
Feb. 1946		221.132	136.124	282.195	200.682	1221.883
Peak	(month/year)	923.719 (July 1948)	566.772 (July 1948)	817.953 (June 1948)	824.070 (Nov. 1948)	3905.420 (Oct. 1947)

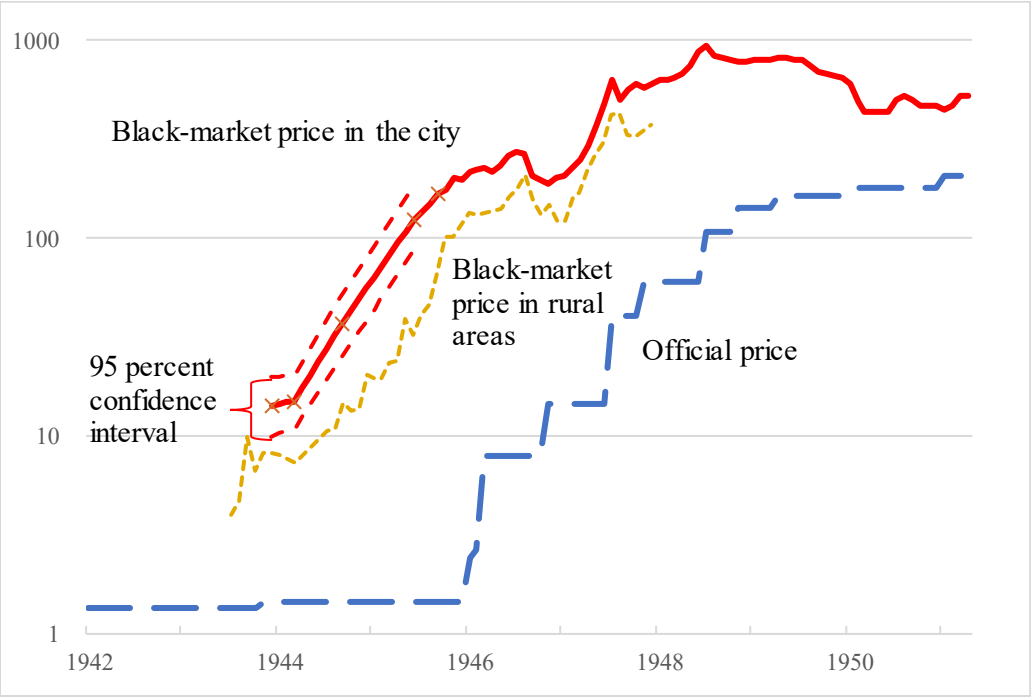
(Reference 1) Quarterly rate of price cognate

	Rice	Sweet potatoes	Potatoes	Chicken eggs	Sugar
1943/4Q-1944/3Q	38.2	30.6	40.5	46.8	79.7
-1945/2Q	49.4	n.a.	35.3	40.9	57.3
-Sept. 1945	32.8	52.5 (1944/3Q-)	7.1	9.4	74.2
-Feb. 1946	19.9	68.8	133.1	54.9	-3.5
-Peak	15.9	15.9	11.6	15.7	12.8

(Reference 2)

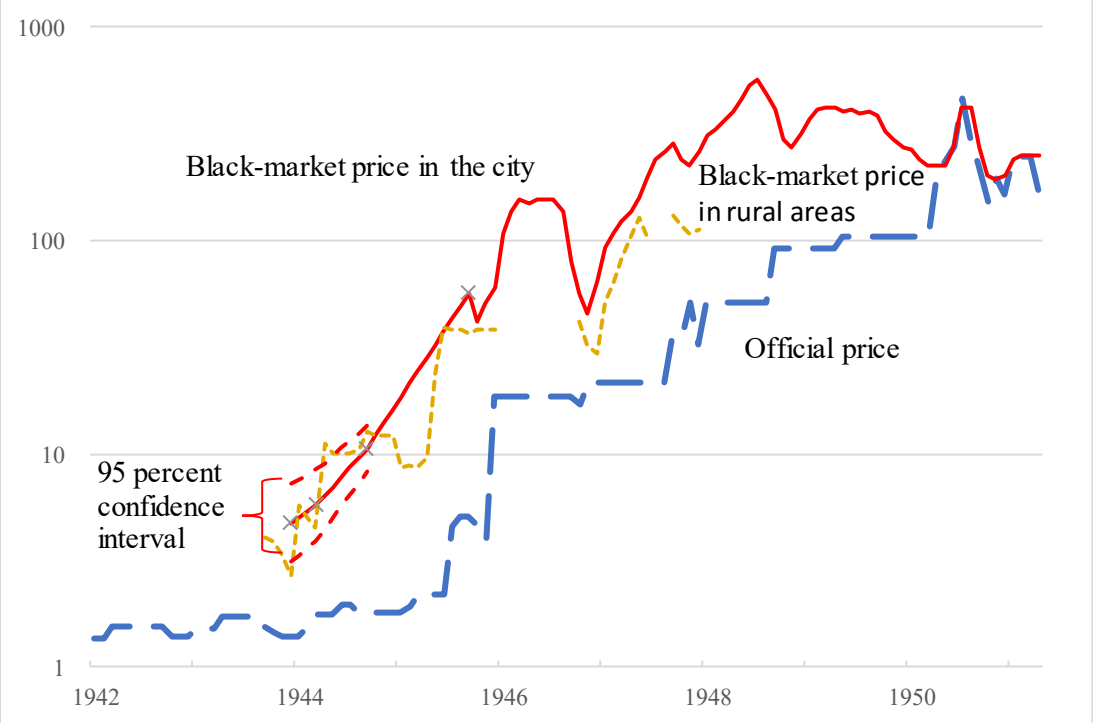
Average retail price in 1934	0.303 yen/sho	0.296 yen/kan	0.179 yen/kan	0.0291 yen/piece	1.438 yen/kan

Figure 1. Rice prices (1934 average=1)



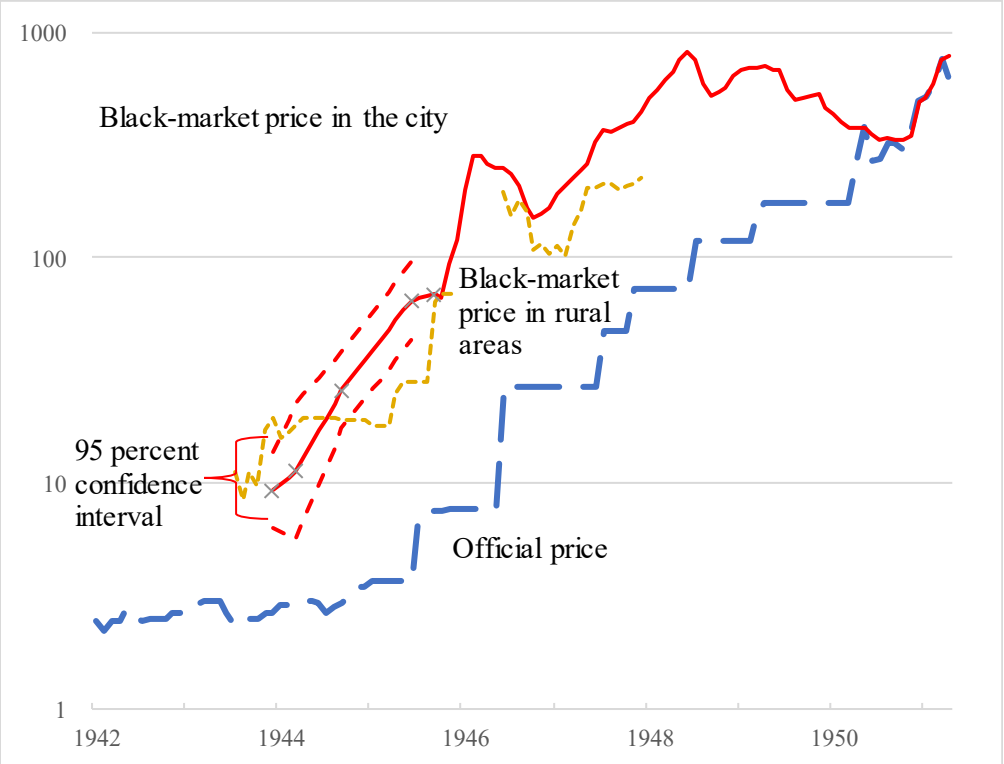
Sources: National Agricultural Association (1948); Toyo Keizai Shinpo Sha (1954); Nakamura and Mizoguchi (1994)

Figure 2. Sweet potato prices (1934 average=1)



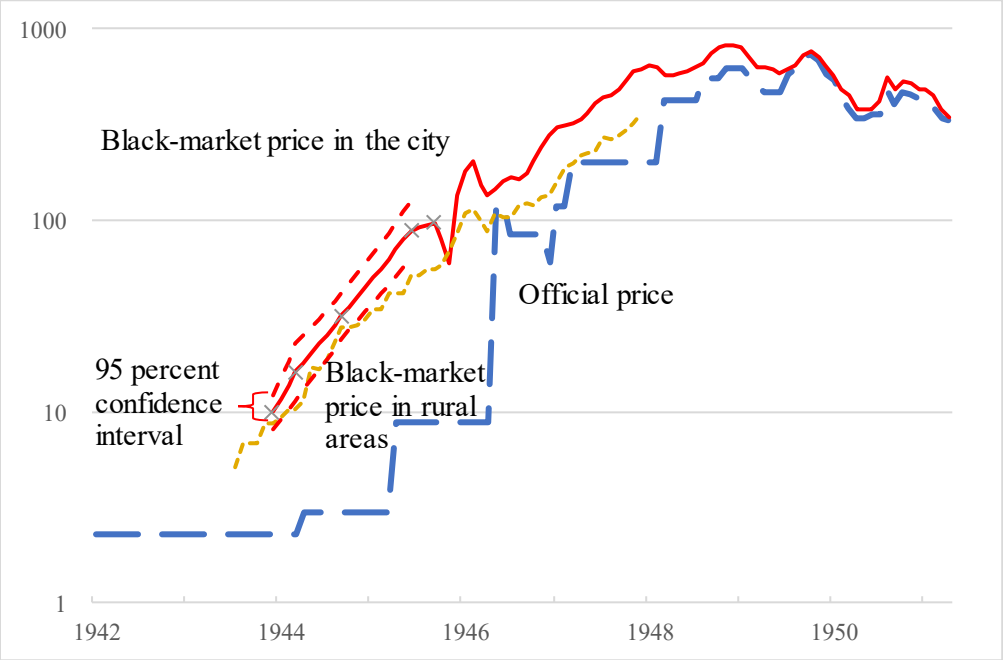
Sources: See Figure 1

Figure 3. Potato prices (1934 average=1)



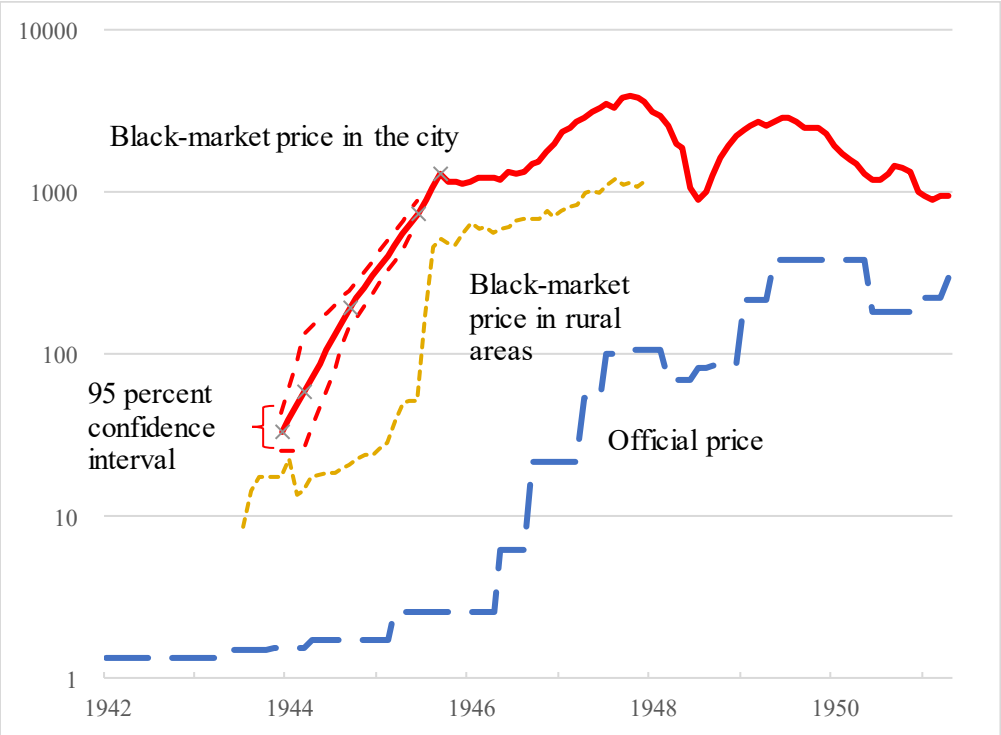
Sources: See Figure 1

Figure 4. Chicken egg prices (1934 average=1)



Sources: See Figure 1

Figure 5. Sugar prices (1934 average=1)



Sources: See Figure 1