On large-scale money finance in the presence of black markets: A case of the Japanese economy during and after World War II[1]

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Abstract: This paper explores an alternative role performed by large-scale money finance as a fiscal instrument to fund resources *indirectly* from black markets when an economy is heavily controlled. It demonstrates that (1) in the Japanese national accounts, the aggregate expenditure exceeded the aggregate income by the amount of the income leakage to black markets under the strict price control for the wartime and postwar years 1937-1949, and (2) in order to fund financial shortage resulting from the income leakage, private agents bartered directly with illegal dealers, but the government let the Bank of Japan underwrite public bonds instead of dealing directly with formal, but poor agents or rich, but illegitimate agents. The BoJ notes issued to the government were eventually held as means to conceal income by illegal dealers. Some policy implications for currency reforms are also explored with consideration for the fact that the emergence of black markets necessitated the BoJ's direct underwriting.

Key words: money finance, wartime finance, price control, black markets, national accounts, statistical discrepancies.

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1. Introduction

This paper explores an alternative role performed by large-scale money finance which had been conducted by the Bank of Japan (BoJ) for the years 1937-1949, or during/after the Sino-Japanese War (1937-1945) and the Pacific War (1941-1945). Quite frequently, large-scale money finance initiated by finance minister Takahashi Korekiyo in 1932 has been regarded as one of the most successful unconventional monetary policy, while the same policy framework employed after the assassination of Takahashi in 1936 as responsible for the postwar high inflation. However, the latter policy worked quite differently as a fiscal instrument to finance resources *indirectly* from black markets under the strict price control.

According to the Japanese national accounts compiled by the Economic Planning Agency (1964), hereafter the EPA national accounts, the aggregate expenditure continued to exceed the aggregate income in a nominal term for the years 1937-1949, during which the Japanese economy had been heavily controlled by the central government. Firstly, this paper demonstrates that such largely positive statistical discrepancies[3] mainly reflected not disturbing effects of measurement or aggregation errors, but a necessary consequence of the price control, which had been implemented strictly for most items of intermediate and final goods by the central government during and immediately after the Wars.

More concretely, under the strict price control, producers officially disclosed as if they had sold all items of their products at official prices, but they never reported any illegal margin resulting from selling to black market dealers. On the other hand, given an extreme scarcity of goods by strict rationing, producers and consumers were forced to purchase a part of goods from black markets, and recorded expensive payments to undercover dealers on the books. Consequently, the aggregate expenditure increased by the expense on final goods purchased in black markets, while the aggregate income measured as value added decreased by the expense on intermediate goods procured from illegal dealers. Then, there emerged a largely positive statistical discrepancy

[3] A statistical discrepancy of the national accounts in peacetime periods has attracted a strong econometric interest for a long time in a long list of papers including Gartaganis and Goldberger (1955) and Adams and Janosi (1966).

as the size of black markets under the strict price control.

Secondly, this paper explores possible macroeconomic impacts of the above income leakage to black markets. It follows from such positive statistical discrepancies that the net national saving, which was computed from the income account, was short of the sum of net investment and net export, which was calculated from the expenditure account. That is, formal economic agents, public or private, could not finance sufficiently their investment or export only by tax/subsidy transfers or borrowings among those in the formal economy.

There existed two major channels through which the income leaked to black markets flowed back to the formal economy. A natural channel was that private agents in the formal economy bartered directly with illegal dealers by exchanging inventories held by firms and durables by households for black market resources. Though seemingly counter-intuitive, on the other hand, the BoJ's direct underwriting of public bonds had been an inevitable fiscal instrument for the government to finance resources *indirectly* from black markets.

Let us take a close look at the latter channel. The government could not finance any more resources from the formal economy which suffered from the income leakage, or it could not deal directly with illegitimate agents in black markets either. But, the government could deal directly with a legitimate institute, the BoJ. The notes issued newly to the government by the BoJ first circulated as a medium of exchange among those in the formal economy. Then, the new bank notes eventually flowed into black markets because the total expenditure made by those in the formal economy exceeded the total income received by them. In turn, undercover dealers held the newly issued BoJ notes to conceal income by exploiting the uninscribed nature of central bank notes. In this case, the eventual holders of the new BoJ notes were not formal private agents, but those in black markets. In sum, the government could finance resources *indirectly* from black markets without dealing directly with illegal dealers.

This paper has three important contributions. Firstly, it proposes a systematic way to measure a heavily controlled economy by a system of national accounts, and demonstrates that a statistical discrepancy between aggregate expenditure and income corresponds to the size of black

markets. Mizoguchi and Nojima (1993) and Mizoguchi (1996) first make an informal statement that the postwar price control was responsible for largely positive statistical discrepancies of the EPA national accounts. This paper formalizes their informal remark, and extends it to not only the postwar period, but also the wartime period.

Secondly, this paper sheds light on an alternative role performed by large-scale money finance in the presence of black markets. From the viewpoint of a government, on the one hand, direct underwriting of public bonds by a central bank can serve as a legitimate instrument to fund a financial shortage *indirectly* from those illegitimate in black markets. Among those in black markets, on the other hand, newly issued bank notes can play a role as an instrument to conceal income. One important consequence of such mutual benefits between a government and illegal dealers is that even large-scale direct underwriting may have limited impacts on prices to the extent that those outside a formal economy are willing to hold newly issued bank notes.

Thirdly, the above historical explorations shed light on possible policy implications for currency reforms. As Rogoff (2016) and others discuss, a fundamental economic reason for abolishing central bank notes is that central bank notes trigger off black market transactions. In the Japanese historical experiences, however, the emergence of black markets itself necessitated the bank notes issued to the government by the BoJ. Without any careful attention to this reverse causality, repealing central bank notes might not result in the disappearance of black markets, but a privately-created sophisticated currency would legally take over the alternative role performed by central bank notes.

This paper is organized as follows. Section 2 offers a brief description of the price control implemented during and after the Wars, and presents a simple model of effects of price control on national accounts. Section 3 interprets the Japanese national accounts of 1930s-1940s along the framework presented in Section 2. Section 4 concludes this paper.

2. Price control in practice and theory

2.1. A brief history of the price control and black markets during and after the Wars

A fundamental problem faced by the Japanese economy during and after the Wars was a stagnant production. According to the EPA (1964), the real gross national expenditure had been sluggish in the 1940s; in 1934-1936 constant prices, it stayed at 13.4 billion yen in 1930, 16.6 in 1935, 22.1 in 1939, 20.1 in 1944, 10.9 in 1946, and 16.2 in 1950. Among possible factors responsible for the prolonged stagnant production, a shortage of import goods was most crucial. In particular, production by munitions factories, heavily dependent on import of intermediate goods from the Allies, declined substantially due to a series of the economic blockades imposed by the Allies since the late 1930s. Even after the Wars, the General Headquarters imposed strict restrictions on import except for a humanitarian purpose. It was after these import restrictions were lifted for heavy oil in 1947 and for other commodities in 1948 that the Japanese economy started to recover itself.

Given such a serious shortage of materials and products, the government was forced to ration scarce resources according to priority, namely for the munitions industry during the Wars, and the heavy industry including coal and steel in the postwar reconstruction. For this purpose, the wartime government legislated the Act on Temporary Measures concerning Export and Import Goods (ATMEIG), the Temporary Fund Adjustment Act (TFAA), and the Material Mobilization Plans (MMP) in 1937, the National General Mobilization Act (NGMA) in 1938, and the Productive Capacity Expansion Plans (PCEP) in 1939.

Initially under the ATMEIG in 1937, the NGMA in 1938, and later by the Price Control Ordinance enacted in 1939, the government set the official prices at extremely low levels eventually for most items of final and intermediate goods. Accordingly, especially in intermediate goods markets, producers had a strong incentive to sell their own goods to black markets at higher prices, and to retain illegal earnings off the books. At the same time, due to strict rationing, producers were forced to purchase goods through undercover dealings. Consequently, production costs increased with expensive intermediate goods from black markets, but producers had to

disclose as if they had sold all items of intermediate and final goods at the cheap official prices. Then, producers at official markets were forced to carry considerable losses, for which were often compensated by government subsidies such as the subsidies to offset price differentials and the loss compensation. In addition, consumers had to purchase expensive goods from black markets in the last years of the Wars.

The police force in charge of economic cases launched a crackdown on illegal transactions in the late 1938, but since 1941, it had weakened gradually such control partly by its manpower shortage, and partly by frequent involvement of military personnel in undercover transactions. According to Nishida (1994) and Miwa (2015), as a consequence of ineffective material allocations under the MMP, munitions factories were often rationed beyond necessity, and they disposed such excess supply of goods into illegal markets. Nishida (1994) also points out that munitions factories purchased consumption goods from illegal dealers on behalf of their managers and employees for the period 1943-1945. In this way, munitions factories emerged as both sellers and buyers in black markets in the last years of the Wars.

While there is little time-series record of black markets prices during the wartime period,[4] Morita (1963) documents the time-series of the effective wholesale price indexes, which reflected both official and black market transactions. The effective indexes, often called Morita indexes, were compiled by the Bank of Japan in the last years of the Wars, and were employed in computing the nominal expenditure by the EPA (1964).[5] As reported in Table 1, the effective-to-official price index increased from 1.08 in 1940 to 1.45 in 1944 for the wholesale indexes, and from 1.07 in 1940 to 1.93 in 1944 for the retail indexes. It follows from the series of the two ratios that the transactions of retail goods tended to rely more on black markets than those of wholesale goods.

Basically, the strict price control was maintained even after the Wars. The Price Control

[4] Mizoguchi (1995) reports the black-to-official market prices about several items of consumption goods as of the first quarter of 1944, which was, for example, 7.45 for rice/wheat, 3.12 for vegetables, 4.73 for fish, 5.25 for meat, and 5.56 for seasonings.

[5] As Morita (1963) explains, the effective wholesale price index was computed as the nominal amount of transactions by drafts divided by the volume of commodity transactions, while the effective retail price index was computed as the nominal amount of transactions by cash divided by the volume of commodity transactions.

Ordinance was replaced by the Price Control Act in 1946, while the MMP was switched to the Material Supply and Demand Planning in 1945, which was reformulated as the Priority Production System in 1946. In the aftermath of the Wars, the government concentrated material and financial resources on the heavy industry, in particular coal and steel. As in the wartime period, the government offered subsidies to offset price differentials for products of the heavy industry. According to the Bank of Japan (1966), the black-to-official market price was fairly high for production goods; it was 7.2 in 1946, 5.3 in 1947, 2.9 in 1948, and 1.7 in 1949 respectively. The government had lifted the price control as well as the resource rationing up to the early 1950s. Then, black markets disappeared completely.

2.2. A simple model of effects of price control on national accounts

This subsection demonstrates that when official and black market prices are present simultaneously, there emerges a positive statistical discrepancy between the aggregate expenditure and income in national accounts. The situation described in Section 2.1 may be simplified as follows. In corporate accounting, producers disclose as if they sell all items of final and intermediate goods at official prices, while the purchases of intermediate goods from underground dealings are recorded at black market prices. The margins earned by selling to underground dealers are off the books. On the other hand, consumers purchase a part of consumption goods from black markets.

Let us below formalize possible effects of price control on national accounts. Here, it is assumed that the purchases of any goods are valued at transaction prices, and the sales of any goods are valued at official prices. In addition, black market margins are not reported at all. Here, P^{om} and P^{bm} denote official and black market prices. For intermediate goods, V_{inter}^{om} and V_{inter}^{bm} are traded in official and black markets. For final goods, V_{final}^{om} and V_{final}^{bm} are traded in each market. The transactions are summarized as follows.

	Official markets	Black markets
Intermediate goods	$P^{om}V^{om}_{inter}$	$P^{bm}V^{bm}_{inter}$
Final goods	$P^{om}V^{om}_{final}$	$P^{bm}V^{bm}_{final}$

According to the above valuation rule, the nominal aggregate expenditure of final goods Y^E_n is computed as follows. Note that a variable with a lower subscript n denotes a nominal variable.

$$Y^E_n = P^{om}V^{om}_{final} + P^{bm}V^{bm}_{final} = P^{om}\left(V^{om}_{final} + V^{bm}_{final}\right) + \left(P^{bm} - P^{om}\right)V^{bm}_{final} \qquad (1)$$

On the other hand, the nominal aggregate income as value added Y^{VA}_n is calculated as

$$\begin{aligned} Y^{VA}_n &= P^{om}\left(V^{om}_{inter} + V^{bm}_{inter} + V^{om}_{final} + V^{bm}_{final}\right) - \left(P^{om}V^{om}_{inter} + P^{bm}V^{bm}_{inter}\right) \\ &= P^{om}\left(V^{om}_{final} + V^{bm}_{final}\right) - \left(P^{bm} - P^{om}\right)V^{bm}_{inter} \end{aligned} . \qquad (2)$$

Finally, the unreported margin in black markets Y^{bm}_n corresponds to

$$Y^{bm}_n = \left(P^{bm} - P^{om}\right)\left(V^{bm}_{final} + V^{bm}_{inter}\right). \qquad (3)$$

As equations (1) and (2) imply, the aggregate expenditure increases by the amount of expenditures on final goods in black markets, while the aggregate income decreases by the amount of expenditures on intermediate goods in illegal transactions. Then, the statistical discrepancy between the expenditure and the income is equal to the unreported illegal margin.

$$\begin{aligned} SD_n &= Y^E_n - Y^{VA}_n \\ &= \left(P^{bm} - P^{om}\right)\left(V^{bm}_{final} + V^{bm}_{inter}\right) \\ &= Y^{bm}_n \end{aligned} \qquad (4)$$

In this way, a part of the aggregate income leaks from formal markets to black ones by the amount of the statistical discrepancy SD_n or the unreported margins earned by illegal dealers Y^{bm}_n.

Given the nominal aggregate expenditure and income by equations (1) and (2), GNE and GNI deflators are defined as follows.

$$\begin{aligned} P^{GNE} &= \frac{P^{om}\left(V^{om}_{final} + V^{bm}_{final}\right) + \left(P^{bm} - P^{om}\right)V^{bm}_{final}}{V^{om}_{final} + V^{bm}_{final}} \\ &= P^{om} + \left(P^{bm} - P^{om}\right)\frac{V^{bm}_{final}}{V^{om}_{final} + V^{bm}_{final}} \end{aligned} \qquad (5)$$

$$P^{GNI} = \frac{P^{om}\left(V_{final}^{om} + V_{final}^{bm}\right) - \left(P^{bm} - P^{om}\right)V_{inter}^{bm}}{V_{final}^{om} + V_{final}^{bm}} \\ = P^{om} - \left(P^{bm} - P^{om}\right)\frac{V_{inter}^{bm}}{V_{final}^{om} + V_{final}^{bm}} \qquad (6)$$

That is, $P^{GNE} > P^{om} > P^{GNI}$ holds. The real share of black markets can be computed from these prices.

$$\frac{V_{inter}^{bm} + V_{final}^{bm}}{V_{final}^{om} + V_{final}^{bm}} = \frac{\dfrac{P^{GNE} - P^{GNI}}{P^{om}}}{\dfrac{P^{bm}}{P^{om}} - 1} \qquad (7)$$

There are two remarks on the above accounting. Firstly, the nominal size of the aggregate income is intact with introducing government subsidies to offset price differentials. Such a subsidy is a transfer from a government to private corporations. That is, an increase in corporate profits by government subsidies is cancelled out exactly by an increase in public deficits at the level of the aggregate income. Secondly, it is assumed that only black market margins are unreported in the above setup. However, if the sales of goods at black markets themselves are unreported, then the size of the statistical discrepancy dictated by equation (4) underestimates the size of black markets.

2.3. Macroeconomic financial shortage and money finance by a central bank

As demonstrated in Section 2.2, a positive statistical discrepancy reflects not any disturbing effect of measurement or aggregation errors, but a flow of funds in the presence of black markets. It follows from such a positive statistical discrepancy that public and/or private agents in a formal economy are subject to a financial shortage.

Let us see the above point within a general framework. Given a positive statistical discrepancy $SD_{n,t} > 0$, the aggregate expenditure exceeds the aggregate income in a nominal term as follows.

$$C_{n,t} + G_{n,t} + \left(\Delta K_{n,t}^{private} + \Delta K_{n,t}^{public}\right) + NX_{n,t} + NI_{n,t} > Y_{n,t}^{NNI}, \qquad (8)$$

where $Y_{n,t}^{NNI}$, $C_{n,t}$, $G_{n,t}$, $\Delta K_{n,t}^{private}$, $\Delta K_{n,t}^{public}$, $NX_{n,t}$, and $NI_{n,t}$ denotes net national income, private consumption, government consumption, net private fixed investment, net public fixed investment, net export, and net income transfer from foreigners at time t respectively. Any stock variable is measured at the end of each period.

Equation (8) implies that the net national saving $S_{n,t}^{national}$ is short of the sum of net investment and net export.

$$\left(\Delta K_{n,t}^{private}+\Delta K_{n,t}^{public}\right)+NX_{n,t}+NI_{n,t}>S_{n,t}^{national}=Y_{n,t}^{NNI}-\left(C_{n,t}+G_{n,t}\right) \qquad (9)$$

That is, public and/or private agents in a formal economy cannot finance sufficiently their investment or export through the net national saving.

How do they fund such a macroeconomic financial shortage resulting from the income leakage to black markets? There are potentially two ways to reflux resources from black markets back to a formal economy. As the first channel, private agents in a formal sector barter directly with illegal dealers by exchanging inventories held by firms and durables by households for resources from black market dealers. For large-scale illegal transactions, they may use housing and land as a medium of exchange. On the other hand, undercover dealers hold physical assets or immovable properties as a mean of store of value.

As discussed in the introduction, central bank's direct underwriting of public bonds is the inevitable fiscal instrument for a government, because (i) a government cannot finance any more resources from a formal economy suffering from the income leakage, (ii) a government cannot deal directly with illegitimate agents, but it can deal with a central bank, (iii) bank notes newly issued to a government finally flow into black markets because the total expenditure made by those in a formal economy exceeds the total income received by them, and (iv) undercover dealers eventually hold new issues of bank notes to conceal income by exploiting the uninscribed nature.

In this way, black market dealers lend their concealed resources $\mu SD_{n,t}$ $(0<\mu<1)$ *indirectly* to a central bank by holding bank notes, or barter their hidden resources $(1-\mu)SD_{n,t}$ directly with private agents in a formal economy. Their choice between the two or how μ is determined may depend on inflation rates and tax surveillance. With low inflation or strong surveillance, illegal

dealers may prefer to hold bank notes.

Note that a flow of funds differs completely between a standard monetary model without any black market and the current setup embedded by black markets. In a standard model, $C_{n,t}+G_{n,t}+\left(\Delta K_{n,t}^{private}+\Delta K_{n,t}^{public}\right)+NX_{n,t}+NI_{n,t}=Y_{n,t}^{NNI}$ always holds. As shown in Figure 1-1, a government funds government consumption, net public investment, and interest payments ($i_t B_{n,t}$) in excess of tax revenues ($T_{n,t}$), or $G_{n,t}+\Delta K_{n,t}^{public}+i_t B_{n,t}-T_{n,t}$ by issuing bank notes ($\Delta M_{n,t}$) or/and public bonds ($\Delta B_{n,t}$) to households.

$$\begin{aligned}&G_{n,t}+\Delta K_{n,t}^{public}+i_t B_{n,t}-T_{n,t}\\&=\Delta M_{n,t}+\Delta B_{n,t}\\&=Y_{n,t}^{NNI}-C_{n,t}-\Delta K_{n,t}^{private}-NX_{n,t}-NI_{n,t}+i_t B_{n,t}-T_{n,t}\end{aligned}$$

In this case, the entire new issues of bank notes are eventually financed from household savings.

On the other hand, once a part of aggregate income leaks to black markets, not households, but illegal dealers eventually hold bank notes newly injected by direct underwriting up to $\Delta M_{n,t}=\mu SD_{n,t}$, while households invest in newly issued public bonds up to

$$\Delta B_{n,t}=Y_{n,t}^{NNI}-C_{n,t}-\Delta K_{n,t}^{private}-NX_{n,t}-NI_{n,t}+i_t B_{n,t}-T_{n,t}+\left(1-\mu\right)SD_{n,t}.$$

As shown in Figure 1-2, the new issues of bank notes are finally held by not those in a formal economy, but those in black markets. As its flip side, a government can finance resources *indirectly* from black markets without dealing directly with illegal dealers.

Let us next take a look at a money market. Money demand from those in a formal economy ($M_{n,t}^{formal}$) is proportional to the nominal aggregate expenditure ($Y_{n,t}^{E}$). As in Cagan (1956), Marshallian k ($\frac{M_{n,t}^{formal}}{Y_{n,t}^{E}}$) is usually formulated as $\frac{M_{n,t}^{formal}}{Y_{n,t}^{E}}=m\left(i_t\right)$, where $m\left(i_t\right)$ is decreasing in a nominal rate of interest. With additional money demand from those in black markets, the observed Marshallian k ($\frac{M_{n,t}}{Y_{n,t}^{E}}$) then exceeds $m\left(i_t\right)$.

$$\frac{M_{n,t}}{Y_{n,t}^{E}}>m\left(i_t\right) \qquad (10)$$

That is, from the viewpoint of a government, bank notes serves as a necessary instrument to fund resources *indirectly* from black markets, while bank notes are convenient for illegal dealers to conceal income. Given such mutual benefits between a government and those in black markets, money finance has limited impacts on prices to the extent that money demand from illegal dealers is strong, and Marshallian k is accordingly high.

2.4. Institutional details of money finance, subsidies, and barter in black markets

2.4.1. Direct underwriting of public bonds by the BoJ

Let us briefly describe some institutional details of the large-scale money finance by the BoJ, and the government subsidies to offset price differentials in corporate sectors during the wartime and postwar periods. Finance minister Takahashi Korekiyo initiated large-scale money finance by requesting the BoJ to directly underwrite new issues of the public bonds in November 1932. Even after the assassination of Takahashi in 1936, the government continued such money finance throughout World War II.

The BoJ's underwriting was initially introduced as not a fiscal instrument for the government, but a macroeconomic policy measure. While the BoJ directly underwrote the public bonds during the years 1932-1936, it resold to the private banks more than 90% of what it purchased from the government. It implies that the government eventually financed its own deficit by borrowing from not the BoJ, but the private banks.[6] As analyzed in detail by Shibamoto and Shizume (2014), the above monetary policy indeed worked effectively to stimulate the economy mainly through a marked depreciation of the yen.

However, the direct underwriting by the BoJ had been employed as a powerful fiscal tool since the Sino-Japanese War was sparked off in 1937. Even after 1937, the BoJ continued to resell most of their direct purchase of the public bonds to the private banks, but the private banks financed the bond purchase from the BoJ by not their own private deposits, but credit provided directly by the BoJ. It was equivalent to that the government received credit indirectly from the

[6] See Shima (1983).

BoJ via the private banks.[7] Since February 1942, the upper limit of the BoJ notes had been determined solely by the decision of the minister of finance.[8]

Even in the aftermath of the Wars, the BoJ kept underwriting public bonds directly from the government. While the General Headquarters prohibited the BoJ from underwriting the long-term public bonds in November 1945, the BoJ was still allowed to underwrite the short-term public bonds. After the Public Finance Act was legislated in March 1947, the BoJ could not underwrite any public bonds in principle.

However, the BoJ underwrote the short-term bonds issued by the Reconstruction Finance Bank (RFB), which was founded as a public financial institute in January 1947. The RFB was not classified as a governmental body, and the BoJ was able to underwrite the RFB short-term bonds even under the Public Finance Act.[9] By underwriting the RFB bonds, the BoJ issued the bank notes by 39.6 billion yen in 1947, and by 37.2 billion yen in 1948, which occupied about 30% of the total issue each year. However, the RFB was not allowed to issue bonds any more in April 1949 under the direction of the General Headquarters. In this way, the BoJ developed direct underwriting of the public and quasi-public bonds from November 1932 to March 1949.

2.4.2. Government subsidies to offset price differentials

During the wartime period, producers in the munitions industry always carried enormous losses as a result of their purchases of expensive intermediate goods in black markets, and their sales of cheap final goods in official markets. A substantial fraction of such losses was compensated for by the subsidies and loss compensation from the government. According to Nakamura (1974), for example, the Japan Coal Company was founded as a public institute to control coal markets in

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[7] The BoJ advanced funds to the private banks, which in turn put up the public bonds as collateral at the BoJ. Because the lending rate charged by the BoJ was lower than the yield on the long-term public bonds, the private banks were willing to purchase the public bonds from the government by receiving inexpensive credit from the BoJ.

[8] Japan suspended a gold standard in December 1931, but the outstanding BoJ notes had been still constrained by the amount of specie reserves up to January 1942.

[9] The RFB was initially planned to be financed by only equity from the government, but it was forced to issue short-term bonds after the government gave up sufficient equity finance to the RFB. By underwriting the RFB bonds, the BoJ issued the bank notes by 39.6 billion yen in 1947, and by 37.2 billion yen in 1948, which occupied about 30% of the total issue each year.

1939. The Japan Coal purchased coals from all domestic mines at the cost prices, and sold them to final users through private coal companies at the official prices, much cheaper than the cost prices. In 1944, the official price was about a half of the cost price.

The corporate losses resulting from the strict price control were even larger at the heavy industry after the Wars. The losses were initially financed from the Reconstruction Finance Bank, which was backed by the BoJ's underwriting as mentioned above, and were later subsidized or compensated for by the government. Miwa and Ramseyer (2004) documents that employing the accounting data of Hokkaido Colliery and Steamship Company, the official coal prices were updated extremely slowly in spite of ongoing high inflation, and became only 40% of the cost prices in the early 1948.

In this way, most losses resulting from such large price differentials were eventually covered by the government subsidies and the loss compensation. The expense on the subsidies and loss compensation to heavy industry occupied the general account expenditure by 17.8% in 1947, 23.8% in 1948, and 30.2% in 1949. By the order of the General Headquarters, however, the government could not make any subsidy or compensation to corporate losses from the early 1949.

3. The wartime and postwar national accounts under the strict price control

3.1. On construction of the national accounts

Let us interpret the wartime and postwar EPA national accounts along the framework presented in Section 2. The EPA (1964) compiled the annual national accounts from 1930 to 1951 with 1934-1936 as the base years.[10] Unfortunately, any data of 1945 are not available in the EPA national accounts, but the nominal GNE of 1945 can be approximated by other data sources.[11] In

[10] Okawa et al. (1974) constructs the Japanese national accounts for the years 1885-1940. Fukao et al. (2015) presents a more comprehensive version of the Japanese national accounts of the period 1874-2008. Jean-Pascal et al. (2016) presents a historical note on a brief history of the Japanese national accounts.

[11] As to the GNE of 1945, the real GNE can be computed from the real gross domestic product which was estimated by Mizoguchi and Nojima (1993), while the GNE deflator (P_t^{GNE}) can be chosen such that $\frac{P_{1945}^{GNE}}{P_{1945}^{WPI}} = \frac{1}{2}\left(\frac{P_{1944}^{GNE}}{P_{1944}^{WPI}} + \frac{P_{1946}^{GNE}}{P_{1946}^{WPI}} \right)$ may hold, where the wholesale price index (P_t^{WPI}) is

addition, the outstanding BoJ notes, the outstanding public debts including the public bonds, and the wholesale/retail price indexes are available from the Bank of Japan (1966).

There are three remarks on the EPA national accounts. Firstly, the expenditure account was evaluated according to not the official prices, but the transaction prices recorded by Morita index as follows.[12] For example, the series of consumption expense from some production data were first valued at the official prices recorded by the wholesale/retail price indexes. Then, these series were adjusted by the effective price indexes or Morita indexes explained in Section 2.1, which reflected both official and black market prices. As shown in Table 1, Morita indexes (the effective prices) and the GNE deflator indeed behave similarly in relation to the official prices (the wholesale/retail prices). In this way, the underestimation of expenses driven by the official prices was corrected to some extent by the transaction prices in the expenditure account. For the postwar data, black market prices were surveyed directly by the Bank of Japan, and were considered explicitly in constructing the expenditure account.

Secondly, the EPA national accounts computed the aggregate income independently of the expenditure account. On the one hand, employee compensation was totalized from several surveys of wages and labor force. On the other hand, corporate income was aggregated from corporate tax returns data with due consideration for differences between business and taxation accounting. In the taxation data, black market margins were unlikely to be included. Note that the computation of corporate income differs entirely between the EPA national accounts and the recent versions of the Japanese national accounts. In the latter accounts, corporate income is never aggregated directly from corporate tax returns, but it is instead computed as a residual by subtracting the estimated employee compensation from the aggregate value added.[13]

Thirdly, while the Japanese government and private corporations developed military and

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available from the Bank of Japan (1966). Thus, the nominal GNE of 1945 can be inferred from the calculation of the real GNE and the GNE deflator.

[12] See Mizoguchi and Nojima (1993).

[13] According to Yamamoto (2011), France, England, Finland, Germany, Norway, and Spain follow the same method adopted currently by the Japanese government. In Canada, the U.S., and Australia, on the other hand, corporate income is aggregated from corporate accounting data together with corporate tax returns data. Fujiwara and Ogawa (2016) compute aggregate corporate income from tax returns data for the current Japanese economy.

economic activities in the overseas territories during the wartime period, the interior economy was almost separated from the economies of the overseas territories in terms of income transfer. As documented in detail by Hara (1976), under the strict capital control coupled with a fixed exchange rate system, the income transfer from/to the overseas territories had been constrained tightly. The relative size of net income transfer was much less than one percent of the nominal GNE during the wartime period. Most of overseas military and industry activities were financed within each territory through the bank notes which were issued intensively by the reserve banks and the central banks in the occupied territories. Accordingly, the size of the aggregate income of the interior economy had not been influenced much by the economies of the overseas territories.

3.2. Interpretations of largely positive statistical discrepancies

Let us first examine the relative magnitude of the statistical discrepancy of the EPA national accounts. All nominal macroeconomic variables are expressed below in terms of the ratio relative to the nominal GNE. As shown in Figure 2, the sum of net investment and net export, computed from the expenditure account, exceeded the net national saving, calculated from the income account, during the years 1937-1949 by larger than 5% of the nominal GNE. The period in which largely positive discrepancies are observed exactly corresponds to the period in which the Japanese economy had been strictly subject to the price control.

During the wartime period, the discrepancy ratio peaked at 11.8% in 1938, and it declined gradually to 6.4% in 1941. Then, the ratio increased again gradually to 10.9% in 1944. Such wartime movements in the discrepancy ratio can be interpreted broadly along the scale and scope of black markets. The ratio was high immediately after the government control was implemented in 1937. A reason for this immediate increase was that ineffective rationing helped to create black markets from the very beginning of the economic control (see Miwa (2015)). From the late 1938, stronger surveillance on illegal transactions by the police force contributed to a decline in the ratio. However, the ratio resumed increasing with less manpower in the police force and heavier involvement of military personnel and munitions factories in uncover dealings.

During the postwar period, on the other hand, black markets were most active in 1945 and 1946. Since then, they were gradually shrinking. Accordingly, the discrepancy ratio declined from 19.4% in 1946 to 5.9% in 1949. In 1949, the government lifted most of policy instruments for the economic control. Consequently, black markets disappeared up to the early 1950s.

Let us next take a look at the behavior of the GNE and GNI deflators together with the official prices, which were recorded in the wholesale/retail price indexes. As equations (5) and (6) implies, the official prices should be between the GNE and GNI deflators. As shown in Table 2 and Figure 3, however, the official prices were between both deflators only in 1939. For both wholesale and retail prices, the official prices were even above the GNE deflators in 1937 and 1938, and they were even below the GNI deflators for the years 1940-1949.

It is hard to imagine that the wholesale/retail price indexes failed to trace the actual official prices, which were completely observable. Hence, either deflator must have been subject to some biases. In particular, the GNI deflators might have been too high because the real share of intermediate goods procured from black markets ($\frac{V_{inter}^{bm}}{V_{final}^{om}+V_{final}^{bm}}$) would have been underestimated substantially. Such underestimation would have occurred when firms had been reluctant to report any transaction with illegal dealers in filing corporate tax returns. Accordingly, a substantial portion of purchases of intermediate goods from black markets might have been completely off the books. Given these possibilities that the transactions of intermediate goods in black markets were heavily underestimated, the EPA national accounts offers a lower bound for the size of black markets.

In the light of the above inconsistency between the GNE/GNI deflators and the official price indexes (wholesale/retail price indexes), equation (7) cannot be employed for deriving the real share of black markets ($\frac{V_{inter}^{bm}+V_{final}^{bm}}{V_{final}^{om}+V_{final}^{bm}}$). Thus, the share is approximated under the assumption that $P^{om} \approx \frac{P^{GNE}+P^{GNI}}{2}$. The black-to-official price ratios ($\frac{P^{bm}}{P^{om}}$) are available from the Bank of Japan

(1966) for the postwar period between 1946 and 1951, but they are not obtainable for the wartime period. Thus, the ratios are fixed at 3.0 for the latter period.

As reported in Table 3, the real share of black markets ranged between 3.3% and 6.3% for the wartime period, and between 3.5% and 8.7% for the postwar period. Given the black-to-official price ratios close to one, the ratio 2.4% in 1950 and 29.1% in 1951 are meaningless. As mentioned above, the EPA national accounts were likely to severely underestimate the real share of intermediate goods transactions in black markets. Thus, the real share of the black markets reported in Table 3 should be interpreted as its very lower bound.

3.3. Money finance under strong money demand from illegal dealers

Let us then move to the financial side of the national economy. Figure 4 depicts the time series of net public and private saving, into which the net national saving is divided. For the wartime period, the public sector were chronically suffering from negative saving, while the private sector saved substantially by pressure from the government. However, largely positive statistical discrepancies implies that both public and private agents still suffered from a severe financial shortage in spite of enormous private saving. For the postwar period, on the other hand, both public and private sectors with almost zero net saving faced a severe financial shortage in 1946. From 1947 through 1949, the public sector had improved its financial position substantially, but the private sector had been stagnant at zero saving.

How did the BoJ behave to compensate for such severe financial shortages for the wartime and postwar periods? As discussed in Section 2.3, a macroeconomic financial shortage, which was represented by the statistical discrepancy $SD_{n,t}$, was financed from black market income partly by money finance $\mu SD_{n,t}$, and partly by barter transactions between those in the formal economy and those in black markets $(1-\mu)SD_{n,t}$. As mentioned before, those in the formal economy employed as a mean of payment durables in households, inventories in firms, and secondhand homes[14] to barter for goods from black markets. Figure 5 depicts the time series of μ, or an

[14] When the Price Control Ordinance was enacted in 1939, house rents were heavily controlled, but the prices of housing and land were outside the scope of the Ordinance. In 1939, newly-built

increment in the BoJ notes relative to the statistical discrepancy $\frac{\Delta M_{n,t}}{SD_{n,t}}$. For the years 1937-1942, μ was relatively low, between 14.2% and 41.7%, but it soared to 53.9% in 1943 and 91.9% in 1944. That is, the economy-wide financial shortage was covered mainly by the BoJ in the last years of the Wars. In 1946, 1947, and 1948, on the other hand, μ was relatively high, above 40%, but it degenerated to zero in 1949.

As discussed in Section 2.3, the BoJ notes eventually flowed into black markets. As its flip side, illegal dealers lent resources to the BoJ by holding the BoJ notes as an instrument to conceal income. In this way, a money demand expanded with constant needs from illegal dealers. Figure 6 depicts the time series of Marshallian k ($\frac{M_{n,t}}{Y^E_{n,t}}$) as a measure of strength of money demand. Marshallian k started to increase steadily from 1937, and sharply from 1942. It was 13.1% in 1942, 16.1% in 1943, 23.8% in 1944, and 48.4% in 1945[15]. Because the official discount rate, a representative short-term interest rate, was constant at 3.3% for the years 1937-1945 (see Table 1), only strong money demand was responsible for a quick increase in Marshallian k. In the aftermath of the Wars, Marshallian k declined quickly from 19.7% in 1946 to 10.5% in 1949.

The BoJ notes held by those in black markets circulated outside a deposit (credit) creation mechanism. Accordingly, the ratio of the BoJ notes relative to the outstanding deposits of commercial banks increased dramatically. As shown in Figure 6, the ratio was below 15% before 1942, but it rose quickly to around 50% in 1945 and even beyond 90% in1947. That is, a substantial fraction of the BoJ notes stayed out of the banking system in the last years of the Wars and in their immediate aftermath.

One seemingly puzzling phenomenon was that the prices increased relatively mildly in spite of quite active money finance during the wartime period. For the years 1938-1945, the wholesale

houses were targeted by the price control, but secondhand homes were not. Consequently, the owners of secondhand homes had a strong incentive to sell own houses instead of lending them at cheap rents. According to Ono (2007), old houses were traded actively as a target of speculation in black housing markets during the years 1943-1944.

[15] The nominal GNE of 1945 is approximated according to the method described in footnote 11.

(retail) price index, either of which represented the official price, rose by 14.9% (13.1%) per year. Even with the transaction prices which reflected both official and black market prices, the GNE deflator increased by 29.6% per year. Let us see what would have happened to the price behavior in the absence of strong money demand from black market dealers. If Marshallian *k* had been constant at 10% during the Wars, then the GNE deflator would have soared by 61.7% per year.[16] As depicted in Figure 7, the GNE deflator would have been multiplied by 29.0 instead of 6.2 for the years 1938-1945.

3.4. On circulation of the BoJ notes

It is quite hard to obtain any quantitative observation of how the BoJ notes circulated in black markets under the strict price control, but there was one precious opportunity where the BoJ notes, which had been handed over from one illegal dealer to another, came to light in the formal economy. It was when the BoJ forced any holder of the notes to exchange the old bills for the new bills in February 1946.[17]

In December 1945, the government suggested that the BoJ might collect the old bills in exchange for the new bills. Their policy purpose was to capture black market income as precisely as possible, and impose capital levy on it as much as possible. Surprised by the intention of the government and the BoJ, illegal dealers rushed to trade any cash in hand for physical materials and food, and they in turn refused to sell their inventories for the old bills. Consequently, most black markets disappeared until the exchange for the new bills was completed in March 1946.

According to the Ministry of Finance (1986), the outstanding BoJ notes reduced dramatically from 61.8 billion yen on February 18th to 15.2 billion yen on March 12th upon the official

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[16] A counter-factual GNE deflator can be computed by $P_t^{GNE} = \frac{M_{n,t}}{m(i_t)Y_{r,t}^{GNE}}$ where $Y_{r,t}^{GNE}$ is the real GNE.

[17] More precisely, the government officially announced the Emergency Financial Measure on the evening of Saturday, February 16th. The measure included the following provisions. Firstly, the old bills would be invalidated by March 2nd. Secondly, deposits by the old bills at financial institutions could be made by March 7th (later revised to 9th). Thirdly, withdrawals from deposits by the new bills were severely restricted.

announcement on February 16th. The BoJ eventually collected the old bills by the amount of 50.3 billion yen. Among 50.3 billion yen old bills, 9.0 billion yen were collected from the rural districts of Southern Kanto, Tokai, and Kinki, while 8.1 billion yen from the urban districts of Tokyo and Osaka. These statistics indicated that illegal dealings were most active in agricultural and commercial sectors. After the new bills started to circulate, the outstanding BoJ notes resumed rising to 136.3 billion yen as of June 1947, and 230.5 billion yen as of June 1948. The distribution of the new bills shifted from agricultural sectors to commercial sectors. The Ministry of Finance (1986) mentioned that the new bills continued to be held by illegal dealers by citing a word in vogue 'the new rich with the new bills' (新円成金, shin-en narikin).

4. Conclusion

The economic situation addressed by this paper is quite ironical in the sense that the BoJ's direct underwriting was necessitated by the emergence of black markets under the strict price control. In response to a severe material shortage since 1937, the Japanese government initiated a controlled economy, and allocated scarce resources preferentially to the munitions industry during the Wars and the heavy industry after the Wars. The price control induced a part of aggregate income to leak to black markets, and drove the formal economy into a serious financial shortage. Given shrinking formal income, the government could neither impose more taxes on those in the formal sectors, nor issue more public bonds/money to them. Then, the only feasible fiscal instrument to fund a huge fiscal need was for the BoJ to underwrite public bonds from the government. The income leakage to black markets itself created a large space for the BoJ notes in black markets, where illegal dealers were willing to hold the notes to conceal income. Then, the impact of the BoJ's direct underwriting on the prices had been weakened to the extent that money demand from black markets was strong. In this way, the government financed resources *indirectly* from black markets by the BoJ's underwriting of public bonds for the thirteen years (1937-1949).

One important lesson for currency reforms available from the above historical explorations is that black market transactions were not created by the BoJ notes, but their emergence

necessitated the notes as a fiscal tool to finance once-leaked resources from black markets back to formal ones. Given such a reverse causality from black markets to central bank notes, the abolition of central bank notes, as proposed by Rogoff (2016) and others, might not necessarily result in the disappearance of black markets. Suppose that in a currency reform, any uninscribed nature is stripped from central bank notes, say by attaching inscription to each digital currency account, and forcing all bank-note holders to exchange paper currency for digital currency. Then, such digital currency issued by a central bank would not circulate in black markets. However, privately-created sophisticated digital currency with uninscribed nature might take over the role performed previously by central bank notes to reduce the friction between formal and black markets. It would be extremely difficult to separate money as an absolute evil to evade taxes from money as a necessary evil to connect black markets to formal ones.

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Table 1: Comparison with Morita index (standardized as of 1936)

	BoJ		Morita index				EPA	
	official price		(3) effective wholesale price		(4) effective retail price		(5) GNE deflator	
	(1) wholesale	(2) retail		relative to (1)		relative to (2)		relative to (1)
1936	100.0	100.0	100.0	1.00	100.0	1.00	100.0	1.00
1937	121.4	109.4	118.9	0.98	108.6	0.99	105.8	0.87
1938	128.1	125.3	125.7	0.98	120.3	0.96	117.3	0.92
1939	141.5	140.4	145.4	1.03	134.8	0.96	144.2	1.02
1940	158.4	163.1	170.7	1.08	175.0	1.07	183.7	1.16
1941	169.7	165.0	184.2	1.09	204.1	1.24	206.7	1.22
1942	184.6	169.8	235.9	1.28	265.6	1.56	251.0	1.36
1943	197.5	180.2	266.5	1.35	312.3	1.73	291.3	1.48
1944	223.8	201.7	325.0	1.45	390.0	1.93	355.8	1.59

Table 2: Deflators, price indexes, and official discount rates (1934-1936 as base years)

	GNE deflator	GNI deflator	wholesale price index	retail price index	official discount rate
1930	1.03	1.02	0.89	1.01	5.4%
1931	0.90	0.89	0.75	0.89	5.4%
1932	0.93	0.95	0.83	0.89	5.3%
1933	0.98	1.01	0.95	0.95	4.0%
1934	0.97	0.96	0.97	0.97	3.7%
1935	1.01	1.03	0.99	0.99	3.7%
1936	1.04	1.07	1.04	1.04	3.4%
1937	1.10	1.03	1.26	1.14	3.3%
1938	1.22	1.08	1.33	1.30	3.3%
1939	1.50	1.35	1.47	1.46	3.3%
1940	1.91	1.77	1.64	1.70	3.3%
1941	2.15	2.01	1.76	1.72	3.3%
1942	2.61	2.38	1.91	1.77	3.3%
1943	3.03	2.76	2.05	1.87	3.3%
1944	3.70	3.30	2.32	2.10	3.3%
1945	0.00	0.00	3.50	3.08	3.3%
1946	43.70	35.24	16.27	18.93	3.4%
1947	109.40	93.44	48.15	50.99	3.7%
1948	191.40	165.98	127.90	149.60	4.5%
1949	233.30	219.48	208.80	243.40	5.1%
1950	243.00	241.83	246.80	238.10	5.1%
1951	295.30	286.83	342.50	309.50	5.3%

Table 3: Real share of black markets

	black-to-official ratio	real black market share
1937	3.0	3.5%
1938	3.0	6.3%
1939	3.0	5.3%
1940	3.0	3.9%
1941	3.0	3.3%
1942	3.0	4.7%
1943	3.0	4.7%
1944	3.0	5.8%
1945		
1946	7.2	3.5%
1947	5.3	3.7%
1948	2.9	7.5%
1949	1.7	8.7%
1950	1.2	2.4%
1951	1.1	29.1%

Figure 1-1: Money finance in a standard model

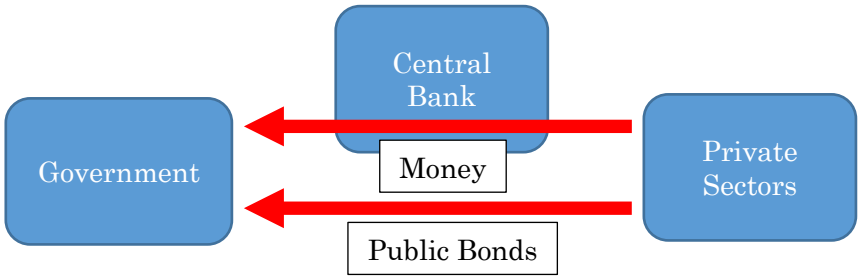


Figure 1-2: Money finance in the presence of black markets

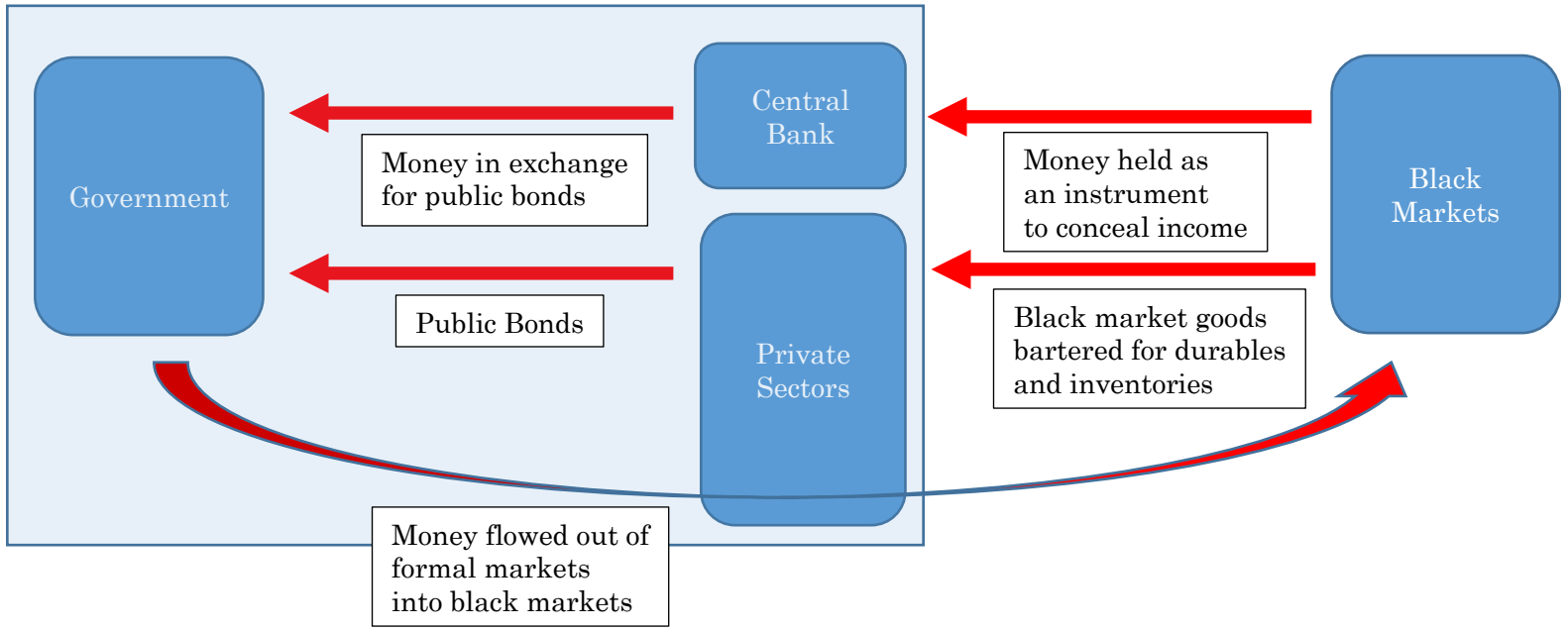


Figure 2: Net investment, net national saving, and statistical discrepancy

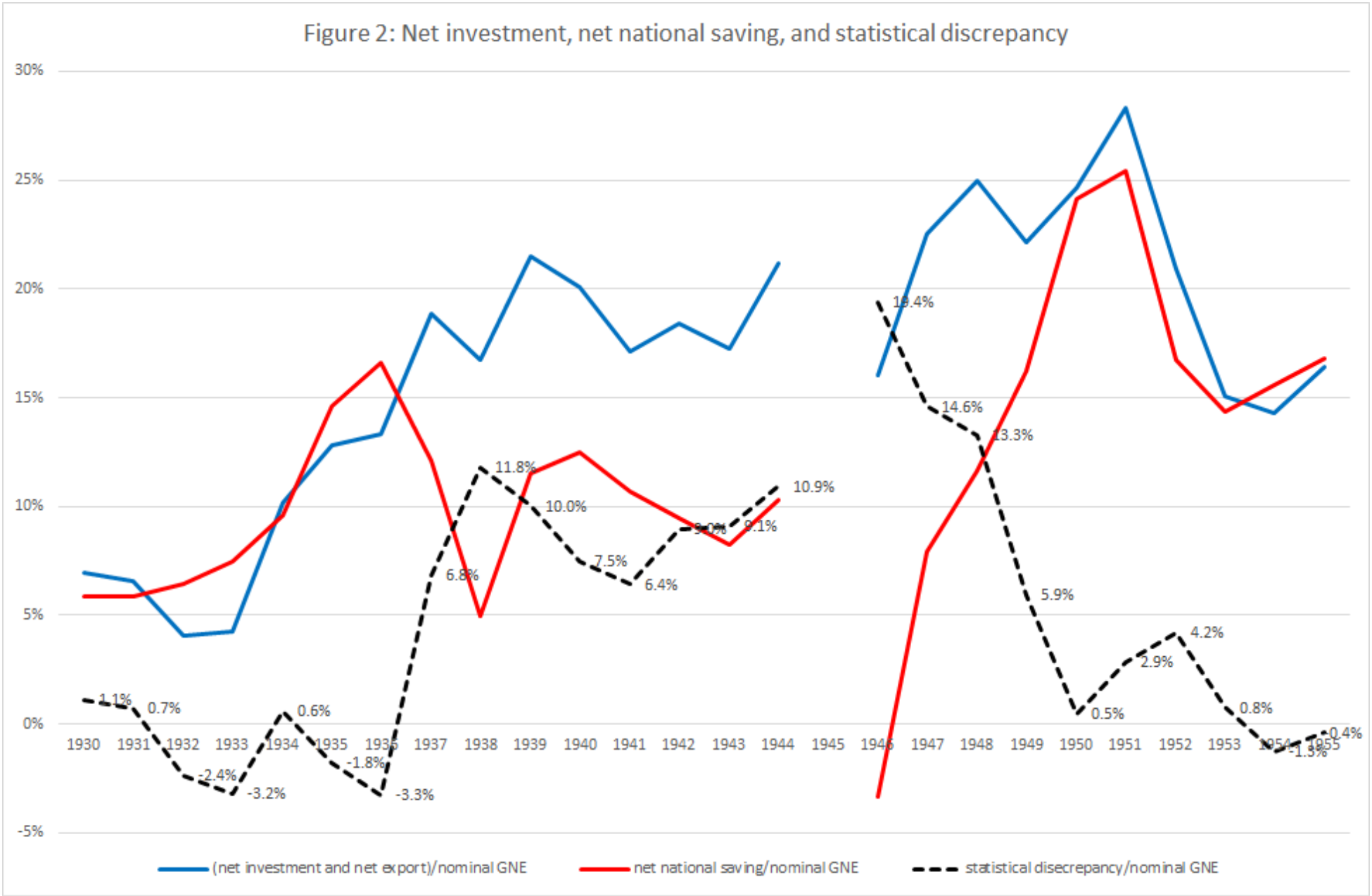


Figure 3: A comparison among GNE deflator, GNP deflator, and wholesale price index in logarithm (base years: 1934-1936)

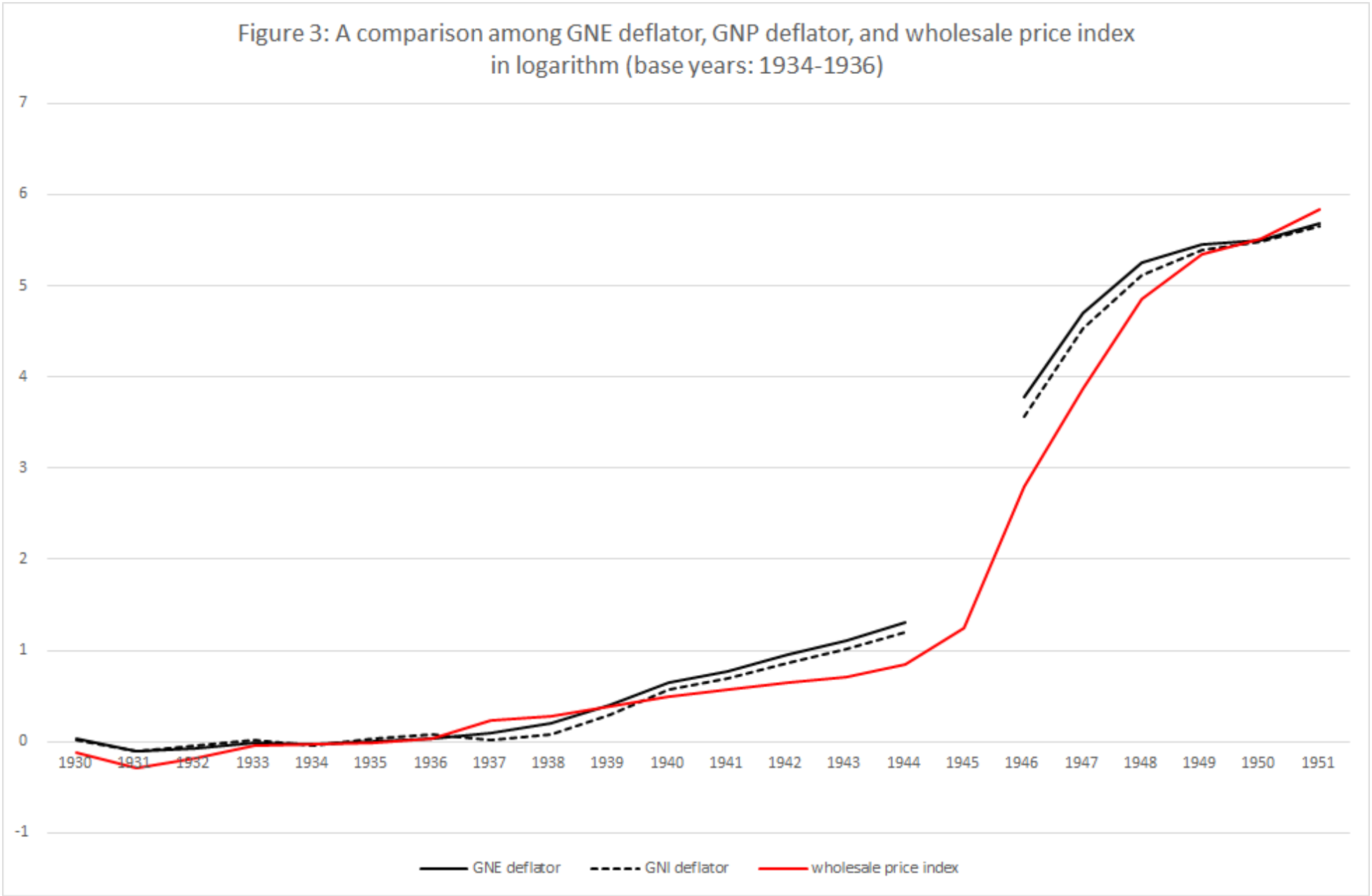
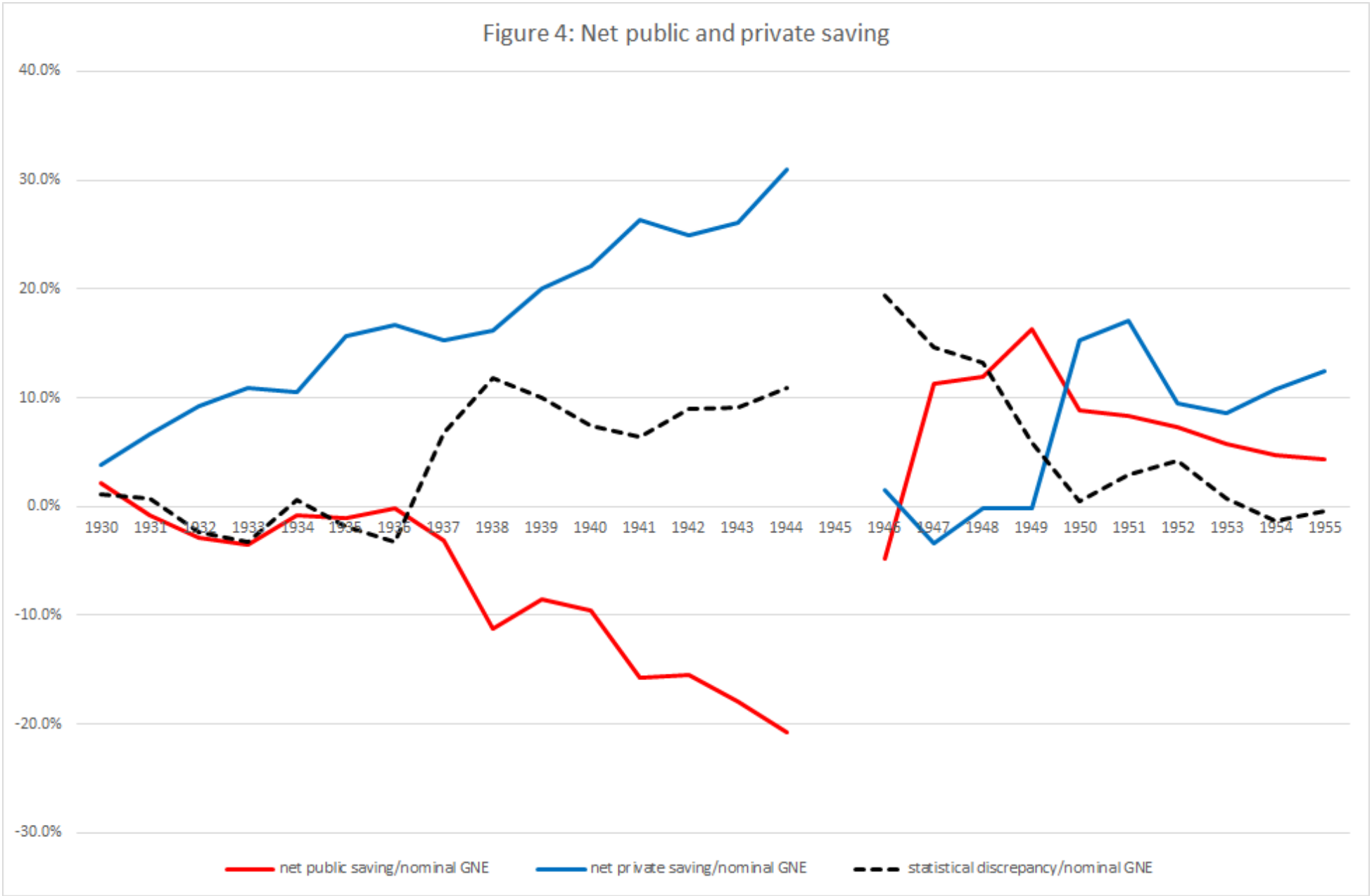
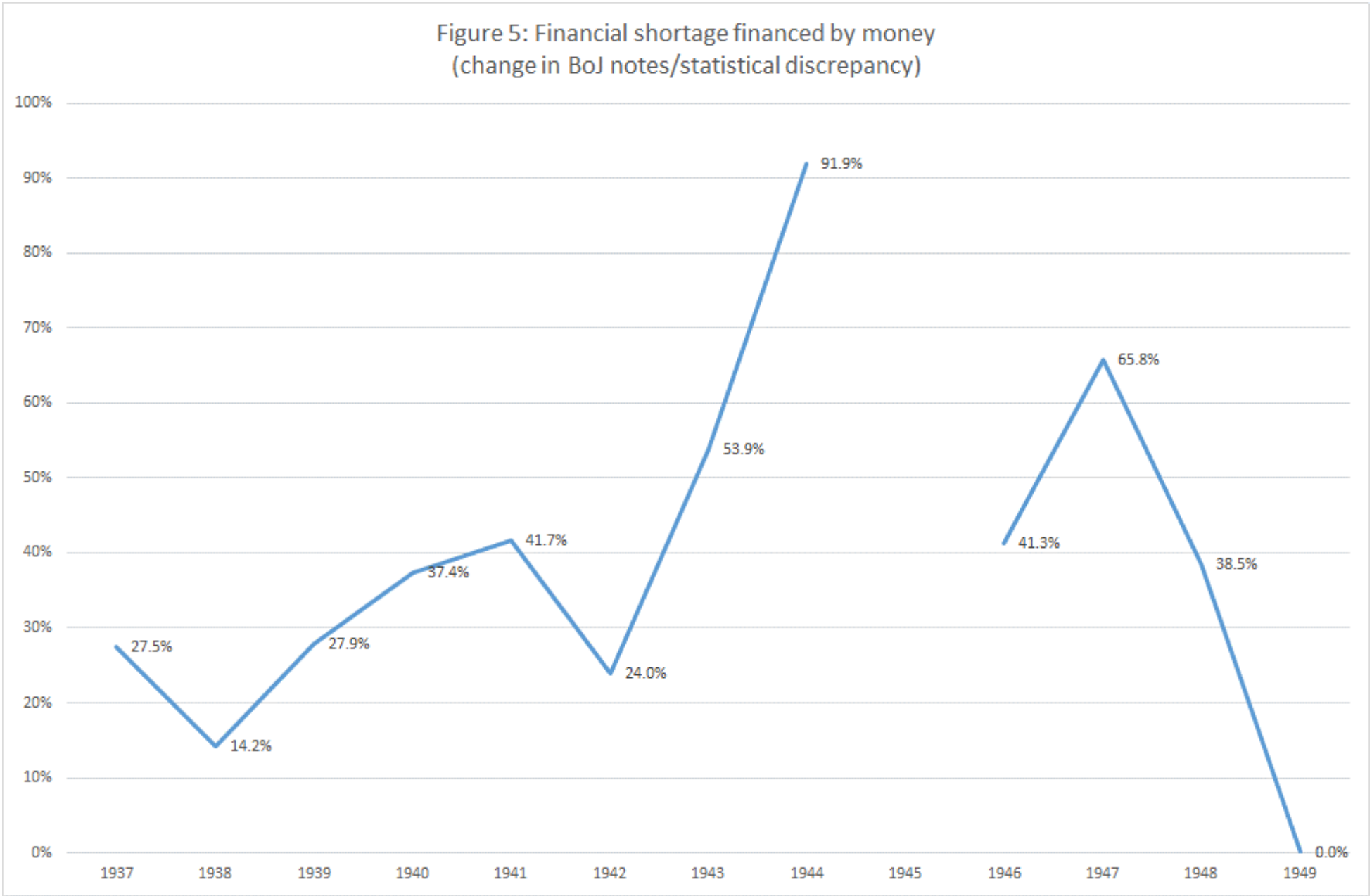
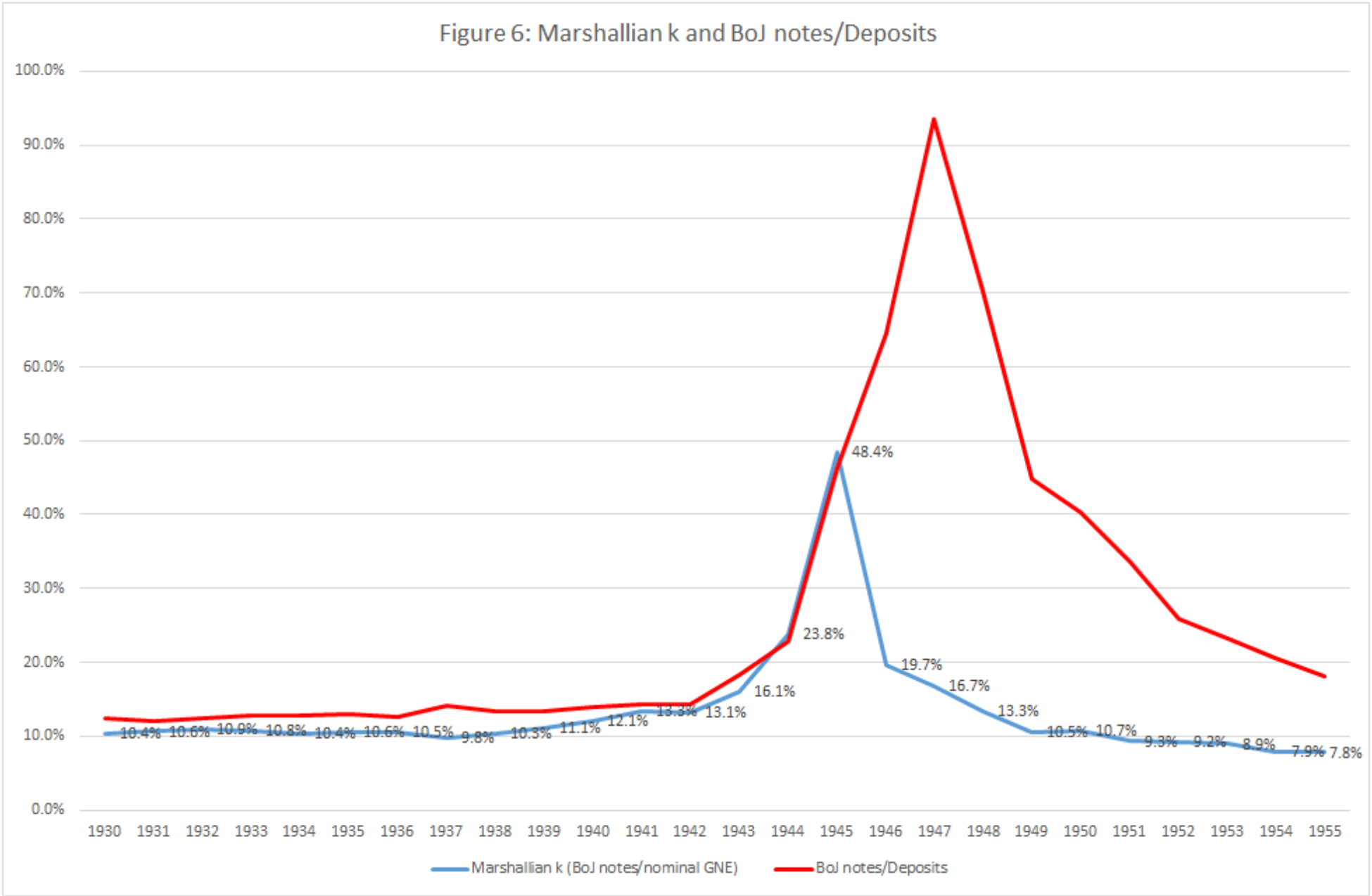
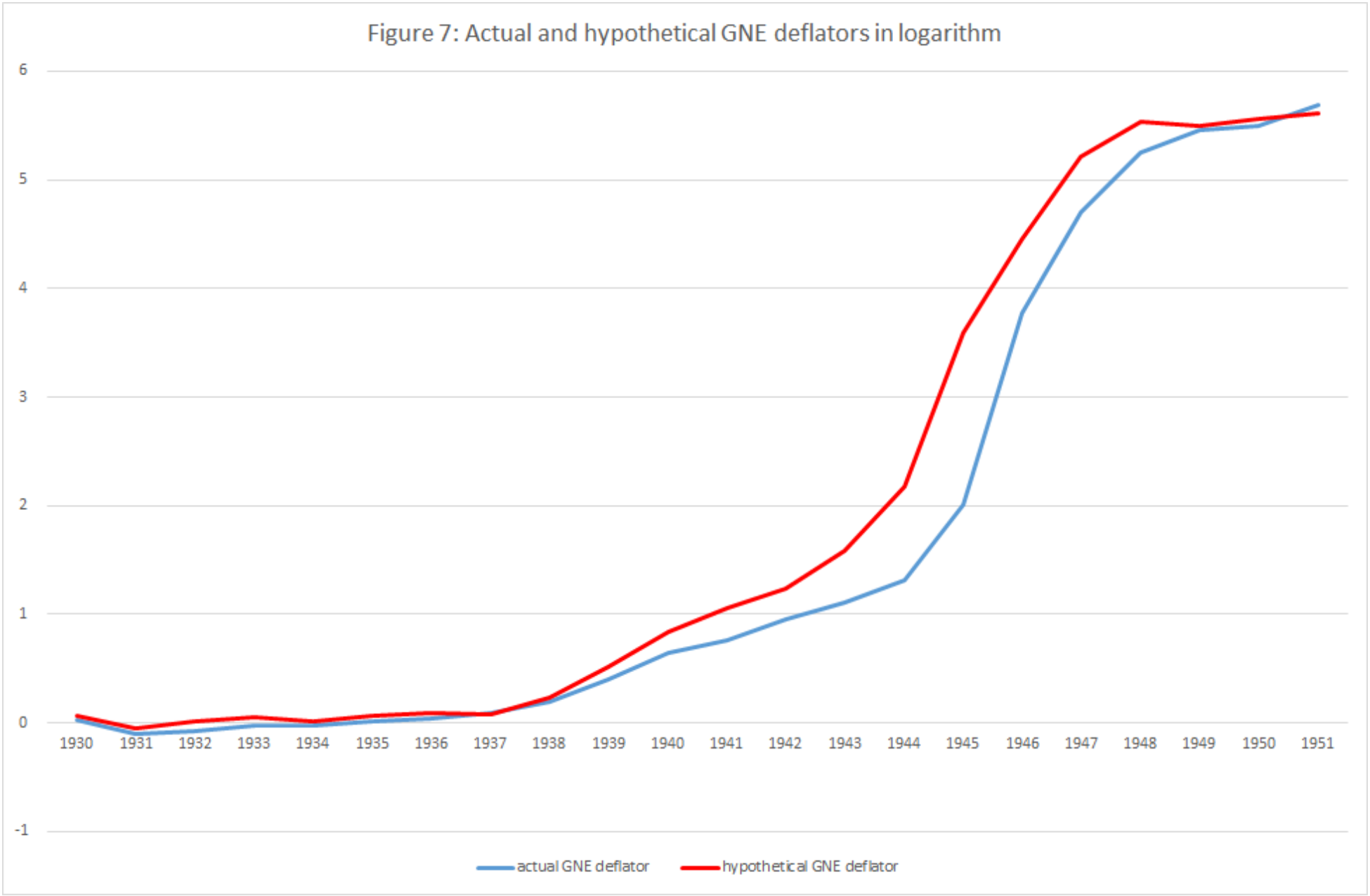


Figure 4: Net public and private saving




Figure 5: Financial shortage financed by money
(change in BoJ notes/statistical discrepancy)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
27.5%
14.2%
27.9%
37.4%
41.7%
24.0%
53.9%
91.9%
41.3%
65.8%
38.5%
0.0%


Figure 6: Marshallian k and BoJ notes/Deposits
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955
10.4% 10.6% 10.9% 10.8% 10.4% 10.6% 10.5% 9.8% 10.3% 11.1% 12.1% 13.3% 13.1% 16.1% 23.8% 48.4% 19.7% 16.7% 13.3% 10.5% 10.7% 9.3% 9.2% 8.9% 7.9% 7.8%
Marshallian k (BoJ notes/nominal GNE)
BoJ notes/Deposits


Figure 7: Actual and hypothetical GNE deflators in logarithm
6
5
4
3
2
1
0
-1
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
actual GNE deflator
hypothetical GNE deflator