Economic Fluctuations in Japan during the Interwar Period: Re-Estimation of the LTES Personal Consumption Expenditures

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To date, most research on interwar period economic fluctuations in Japan has been based on Estimates of Long-Term Economic Statistics of Japan since 1868 *(LTES), edited by Kazushi Ohkawa* et al. *Regardless, the LTES data are just one set of estimations. They require scrutiny, especially for the measurement of personal consumption, which has a high weight in the gross national expenditure. This paper re-estimates the LTES personal consumption expenditures by adjusting the estimation methods for certain expense categories and deducting imputations (which may have a large measurement error), and then calculates real GDP (adjusted real GDP) focusing on the market economy. The re-estimation presents no major changes from the LTES in the shape of the economic fluctuations of the 1920s, when the Japanese economy continuously posted "unbalanced growth." From the Showa Depression forward, however, while the LTES shows continued positive real GDP growth, the re-estimation indicates negative growth in adjusted real GDP in 1931. These findings remain robust after considering the bias from the deflator formula. Given the characteristics of the national accounts and the measurement error, these re-estimation results suggest that the severity of the Showa Depression may have been underestimated in the prior research.*

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I. Introduction

Many analyses have been conducted on the growth and fluctuations of the Japanese economy since the Meiji Period (1868–1912) based on *Estimates of Long-Term Economic Statistics of Japan since 1868* (LTES), edited by Kazushi Ohkawa *et al.*[1] Early research on the interwar period[2] Japanese economy tended to stress a crisis of Japanese capitalism, using such terms as "chronic recession" and "great depression." Since the publication of Nakamura (1971), however, the research has mostly advanced under the notion that "Japanese economy was actually growing quickly by international standards,"[3] as indicated by the LTES.

While there were some estimates of macroeconomic statistics prior to the LTES, the LTES reviews their estimation methods and provides massive statistical data systematically prepared in accordance with the internationally recognized System of National Accounts (SNA). In that sense, the LTES are indispensable fundamental statistics for economic historians, and for that reason they have been called an "everlasting achievement."[4]

Despite their reputation, the LTES are still just one set of estimations based on limited underlying data and several assumptions. Miyohei Shinohara, who prepared the LTES personal consumption estimates, viewed estimating personal consumption— which has a high weight as a component in gross national expenditure (GNE)—as "the most difficult field."[5] So due caution to the statistical accuracy is required when making analyses using the LTES.[6] Additionally, under the SNA, personal consumption expenditures incorporate imputations, which evaluate expenditures that are not actually paid in the market. Estimation errors in such imputations may have had a great influence during the prewar (pre-World War II) period, with its large share of non-market transactions.

Of course, LTES editors Kazushi Ohkawa and Miyohei Shinohara were well aware of these estimation problems, which were noted when the LTES were first published. Sato (1979) noted the issues and problems through "assessments and close scrutiny," and Nakamura (1979) discussed the "accuracy of the LTES." Since that time, however, the statistical verifications of the LTES have not been sufficient, perhaps because the LTES are such a huge body of statistics.

Japan's economic fluctuations during the interwar period, following the Showa Depression, have been attracting a great deal of attention in recent years because of the deflation suffered by the Japanese economy in the past decade. One issue for economic history research is to statistically re-examine the LTES and gain a more accurate grasp of the fluctuations in the Japanese economy during the interwar period. Considering how econometric analysis has become easier in recent years, it is now more important than ever before to scrutinize the fundamental historical statistics, including the

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1. While some of the statistics were revised in Ohkawa and Shinohara (1979), this paper refers to all the versions including the 1979 edition as "LTES."
2. This paper defines 1918 through 1936 as the "interwar period."
3. Nakamura (1983, p. 156).
4. Sato (1981a, p. 10).
5. Shinohara (1967, p. 49).
6. Under the LTES values, real personal consumption expenditures account for 84 percent of GNE in 1924–26 and for 70 percent in 1934–36, ten years later.

year-to-year fluctuations in the data. Fortunately, some of the LTES base data and worksheets were made available to the public three years ago.[7] Accordingly, this paper examines the LTES interwar period personal consumption expenditure estimations, prepares new estimates, and then examines the macroeconomic fluctuations at that time focusing on personal consumption expenditures.

The remainder of this paper is structured as follows. Section II reviews how the prior LTES-based research grasps the economic fluctuations during the interwar period. Section III examines the LTES estimation methods focusing on personal consumption expenditures, summarizes the estimation characteristics and problems, and conducts the re-estimation. The re-estimation revises the contents of certain personal consumption expenditures, changes the deflator index formula, and deducts imputations. Section IV discusses the re-estimation results from Section III and the real GDP figures based on them in light of the historical facts of the time, and finally summarizes the economic fluctuations during the interwar period.

II. Prior Research on Interwar Period Economic Fluctuations

The series of research by Takafusa Nakamura on the macroeconomic developments in the Japanese economy is well known for summarizing the facts based on the LTES and related statistics, and for building up the foundations for future economic history research. Nakamura refuted the then-dominant view that the interwar period Japanese economy could be characterized by "panics and the advance of monopolies." His analyses show "how growth could occur in the midst of these panics" based on the statistical fact that during this period "the Japanese economy was actually growing fast by international standards."[8],[9]

Looking at the LTES real GNE figures (Figure 1), we see that while negative growth was posted during the postwar depression in 1920, 1922, and 1923, high growth rates were recorded in 1921, 1924, and 1925. What is more, the LTES real GNE does not show any negative growth from 1926 to 1936, a period which includes the Showa Depression following the onset of the Great Depression abroad. These developments do not change significantly when the figures are converted to GDP, which is used as the standard today.[10] Nakamura's analysis incorporates a great deal of statistical data aside from the LTES, and it is well known that the 1920s was a period of "unbalanced
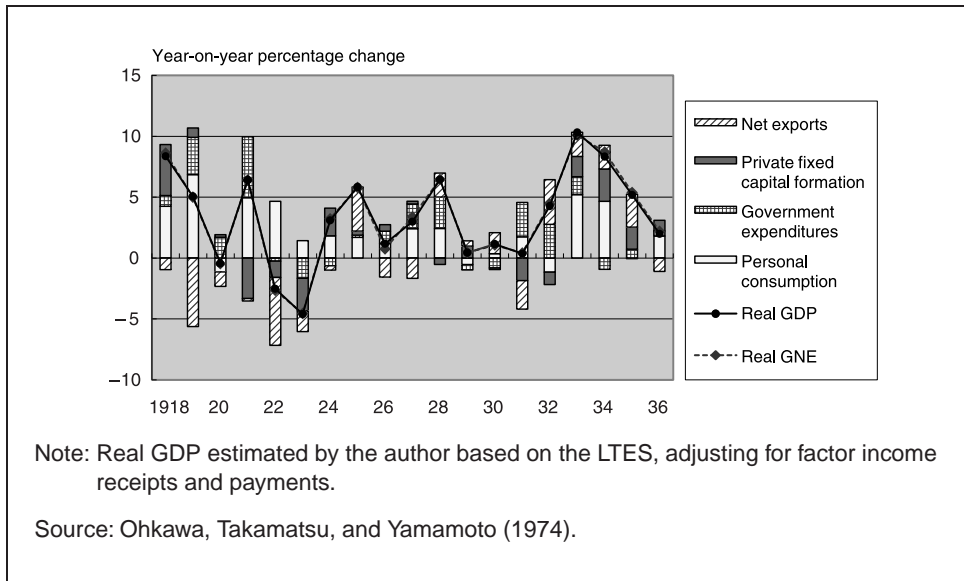
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7. In 2005 a total of 20 volumes of materials (Institute of Economic Research [2005]) were released and can currently be viewed at the institute's Research Center for Information and Statistics of Social Science. However, these constitute only part of the LTES base materials and are not always sufficient to identify the details of the estimations.

8. Nakamura (1983, p. 156).

9. Strictly speaking, when Nakamura (1971), which is the original Japanese version of Nakamura (1983), was published, the LTES had been published as the expenditure components sections in Shinohara (1967), but because Ohkawa, Takamatsu, and Yamamoto (1974) had not yet been published, the GNE figures were recomposed by Nakamura himself.

10. While Ohkawa, Takamatsu, and Yamamoto (1974) estimate the GNE (gross national product [GNP]), considering that the domestic concept is more appropriate to express changes in the real economy, this paper estimates gross domestic product (GDP) from the LTES GNE adjusted for the payment of factor income using data from Yamazawa and Yamamoto (1979). Incidentally, under the current 93SNA the former GNE is arranged as gross national income (GNI).

Figure 1 LTES Real GNE and Contribution Analysis

Note: Real GDP estimated by the author based on the LTES, adjusting for factor income
      receipts and payments.

Source: Ohkawa, Takamatsu, and Yamamoto (1974).

growth" under a dual structure, with a large gap between traditional and modern indus-
tries. Nakamura (1989b) writes, "Even during the Showa Depression the growth rate in
real GNP just declined somewhat, with no negative growth whatsoever." He says that
in contrast with the drop in nominal GNP, the slump at that time may be characterized
as a "price recession."[11]

Sato (1981b) uses the LTES for econometric analysis under a macroeconomic
framework, and asserts, "The Japanese economy during the interwar period was mostly
controlled by the price elasticity mechanism."[12] Sato regresses the rate of change in
prices and the real growth rate respectively on the relative structure between invest-
ments and imports, and backs up his hypotheses by showing that the parameter for the
former is larger. This way of thinking was not only adopted by Nakamura, but also
became the starting point for the understanding of the issues in the series of research
recorded in Yoshikawa and Okazaki (1990). Incidentally, the latter includes Yoshikawa
and Shioji (1990), which—while agreeing that nominal prices during the prewar period
were elastic—disagrees with the viewpoint that "the fluctuations in volume (in the real
economy) were minor." Yoshikawa and Shioji (1990) conduct a quantity index analysis
using warehouse entry and exit data and conclude that "at least concerning the modern
industrial sector, the quantitative fluctuations were very large."[13]

On the other hand the analyses in Takeda (1983) and Hashimoto (1984), which
grasp the economic fluctuations during the interwar period as the capital accumulation
process of a developing capitalist country, analyze the actual conditions of the economic

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11. Nakamura (1989b, p. 304).
12. Sato (1981b, p. 10).
13. Yoshikawa and Shioji (1990, p. 175).

structure at that time based on the facts presented by the LTES. For example, Takeda (1983) states that considering how private consumption expenditures continued to grow during the 1920s amid stagnant capital investment, "the increased consumption level following the middle of the World War I boom played an important role in economic trends, at least through the mid-1920s … although this should not be overestimated considering the stagnation of employment and the formation of the dual structure."[14] Addressing the period from 1930 onward, Hashimoto (1984) first summarizes that "the Great Depression in Japan is characterized by continued real GNE growth despite some stagnation and severe price declines," and then proceeds with a detailed analysis.[15] Although we do not investigate these papers any further here, much of the prior research in recent years depicts the interwar period as a time of economic fluctuations amid a framework of "growth" or "expansion" in real GNE (GDP).[16]

III. Re-Estimation of Personal Consumption Expenditures

A. Statistical Characteristics of the LTES

The LTES are sophisticated estimated statistics following the SNA framework. The SNA was first discussed among international organizations from around World War II, and implemented by the United Nations in 1953.[17] More comprehensive standards that include stock figures were established in 1968, and today the "93SNA," which were announced in 1993, are the international standard. The LTES were created along with these developments in the SNA, and their basic estimation methods are not different from those of the present 93SNA. In this paper, we view the overall real economy based on GDP, but as noted in the previous section the movements in GNE as estimated by the LTES do not substantially differ from those of GDP. The following detailed examinations of personal consumption expenditures incorporate some differences in definitions from the 93SNA, but these can be ignored for this estimation of historical statistics based on limited data.[18]

Nevertheless, it is necessary to give careful consideration to the estimation accuracy, because the base data for estimating historical statistics is limited. Sato (1979) discusses the problems with the LTES estimation framework, data reliability, and data processing. Regarding the estimation framework, he says that for expenditures "the problem is the inventory investment series is not estimated as an independent

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14. Takeda (1983, p. 350).
15. Hashimoto (1984, p. 165).
16. Research on the real economy during the prewar period includes Matsumoto (2004), which conducts original analyses by estimating the regional input-output table and income by prefecture.
17. The history of the SNA runs back to the International Conference on Economic Statistics organized by the League of Nations in 1928. The League of Nations announced estimated values for 26 countries for the first time in 1939. Thereafter, examinations of an internationally comparable system were advanced by a League of Nations committee of statistics experts. *Measurement of National Income and the Construction of Social Accounts,* which was released in 1947, is generally viewed as the foundation of the SNA.
18. The 93SNA divides household consumption expenditures into "final consumption expenditures" and "actual final consumption." In addition, general government transfer expenditures (expenses for textbooks, etc.) were included in personal consumption under the standards prior to 1993, but under the 93SNA these are not usually included in household "final consumption expenditures" when used as a GDP component, but rather remain in government expenditures at that stage.

component." As noted below, this requires sufficient consideration when examining personal consumption expenditures. Sato (1979) also points out the large statistical discrepancies between production and expenditures. Such statistical errors are inevitable because the estimation of personal consumption, which determines a substantial portion of the fluctuations in GDP and has an overwhelming weight among expenditure components, is the most difficult area. Sato (1979) also says there were some "copying errors at the worksheet stage" that could result in a major misreading of the actual conditions if analyses apply the LTES without considering these points.[19]

Nakamura (1978) notes that while historical statistics "have fundamental importance for research on economic history and economic development" they "require the greatest caution in their application, because the estimation results may change due to the limitations of the base materials."[20] The need to scrutinize statistics that are the basis for analysis remains unchanged for a quantitative grasp of history, even for well-established statistics such as the LTES. We now proceed to focus on personal consumption expenditures under the LTES.

B. The Personal Consumption Expenditures Estimation Method

The base data for the LTES personal consumption expenditures is Shinohara (1967), *Estimates of Long-Term Economic Statistics of Japan since 1868 6—Personal Consumption Expenditures* (hereafter, "the Shinohara estimates"). Ohkawa, Takamatsu, and Yamamoto (1974), *Estimates of Long-Term Economic Statistics of Japan since 1868 1—National Income,* which compiles the GNE estimates, essentially uses the Shinohara estimates as they are, aside from a few adjustments.[21] For that reason, we also advance the discussion here centered on the Shinohara estimates.

For goods, the Shinohara estimates' basic approach is to jointly use the commodity flow method and the retail valuation method at the subdivided item level. The commodity flow method starts with the production value data, adjusts for inventory fluctuations, imports and exports, and obtains final consumption by adding transportation and retail and wholesale margins at each stage from producers to households. In the Shinohara estimates, clothing expenses are a typical case for the application of the commodity flow method. The retail valuation method conducts similar calculations beginning from production volume data, obtains final consumption volume, and then multiplies this by the retail price to gain final consumption value. Most food expenses are estimated in this way. These estimation methods are both standard under the SNA, and may be considered accurate. The estimations of services basically follow an approach that is close to the commodity flow method at the item level. Compared with goods, the services items are rough and small in number, but overall they are viewed as the best possible given

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19. The wrong value for the 1924 import deflator was a major error in Ohkawa, Takamatsu, and Yamamoto (1974) (inconsistent with Ohkawa *et al.* [1967]). Because this was an error from the worksheet stage, it affected the real imports presented in Ohkawa, Takamatsu, and Yamamoto (1974) and even significantly changed the real GNE estimate. The error is corrected in the English-language version of Ohkawa and Shinohara (1979). Incidentally, real GDP calculated in Section II of this paper is converted to real terms using the correct deflator.

20. Nakamura (1978, p. 9).

21. Ohkawa, Takamatsu, and Yamamoto (1974) judges that the regional consumer food price differentials in Shinohara (1967) are too low and make some adjustment for that in the nominal values, but with no adjustments in the real series, and so on.

the limited data. Accordingly, this paper does not undertake a fundamental revision of the Shinohara estimates from the item level.

The point requiring attention in the Shinohara estimates is that inventory investment is not separated as an expenditure component. Under both the commodity flow method and the retail valuation method, personal consumption is basically estimated from the supply side, that is, from the supply of consumption goods, so it includes items that were produced but not consumed. Especially for items like clothes, which have large inventory fluctuations, Shinohara (1967) calls attention to "the need to note that the percentage of clothing expenditures fluctuates more acutely than in reality" and that "this is apparently the result of partially omitting inventory adjustments at the production and distribution stages in the process of using the commodity flow method to estimate clothing expenditures."[22] Incidentally, Yoshikawa and Shioji (1990) calculate the coefficient of variation for each of the GNE components using the LTES, note that "consumption was very unstable in the Japanese economy during the prewar period," and state that "the cause of this unstable movement of consumption is not clear."[23] One possible answer to this question may be the failure to exclude inventory fluctuations in personal consumption expenditures.

C. Problems and Re-Estimations by Expenditure Item

While it is important to note that the personal consumption expenditures in the Shinohara estimates include items that were not actually consumed but rather accumulated as inventory, the Shinohara estimates are fundamentally solid estimates prepared in line with the SNA framework. Still, there are some problems with the estimation methods when the individual expenditure items are examined in detail. There is room for improvement in the estimation methods for the interwar period, for example, by using alternative statistics. There are also data copying errors that affect the overall findings.

Accordingly, we now re-estimate the following items as categorized under the Shinohara estimates: bread and confectionary (in food expenses), clothing expenses, medical and personal care expenses, and utilities expenses.

First we consider food expenses, which have the greatest weight in consumption. Food expenses account for more than 50 percent of total consumption in the Shinohara estimates, which seems rather high (Table 1) compared with the figures under the Cabinet Statistics Bureau's *Family Income and Expenditure Survey* and the Ministry of Agriculture and Forestry's *Farm Household Economy Survey* implemented during the interwar period.[24] Shinohara himself mentions the values under the *Family Income and Expenditure Survey* and *Farm Household Economy Survey* from the viewpoint of checking the accuracy of statistics estimated from the supply side with demand statistics. He notes that the *Family Income and Expenditure Survey* food expenses do not cover food

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22. Shinohara (1967, p. 29).
23. Yoshikawa and Shioji (1990, p. 170).
24. The *Family Income and Expenditure Survey* was first implemented in 1927 (covering the period from September 1926 to August 1927), so the comparison was made for two periods including 1936, which is at the end of the analysis in this paper. *The Family Income and Expenditure Survey* items compared here are total figures combining the figures for salaried employees and laborers.

Table 1 Personal Consumption Expenditures Expense Items: A Comparison

Constituent share, percent

		Food expenses	Clothing expenses	Housing expenses	Utilities expenses	Medical and personal care expenses	Transportation expenses	Communications expenses	Entertainment expenses	Education, amusement and other expenses	Total
1927	Shinohara estimates	55.96	10.56	11.53	4.31	4.03	3.18	0.56	3.38	6.48	100.00
	Family Income and Expenditure Survey	37.21	13.43	16.96	4.59	6.36	1.46	0.31	7.61	4.11	100.00
	Farm Household Economy Survey	44.30	8.73	5.44	6.56	4.99	—	—	7.45	22.53	100.00
1936	Shinohara estimates	50.24	13.70	12.01	4.22	5.23	3.26	0.68	2.74	7.93	100.00
	Family Income and Expenditure Survey	37.91	11.43	16.95	5.02	6.89	1.55	0.36	8.13	5.18	100.00
	Farm Household Economy Survey	46.44	9.46	6.38	4.56	4.59	—	—	7.93	20.64	100.00

		Rice	Barley	Other grains	Fish	Meat, eggs and milk	Beans and vegetables	Dry goods	Tofu, boiled food and pickles
1927	Shinohara estimates	15.68	0.95	0.75	5.45	3.51	4.45	—	—
	Family Income and Expenditure Survey	13.73	0.19	0.38	3.28	1.95	2.67	0.42	2.01
1936	Shinohara estimates	14.05	0.80	0.76	5.41	3.59	2.86	—	—
	Family Income and Expenditure Survey	13.30	0.11	0.82	3.03	1.95	2.83	0.49	1.72

		Canned and bottled goods	Seasonings	Takeout and outside meals	Alcoholic beverages	Cigarettes	Confectionary and fruits	Other beverages	Total
1927	Shinohara estimates	0.38	4.67	—	9.85	2.45	6.13	1.70	55.96
	Family Income and Expenditure Survey	—	3.17	2.60	2.34	1.32	2.65	0.49	37.21
1936	Shinohara estimates	0.34	4.11	—	8.09	2.38	6.15	1.71	50.24
	Family Income and Expenditure Survey	—	3.17	3.10	1.75	1.37	3.85	0.43	37.91

Sources: Shinohara (1967); Cabinet Statistics Bureau, *Family Income and Expenditure Survey*; and Ministry of Agriculture and Forestry, *Farm Household Economy Survey*.

expenses categorized under childcare expenses, gift-giving expenses, travel expenses, or ceremonial occasion expenses, and holds that this explains the higher weight of food expenses under the Shinohara estimates. According to Shinohara, once these other food expenses are considered, "the actual weight of food expenses in total consumption under the *Family Income and Expenditure Survey* rises to 39–48 percent."[25]

Examining this point in detail, we compare the Shinohara estimates with the *Family Income and Expenditure Survey* figures for specific expense items (Table 1), and find that alcoholic beverages show the greatest divergence between the two, as measured by the percentage of each expense item in total consumption. Alcoholic beverages account for nearly 10 percent of total consumption in 1927 and more than 8 percent in 1936 in the Shinohara estimates, but for just about 2 percent of total consumption in the *Family Income and Expenditure Survey*. The Shinohara estimates for alcoholic beverages are based on the Ministry of Finance's *Tax Bureau Statistics Annual Report,* and may be said to have a high level of statistical accuracy. So it is highly probable that the *Family Income and Expenditure Survey* viewed alcoholic beverages as enterprise expenses rather than household expenditures. Shinohara notes, "It finally became clear in the postwar analyses that cigarettes and alcoholic beverages came to be largely omitted from the *Family Income and Expenditure Survey.*"[26] Thus, the alcoholic beverages figures in the *Family Income and Expenditure Survey* may have been underestimated.

Aside from alcoholic beverages, food items with a wide divergence include confectionary and fruit. Although the gap is not as great as that for alcoholic beverages, the Shinohara estimates for confectionary and fruits are more than 6 percent of total consumption, while the *Family Income and Expenditure Survey* figures are less than 3 percent in 1927 and under 4 percent in 1936. The *Family Income and Expenditure Survey* may have classified some confectionary and fruit consumption as gift-giving expenses. However, Shinohara himself referred to the confectionary estimation as "one of the most difficult,"[27] and it is possible that the Shinohara estimates are too high.

The flow of the Shinohara confectionary estimates is roughly as follows. The value of shipments is calculated by multiplying the raw materials use ratio obtained from unreleased industry documents (1938) by the ratio of shipment volume to the value of raw materials used, estimated from postwar (1958) data. The margin is added to calculate the 1938 consumption value, which is then used as a benchmark to estimate the time-series data using the growth rate in the confectionary manufacturing volume from the Ministry of Agriculture and Forestry's *Food Statistics Annual.*

A lot of confectionary is manufactured by sole proprietorships and other small businesses, and as total production volume cannot be grasped from any other statistics, the estimates in this paper must also basically follow this estimation method. However, there is room for improvement in the margin rate estimation. Specifically, the Shinohara estimates multiply producers' shipments by a uniform retail margin rate (which includes the wholesale margin rate). According to a survey conducted by the city of Tokyo, however, "In confectionary there are a particularly large number of retailers that

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25. Shinohara (1967, p. 29).
26. Shinohara (1967, p. 29).
27. Shinohara (1967, p. 74).

produce their own goods, with few outlets that belong to wholesalers or large manufacturers."[28] Accordingly, we should consider that many of the confectionary makers were small proprietorships running retail outlets (mixed producers/retailers). The margins for these small producers may have been overestimated by multiplying their production by uniform distribution (wholesale and retail) margin rates, just as applied to large confectionary and bread manufacturers.

To resolve this, this paper views the differential between the 1938 benchmark production value and the production value under the Ministry of Trade and Industry's *Census of Manufacturers* as the production by small proprietorships, and recalculates the figures for these small producers applying margins in accordance with the percentages of different types of sales derived from the city of Tokyo's survey to determine the retail sales value (the personal consumption shipment value).[29] The margin rates are estimated from the 1939 Ministry of Trade and Industry's *Census of Commerce.*[30]

Among food expenses, there is also an error in the 1933 data for fish that cannot be ignored, which is corrected for the analyses in this paper.[31] As noted below, this error significantly affects total personal consumption expenditures.

Next, for clothing expenses the Shinohara estimates raise a problem by recording textiles, which have a high weight, entirely as a final demand item just like clothing and other secondary products.[32] At that time, many textiles were probably sold as they were at fabric shops, as final demand items. Regardless, some textiles were certainly also used as intermediate inputs for final products such as clothing, handkerchiefs, and Japanese-style socks. That portion needs to be deducted from final demand. This paper seeks the intermediate input ratio for textiles that became secondary goods from the ratio of textile intermediate inputs in "clothing and other goods" in the 1955 Economic Planning Agency's *Input-Output Table*[33] and uses that to deduct the portion of textiles used for intermediate consumption.

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28. Tokyo Municipal Government (1932, Volume 2, p. 327).

29. The *Census of Manufacturers* covers establishments with at least five workers, which are assumed to specialize in manufacturing, and their shipment values are multiplied by a uniform margin rate assuming distribution through wholesalers to retailers. On the other hand, the shipment values are multiplied by individual margin rates using the percentages of different types of sales under the city of Tokyo survey, and sets individual margin rates. Specifically, these are wholesale and retail margins for shipments to wholesalers and brokers, and retail margins for shipments to retailers (including department stores), with no commercial margins for sales directly to consumers. The percentages of sales were 27.1 percent to wholesalers and brokers, 27.6 percent to retailers, and 45.3 percent direct sales. As a result, on average the re-estimation margin declines compared with that under the Shinohara (1967) estimates.

30. The *Census of Manufacturers* comprises complete wholesale statistics, and the wholesale margin rate can be estimated from the purchases and sales of exclusive wholesalers. The retail margin rate is obtained from wholesalers that also sell retail. Their purchases for wholesaling are calculated in reverse from the wholesale sales and wholesale margins. Purchases for retailing are assumed to equal total purchases minus purchases for wholesaling. The retail margin is the differential between retail sales and purchases for retailing.

31. Specifically, the available supply of fish after adjusting the production volume for imports and exports was mistakenly recorded as 3,820,992 tons instead of the correct figure of 2,820,992 tons, so the net amount after deducting fish for processing was recorded as 2,393,219 tons instead of 1,393,219 tons, resulting in a consumption value error of more than 80 percent.

32. Under the Shinohara (1967) estimates, personal consumption expenditures are determined by calculating total domestic consumption of final demand expense items and multiplying that by a uniform value of 83.5 percent, assuming that as the ratio of personal consumption.

33. This was the first systematically prepared industrial input-output table in Japan, so these values must be applied to the prewar period to seek the intermediate input ratio. This is in line with LTES estimation methods, which use postwar data for unavailable ratio data during the prewar period.

Moreover, transportation costs have an effect on textile consumption, and their fluctuations cause occasional bumps in the time-series data. Those fluctuations are not a problem when considering long-term trends, but their influence cannot be ignored in year-by-year analyses. For example, the real consumption volume of clothing was high in 1931, but one reason was that the freight margin increased from 0.3 percent to 0.4 percent in 1931 (and then dropped back to 0.3 percent from 1932). Freight margin ratios may fluctuate as long as the changes in the product and freight transportation markets are not identical, and in practice margin ratios change continuously in macro statistics just as price changes are continuous, so our analyses in this paper implement smoothing using three-period moving averages for the margin ratios.

As noted above, changes in clothing inventory probably caused the fluctuations seen in the time series. Shinohara wrote that "there was not sufficient time to implement corrections"[34] for the inventory fluctuations. Since actual value data exist for some of the textile distribution inventory, we prepared an adjusted time series, albeit partial, for analytical purposes. Specifically, we calculated the domestic shipment values by subtracting inventory fluctuations—defined as the changes in the year-end figures of the Japan Warehousing Association's *Value of Goods in Principal Warehouses Classified*[35]—from the domestic supply value by type of textile in the Shinohara estimates, and multiplied these by the retail margin.

One more issue in the Shinohara estimates is that health and sanitation expenses, which account for a fairly small amount, show large jumps in the data for "drugs, medicines, and related goods" and "medical services expenses" from 1932 to 1933,[36] and this influences total personal consumption. The source data of the Shinohara estimates are unclear, and we were unable to confirm if there were any institutional reasons.[37] The Ministry of Home Affairs' *Sanitation Bureau Annual* provides the drug production value and import value from 1930 onward. We multiply this by the wholesale and retail margins derived from the *Census of Commerce* to re-estimate the data from 1930 onward.[38] Because the Ministry of Home Affairs statistics do not exist prior to 1930, we adopt the compromise measure of applying the Shinohara estimates' growth rate using the 1930 figure as the benchmark. For medical and personal care expenses, there is also a sudden shift that is apparently an error in the 1923 values of the

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34. Shinohara (1967, p. 29).

35. The data used in this paper are the annual figures from the Bank of Japan Research and Statistics Department's "Economic Statistics of Japan." These inventory data may be too high if they include used fabric.

36. Specifically, "drugs, medicines, and related goods" expenditures doubled (rose 94 percent year on year) in 1933. This influenced medical services expenses because the Shinohara (1967) estimates assume that medical services expenses are proportional to the drugs and other goods used (specifically, 2.246 times "drugs, medicines, and related goods"). As a result, overall medical and personal care expenses shot up 54.1 percent year on year.

37. From 1932, a rural medical relief policy was implemented to dispatch traveling doctors to provide medical diagnosis and treatment in villages with no resident doctors (see Yoshihara and Wada [1999, p. 70]), but it is difficult to believe that this program was sufficiently widespread to result in large changes in the overall medical treatment expenses data. From the perspective of health insurance payments, the actual number of health insurance benefits payments recorded by the Ministry of Home Affairs' *Sanitation Bureau Annual* does not show any developments that would back up the Shinohara (1967) estimates.

38. Because the value of exports cannot be confirmed by the Ministry of Finance's *Trade of Japan,* the amount is assumed to be minimal and no adjustment is made.

Census of Manufacturers that are the underlying statistics, and we prepared estimates to compensate for this point.[39]

Additionally, a rather fine adjustment was made for utilities expenses by correcting the deflator for matches and candles.[40]

D. Selection of the Deflator Formula

While the previous subsection discussed the re-estimation of individual items, in recent years the deflator formula has frequently been noted as a factor causing errors in the estimation of real-basis SNA statistics. The LTES (including the Shinohara estimates) adopt a fixed-weight Paasche formula to calculate real-basis GNE and personal consumption expenditures by changing the nominal values of individual items to a real basis and aggregating the data.[41] While this type of approach has been standard in the SNA, it is well known that the fixed-weight Paasche formula has a downward bias whereby the variability of indices for the constituent items becomes larger as the period from the base year grows longer, and the influence of individual items on the real figures diverges from the actual conditions. As complex calculations have now become possible, the 93SNA recommends the chain index, and the Japanese SNA switched over to the chain index from 2004.

This type of index formula bias may be more conspicuous for historical statistics, which are long-term estimated statistics. For example, Smits (2006) addresses the deflator selection as one of the most important points when compiling historical statistics for international comparison. He calculates real GDP in the Netherlands and concludes that with 1913 as the basis, the 1890 value may vary by as much as 6.8 using different deflators. According to him, "the Dutch economy witnessed only a modest degree of structural change (in terms of shifts from agriculture to other sectors of the economy), which implies that the effects of choosing different deflators might be less important for the Netherlands than for countries which witnessed more structural change."[42]

39. Looking at the breakdown of the Shinohara (1967) estimates, "drugs, medicines, and related goods" and "medical services expenses" doubled (rose 95 percent year on year) from 1922 to 1923 and then dropped by nearly half (declined 41 percent year on year) in 1924. The drug production figures in the *Industrial Statistics Table* show basically the same developments. Examining the *Industrial Statistics Table* figures by prefecture, we found extremely high growth for production in Osaka Prefecture, which differs completely from the drug production figures in the *Osaka Prefecture Statistics,* We judged that the *Industrial Statistics Table* figures are probably incorrect. In this paper, we supplement the *Industrial Statistics Table* data for Osaka Prefecture with the production value growth rate from the *Osaka Prefecture Statistics,* and apply these revised figures to the growth of "drugs, medicines, and related goods" nationwide.

40. Under the Shinohara (1967) estimates, the real consumption volume of matches and candles increased by 47 percent in 1931, and we determined that this was caused by an unnatural movement in the deflator. Because the underlying data for the Shinohara (1967) estimates are not specified, we could not confirm whether this movement was due to an outlier value or some sort of error. Regardless, in this paper we conduct our re-estimation substituting the deflator for matches and candles with the deflator for other utilities expenses.

41. When the price of good i is p_i, the volume of good i q_i, the base time 0, and the relative time t, the fixed-weight Laspeyres formula $P_{0,t}^L$ becomes $P_{0,t}^L = \sum p_{ti} q_{0i} / \sum p_{0i} q_{0i}$, the fixed-weight Paasche formula $P_{0,t}^P$ becomes $P_{0,t}^P = \sum p_{ti} q_{ti} / \sum p_{0i} q_{ti}$, and the fixed-weight Paasche formula can be expressed as $P_{0,t}^F = \sqrt{P_{0,t}^L \cdot P_{0,t}^P}$. We know the relation whereby $P_{0,t}^P \leq P_{0,t}^F \leq P_{0,t}^L$. On the other hand, the chain index does not fix the base time, but rather multiplies the index for each period using the prior period as the base. The chain Paasche formula can be determined as $\overline{P_{0,t}^P} = P_{0,1}^P \cdot P_{1,2}^P \cdot P_{2,3}^P \cdots P_{t-1,t}^P$. The chain index has the advantage of averting bias from changes in the economic structure because the weights change each period. See International Labour Organisation (2004), for example, for an explanation of the index theory.

42. Smits (2006) adopts 1913 as the base year and calculates real GDP running back to 1807 for 14 different cases of deflators (the 12 cases using the Laspeyres, Paasche, and Fisher formulas with fixed weight and chain weight

However, a chain index aggregating each item cannot be calculated for the Shinohara estimates, because individual deflators for each item are not available. It is also noted that chain indexes drift when price indexes move up and down,[43] so problems might emerge for the interwar period, with its large price fluctuations. Accordingly, this paper prepares a simplified chain index deflator and conducts a sensitivity analysis on the re-estimation results. Specifically, we use individual deflators for the nine personal consumption expenditure expense categories under the Shinohara estimates, calculate two deflators using the chain Paasche index and the chain Fisher index, and examine their values.

E. Problems with Imputations

Because the LTES follow the SNA conceptual framework, the Shinohara estimates include imputations as defined by the SNA. These are farmers' home consumption of their own produce and the rent for owner-occupied dwellings. The use of imputations is an SNA rule to measure economic activities that occur without market transactions to analyze the actual economy.[44] The SNA does not impute the value of household chores, even though they are similar economic activities that take place without market transactions.[45]

When this type of rule is applied historically, differences among eras influence the measurement results. The agricultural sector had a large weight in prewar Japan, and farmers consumed a lot of their own produce, so the imputations have a large influence. This factor should not be overlooked, particularly because of the large weight of agriculture in the real economy. Regardless, imputations always involve measurement problems, since they concern transactions that do not occur in the market. This problem becomes even more severe with historical statistics due to the lack of data.

The methods adopted for the imputations in the Shinohara estimates rest on several assumptions. Specifically, looking at the estimation for rice, first the *Farm Household Survey* is used to calculate farmers' home consumption of rice by subtracting rice sales and farm rent payments from total rice production. The ratios of home consumption to total rice income are then sought separately for landed farmers, mixed landed/tenant farmers, and tenant farmers, and these are multiplied by the rice harvests. The Shinohara estimates, which are derived in this way, are influenced by good and bad rice harvests, with large fluctuations in the volume of home consumption. Although such fluctuations may actually occur to a certain extent, it is still unnatural that the peculiar fluctuations

for each and with two sector categorizations for each, plus two fixed price patterns without linking the base year of 1913).

43. A chain index has a "chain drift" property whereby the index does not return to its original level after price bouncing even though prices and volumes are absolutely identical at two different points in time.

44. The rent for owner-occupied dwellings is an "exceptional measure" to prevent difficulties in international GDP comparisons among countries with different ratios of homeowners to renters and to prevent changes in those ratios over time from causing changes in the GDP time series.

45. The 93SNA states that "the reluctance of national accountants to impute values for the outputs, incomes and expenditures associated with the production and consumption of domestic and personal services within households is explained by a combination of factors, namely the relative isolation and independence of these activities from markets, the extreme difficulty of making economically meaningful estimates of their values, and the adverse effects it would have on the usefulness of the accounts for policy purposes and the analysis of markets and market disequilibria—analysis of inflation, unemployment, etc." (Commission of the European Communities *et al.,* 1993, chapter 6, paragraph 6.22).

in the home consumption of rice should determine the fluctuations in total personal consumption expenditures, which are then used to explain the business cycle of the entire economy. For example, in 1931 during the Showa Depression farmers' home consumption of rice rose by nearly 30 percent on a real basis because of the bumper crop the previous year combined with poor sales on the open market, and this consequently contributed to a high growth rate in personal consumption expenditures.[46] Even if there is some truth that home consumption in farming districts rose during the Showa Depression because workers who lost jobs in urban areas returned to their villages, such a characterization gives a substantially different impression from the severe poverty in rural areas at that time. We should therefore be cautious about using the Shinohara estimates, which include imputations, to view the macroeconomic fluctuations of the times.

Moreover, if we assume that the estimated fluctuations in home consumption are correct, we must ask what farmers used as food, for example, in 1930. Looking solely at the Shinohara estimates, it does not appear that the consumption volume of other foods offset the fluctuations in rice from 1930 to 1931. One answer may be provided by Tobata and Ohkawa (1938),[47] who explain, "As is now common knowledge concerning Japan's rice statistics . . . [during the prewar period] there was rice consumed by farmers (broken rice damaged in the process of polishing) that does not appear in the production statistics." If their inference is correct, while the quality may have changed, the volume of home consumption of rice by farmers may not have actually fluctuated all that much by adding broken rice in years with poor harvests. The *Family Income and Expenditure Survey* includes the consumption volume of all broken rice, so this must be considered when we examine personal consumption including home consumption. If the home consumption volume cannot be properly estimated, including imputations under the present SNA standards conversely provides a misleading picture of the economic conditions. Accordingly, in addition to making revisions to specific items, imputations are also deducted for the re-estimation in this paper.[48]

IV. Personal Consumption Expenditures and Economic Fluctuations during the Interwar Period

A. Re-Estimation Results

This section reviews the macroeconomic developments during the interwar period focusing on personal consumption expenditures, based on our results from re-estimating the Shinohara estimates. Table 2 presents the year-on-year growth for each expense item

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46. It is also unclear whether farmers had excess rice left over. The government conducted a second round of rice purchases in February 1931 following the sharp decline in rice prices, but the farmers did not immediately respond. Contrary to the common belief that this was because the purchase price was far below local market prices, one analyst wrote that "another cause was that the purchase timing was already too late. Those small farmers in greatest need of relief had already sold off almost all of their rice" (Toyo Keizai Shimposha [1931, p. 181]). Farmers who needed cash may have had no choice but to sell off their rice, and may have sold it at extremely low prices.

47. Tobata and Ohkawa (1938, p. 56).

48. The imputations actually deducted are those with significant values: home consumption of rice, home consumption of vegetables, and rent for owner-occupied dwellings.

Table 2 Personal Consumption Expenditures Expense Items (After Re-Estimation)
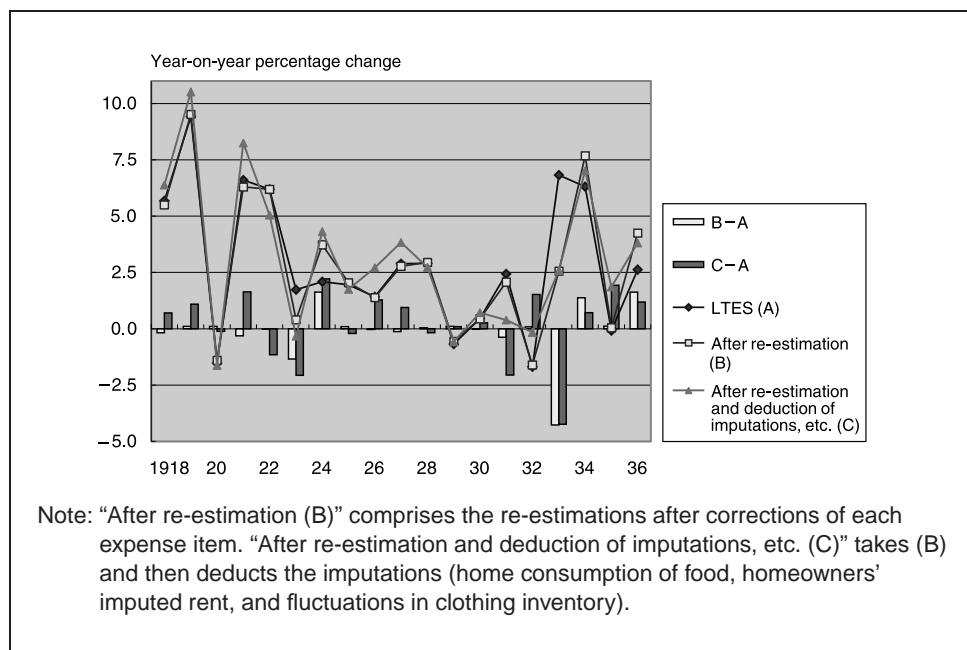
Year-on-year percentage change

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Total personal consumption expenditures (after re-estimation)	5.5	9.5	−1.4	6.3	6.2	0.4	3.7	2.1	1.4	2.8
After deduction of imputations, etc.	6.4	10.5	−1.6	8.3	5.1	−0.3	4.3	1.8	2.7	3.8
Food expenses	3.0	9.1	0.7	6.4	1.0	2.9	1.2	1.9	0.8	1.0
After deduction of home consumption	3.5	10.9	1.5	6.3	2.1	3.1	2.6	1.7	0.8	1.6
Clothing expenses	20.0	39.7	−30.2	27.3	3.2	−19.7	5.5	−8.6	12.8	12.7
After deduction of inventory fluctuations	28.2	34.4	−29.4	37.4	−2.7	−19.0	3.4	−9.1	17.4	10.1
Housing and utilities expenses	13.4	5.6	7.1	−5.1	20.1	7.1	10.4	5.3	−2.4	−2.2
After deduction of home-owners' imputed rent	15.2	8.0	4.8	−2.5	12.6	5.2	13.2	6.2	2.4	1.5
Medical and personal care expenses	−8.5	−9.3	16.6	11.8	11.0	2.0	8.1	−3.9	12.2	2.7
Transportation and communications expenses	8.4	14.6	6.4	12.4	10.4	5.2	10.0	6.1	5.4	6.5
Other expenses	3.3	−3.6	3.3	1.2	18.4	−4.4	2.9	6.8	−1.6	10.7
Total personal consumption expenditures (Shinohara estimates)	5.7	9.4	−1.5	6.6	6.2	1.7	2.1	2.0	1.4	2.9

	1928	1929	1930	1931	1932	1933	1934	1935	1936	1936 share (by amount)
Total personal consumption expenditures (after re-estimation)	3.0	−0.6	0.4	2.1	−1.6	2.6	7.7	0.0	4.3	100.0
After deduction of imputations, etc.	2.7	−0.6	0.7	0.4	−0.2	2.6	7.0	1.9	3.8	88.4
Food expenses	1.6	−0.0	−1.2	2.2	−2.7	3.7	4.2	−2.3	1.7	49.9
After deduction of home consumption	1.4	0.9	−1.5	−0.4	−0.5	4.1	1.3	1.1	1.1	44.7
Clothing expenses	15.5	−15.0	10.0	19.3	1.1	−2.4	25.7	2.7	10.2	13.7
After deduction of inventory fluctuations	15.4	−14.4	12.2	16.2	1.6	−4.6	28.1	2.4	10.8	13.7
Housing and utilities expenses	3.9	4.8	1.8	1.3	0.5	0.5	5.6	−0.1	8.1	17.2
After deduction of home-owners' imputed rent	3.2	3.4	3.6	1.2	2.7	0.5	8.4	−1.1	7.6	10.9
Medical and personal care expenses	7.0	1.0	7.4	3.0	−7.8	1.9	8.3	1.7	2.2	4.3
Transportation and communications expenses	7.1	3.2	−2.9	−1.5	−0.2	6.6	5.9	5.8	7.1	4.1
Other expenses	−4.2	0.3	−2.2	−11.2	0.2	4.4	11.0	6.2	2.9	10.9
Total personal consumption expenditures (Shinohara estimates)	2.9	−0.7	0.5	2.4	−1.7	6.8	6.3	−0.1	2.6	—

following the re-estimation. Figure 2 shows the differentials in annual growth between these re-estimation results and the original Shinohara estimates. The figure shows differentials between the re-estimation results and the original Shinohara estimates ($B-A$) of -1.3 percentage points and -4.3 percentage points for 1923 and 1933, respectively. Conversely, and partially in reaction, the figures for 1924 and 1934 show positive differentials. These differentials reflect the corrections of errors in the underlying data for "drugs, medicines, and related goods" (medical and personal care expenses) in 1923, and for fish (food expenses) in 1933, as mentioned above. The figures for 1936 show a positive differential of 1.6 percent, which was influenced by a change in the estimation method for "drugs, medicines, and related goods."

On the other hand, the differentials between the original Shinohara estimates and the re-estimation results after deducting for fluctuations in the distribution inventory of clothing and imputations (home consumption by farmers and rent for owner-occupied dwellings) ($C - A$) are greater overall than the ($B - A$) differentials. In 1923, this re-estimation shifts the year-on-year change from positive (1.7 percent) to negative (-0.3 percent). This results from deducting the imputations, and from the above-mentioned data correction. Personal consumption expenditures slumped in 1923 as a result of the Great Kanto Earthquake. Deducting the imputations reduces the weights of food expenses and of housing and utilities expenses (which uphold the growth in personal consumption under the original Shinohara estimates), making the effects of the earthquake more conspicuous.

Figure 2 Personal Consumption Expenditures Re-Estimation Results

Note: "After re-estimation (B)" comprises the re-estimations after corrections of each expense item. "After re-estimation and deduction of imputations, etc. (C)" takes (B) and then deducts the imputations (home consumption of food, homeowners' imputed rent, and fluctuations in clothing inventory).

The re-estimation results after deducting imputations and changes in clothing inventory also present different developments following the Showa Depression of 1931. Under both the original Shinohara estimates and the re-estimation with corrections by expense item only, the annual growth in personal consumption increases from 1930 to 1931 and turns negative in 1932. When the imputations and clothing inventory fluctuations are deducted, personal consumption expenditures rise moderately by 0.4 percent in 1931 and then decline slightly by 0.2 percent in 1932. For 1935, the year-on-year changes turn sharply positive, moving from −0.1 percent under the Shinohara estimates to 1.9 percent, showing sustained recovery under the Takahashi economic policy, led by Finance Minister Korekiyo Takahashi. Moreover, these developments do not change significantly overall when the deflator formula is switched to a chain index, with the year-on-year change in personal consumption expenditures turning slightly positive during the 1931 Showa Depression (Figure 3).[49]

Figure 3 Personal Consumption Expenditures by Deflator

Note: All personal consumption expenditures are after deducting imputations (home consumption of food, homeowners' imputed rent, and fluctuations in clothing inventory).

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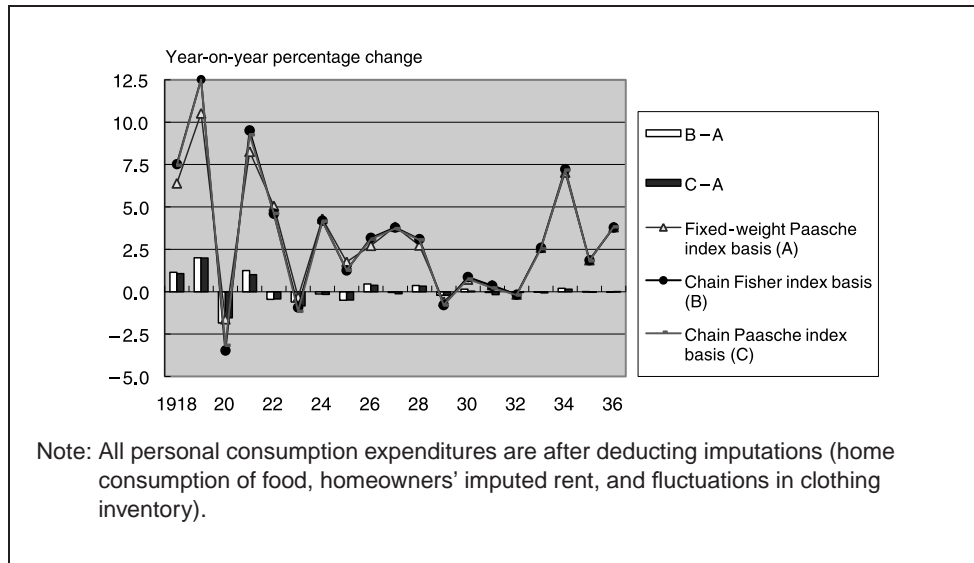
49. Looking at the 1931 year-on-year changes in personal consumption expenditures (after deducting imputations and fluctuations in clothing inventory), the figures are 0.2 percent using a chain Paasche index and 0.2 percent using a chain Fischer index. The differences in the deflator formulas do not exert a great influence on the overall estimations, and that may be because in the interwar period there were no items with sudden price declines amid large share increases, like today's IT products. Incidentally, Figure 3 shows a slight divergence between the fixed weight and the chain index figures through around 1923, and this primarily results from the level of the clothing index. Using a fixed weight with the average from 1934 through 1936 as the base, the index level for clothing, which suffered a comparatively large price decline during the 1920s, becomes relatively high as we move away from the base year, and the actual value is underestimated. In contrast, that problem does not occur when using the chain index, which resets the index level each year. The chain index diverges from the fixed-weight index over this period when there were acute fluctuations in clothing.

B. Macroeconomic Fluctuations and Personal Consumption Expenditures (1920s)

The image of personal consumption expenditures drawn by the Shinohara estimates changes when we conduct re-estimations, deduct imputations, and make adjustments for inventory fluctuations. We now proceed to re-examine the movements of the expenditures components, defining real GDP excluding imputations as "adjusted real GDP."[50] This makes it possible to focus on the interwar period economic fluctuations in the market economy. The previous subsection also made deductions for fluctuations in the distribution inventory of clothing, but because inventory investment cannot be estimated as an independent expenditures component in calculating GDP, personal consumption expenditures here include inventory fluctuations.

First, comparing adjusted real GDP with the LTES during the 1920s, while the downward divergence in 1923 when the Great Kanto Earthquake struck is somewhat conspicuous, the overall movement is not that different. From the end of World War I through the first half of the 1920s, the annual growth in adjusted real GDP was negative at −0.5 percent in 1920, −3.8 percent in 1922, and −7.2 percent in 1923 because the World War I export boom ended and credit conditions were tight (Table 3). Looking at the contributions of the expenditures components, after World War I the negative growth in external demand from depressed exports and the consequent negative growth in private fixed capital formation had a large impact, as shown by the postwar depression and subsequent slump (Figure 4). Reviewing individual personal consumption expenditure items (Figure 5), during the early 1920s clothing expenses showed

Table 3 Year-on-Year Changes in Adjusted Real GDP and Contribution of Personal Consumption Expenditures

Year-on-year percentage change

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Adjusted real GDP	8.7	5.7	−0.5	6.9	−3.8	−7.2	5.3	6.2	1.9	4.0
Contribution of personal consumption expenditures	4.1	7.7	−1.3	5.2	4.2	−0.3	3.8	1.5	1.9	3.3
LTES basis real GDP	8.4	5.0	−0.4	6.4	−2.5	−4.6	3.1	5.8	1.2	3.0
Contribution of personal consumption expenditures	4.2	6.8	−1.1	5.0	4.7	1.4	1.8	1.7	1.2	2.4
	1928	1929	1930	1931	1932	1933	1934	1935	1936	
Adjusted real GDP	6.7	0.6	1.2	−1.2	6.1	7.8	8.9	7.2	2.6	
Contribution of personal consumption expenditures	2.2	−0.5	0.4	0.3	0.0	2.1	4.8	1.3	2.4	
LTES basis real GDP	6.4	0.4	1.1	0.4	4.3	10.3	8.3	5.2	2.0	
Contribution of personal consumption expenditures	2.4	−0.5	0.4	1.7	−1.2	5.2	4.7	−0.1	1.8	

Note: Base-year prices are the averages from 1934 to 1936.

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50. In addition to its application to personal consumption expenditures, the concept of imputations is also applied to the production of financial institutions (imputed interest is the interest received by financial institutions minus the interest paid by financial institutions), but the SNA does not view imputed interest as final demand and does not post it in GDP, so personal consumption excluding imputations can be obtained by deducting imputed home consumption of food and imputed rent for owner-occupied dwellings from personal consumption expenditures.
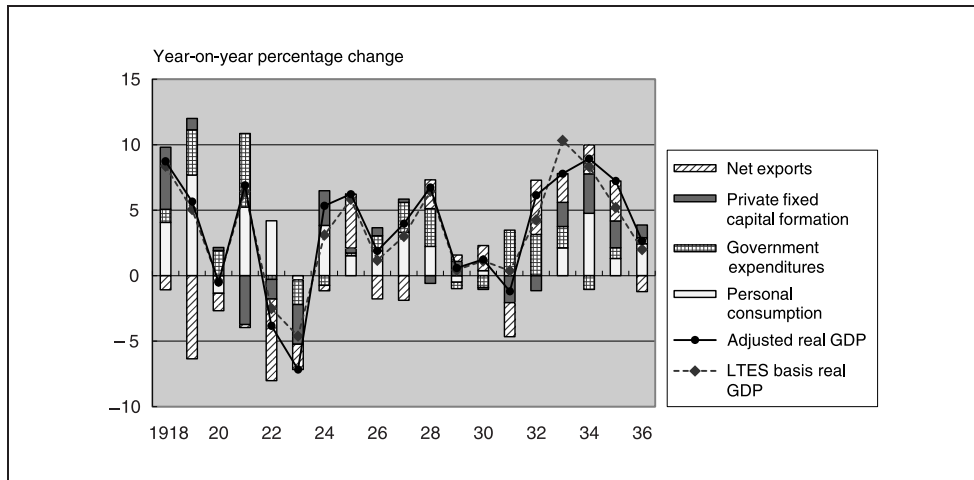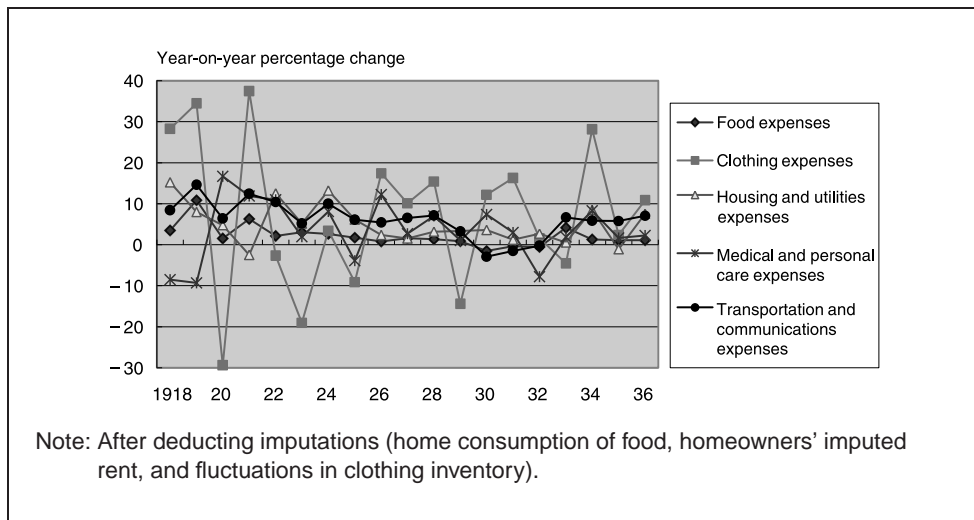
Figure 4   Adjusted Real GDP Contribution Analysis

Figure 5   Personal Consumption Expenditures by Expense Item

Note: After deducting imputations (home consumption of food, homeowners' imputed rent, and fluctuations in clothing inventory).

a large fluctuation, food expenses rose steadily, and housing and utilities, and transportation and communications expenses all recorded rather high growth. While traditional industries were facing a slump, especially in rural districts, electric lighting, gas, water, and other urban infrastructure were improved, the railway network was organized centered on Tokyo and Osaka, and urbanization otherwise advanced. Viewed in terms of expenditures, the "unbalanced growth" can be confirmed by the growth in service-related expenditures.

During the latter half of the 1920s, adjusted real GDP posted high growth similar to the LTES. In particular, adjusted real GDP rose by 4.0 percent in 1927 and 6.7 percent in 1928, even as prices declined and the financial crisis broke out. Nakamura (1989a)

said, "If the Japanese economy was driven by exports during World War I, it was driven by domestic demand during the 1920s,"[51] but this was written considering the heavy industrialization of the 1920s and the strength of the capital investment that supported it. In terms of the component contributions, the growth in GDP expenditures during the latter 1920s was continuously sustained by personal consumption. By item, we see that clothing consumption expanded amid a continued decline in the growth of food expenses. Looking at the components of clothing, fabric generally increased, and personal effects showed the highest growth.

Department stores opened modern outlets in Tokyo and Osaka in the late 1920s, and Western clothing became popular. Amid these changes, goods other than food contributed to pushing up overall consumption expenditures. While this cannot be directly confirmed from actual retail figures, the statements of accounts of the leading department stores show high sales growth from 1926 through 1928,[52] backing up the estimation results (Figure 6).[53] In 1929, clothing dropped sharply, personal consumption growth turned negative while government expenditures also declined, and adjusted real GDP fell sharply by 0.6 percent from the previous year. In July 1929, Junnosuke Inoue was appointed Minister of Finance and implemented fiscal tightening in preparation for repealing the gold embargo, and in August 1929 Prime Minister Osachi Hamaguchi distributed a leaflet entitled "An Appeal to All Citizens," launching a savings drive. In fact, the August 1929 edition of the *Bank of Japan Monthly Bulletin* reported that the spread of the movement encouraging reduced consumption had influenced business conditions.[54]

C. Macroeconomic Fluctuations and Personal Consumption Expenditures (1930s)

During the 1930s, the movements of adjusted real GDP differ from those under the LTES. For example, in 1931 there was a large decline in net exports and private fixed capital formation under the Showa Depression. Despite this, the LTES shows a 0.4 percent increase in real GDP reflecting a 2.2 percent year-on-year rise in personal consumption expenditures. In contrast, after adjustment the year-on-year growth in personal consumption is just 0.4 percent, and consequently the growth in adjusted real GDP turns negative at −1.2 percent. Imputations, especially for the home consumption

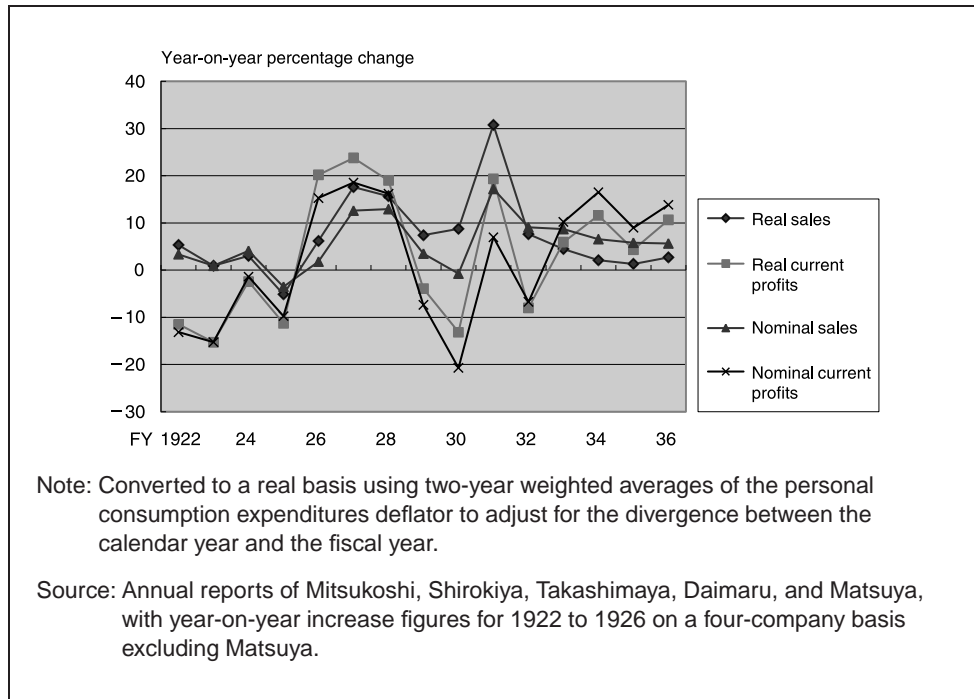..

51. Nakamura (1989a, p. 32).

52. Looking at the sales of five leading department store companies (Mitsukoshi, Shirokiya, Takashimaya, Daimaru, and Matsuya) on a real basis converted using the personal consumption expenditures deflator, sales rose by 6.2 percent, 17.6 percent, and 15.7 percent year on year in 1926, 1927, and 1928, respectively.

53. Today department store sales are a typical index for grasping movements in personal consumption expenditures, but such statistics did not exist at that time. However, some economists were aware of department store sales as an important index for examining business fluctuations. Tanzan Ishibashi of Toyo Keizai Shimposha, who became the 55th Prime Minister from 1956 to 1957, wrote in a lecture for readers, "I would like department store statistics to be prepared. As you know, in the United States and other countries sales indices are now used to judge business conditions ... In other words, I would like figures on such items as sales and stock to be presented as statistics" (Toyo Keizai Shimposha [1932b, p. 43]).

54. The explanation of market conditions states, "The decline in all kinds of prices and the success of the movement encouraging reduced consumption have induced hesitance to consume just as the summer business slump arrives. Commercial transactions are extremely dull. Reports indicate that customer traffic at department stores, which have been said to never experience downturns, have also dropped conspicuously, resulting in a sales decline not seen in recent years" (Bank of Japan [1963, p. 352]).

Figure 6 Sales by Five Department Stores

Year-on-year percentage change

Note: Converted to a real basis using two-year weighted averages of the personal
       consumption expenditures deflator to adjust for the divergence between the
       calendar year and the fiscal year.

Source: Annual reports of Mitsukoshi, Shirokiya, Takashimaya, Daimaru, and Matsuya,
       with year-on-year increase figures for 1922 to 1926 on a four-company basis
       excluding Matsuya.

of rice by farmers, are the main reason for this divergence. Focusing on the market economy, one would not reach Nakamura's conclusion that "the growth rate … just declined somewhat, with no negative growth whatsoever."[55]

Examining the 1931 figures by item, our results show negative growth in food expenses as well as negative growth in transportation and communications expenses.[56] The drop in food expenses was partly caused by declines in the consumption of near-luxuries such as alcoholic beverages, tea, other beverages, and cigarettes. On the other hand, in 1931 clothing shows high growth even as Japan was influenced by the Great Depression abroad, exports slumped, and the Showa Depression grew more severe. This growth in clothing averted a contraction in personal consumption expenditures overall. The clothing figures may result from an estimation problem whereby inventory fluctuations cannot be sufficiently deducted from personal consumption expenses,[57] but expenditures for apparel goods and personal effects did actually increase. This was partly due to expectations of inflation from reinstituting the gold embargo through the end of 1931. Turning once again to Figure 6, department store sales rose even on a nominal

55. Nakamura (1989b, p. 304).

56. Aside from those, there was a large drop in other miscellaneous expenses, with negative growth in recreation expenses, and in education, amusement, and other expenses.

57. The fabric inventory figures from the *Value of Goods in Principal Warehouses Classified* figures used for the estimation in the previous section converted to a real basis using the clothing deflator show a year-on-year increase of 23.7 percent. The textile industry production inventory figures in Fujino and Akiyama (1972) converted to a real basis using the clothing deflator also show a year-on-year increase of 13.6 percent.

basis amid deflation in fiscal 1931, and their sales growth rate was rather high on a real basis. One business report provided this explanation: "Combined with the good timing as consumers turned positive in the peak demand season at the end of the year, the expectations of future price increases substantially advanced sales."[58] It seems that a small business cycle sparked by the reinstitution of the gold embargo took place inside the larger business fluctuation of the Showa Depression.

At that time, department stores were expanding their branch networks and promoting free delivery services, drawing a strong reaction from existing retailers. At the macroeconomic level, it is also necessary to consider the slump at existing retail outlets which was the flip side of the growth in sales at department stores.[59] The growth of urban department stores may be considered as representing the "unbalanced growth" of the 1920s, but this development still did not result in "overall growth" as measured by GDP.

From 1932, the economy expanded once again under the policies of Finance Minister Takahashi, with the devaluation of the yen accompanied by the withdrawal from the gold standard, increases in government expenditures, and adoption of a low interest rate policy by the Bank of Japan. The 1932 year-on-year growth was 6.1 percent for adjusted real GDP compared with 4.3 percent under the LTES, which included a sharp decline in personal consumption expenditures. Our re-estimation clearly highlights the effect of the Takahashi economic policy changes as the economy shifted from negative to positive growth.

Nevertheless, even after adjustment the 1932 personal consumption expenditures remained basically flat from the previous year. Examining this by individual expense items, growth in clothing expenses greatly contracted, and the negative growth in food expenses and in medical and personal care expenses was also a contributing factor. Returning to the department store sales figures, the 1932 increase was less than that of 1931. This was in reaction to the boom experienced when the gold embargo was reinstituted. The reduced growth in clothing expenditures reflects that circumstance. As for food, rice sales dropped following the poor harvest the previous year, and sales of alcoholic beverages, tea, and other beverages continued to decline.

Medical and personal care expenses were also down sharply. This was caused by reduced expenditures for drugs and for medical services. The Ministry of the Interior's *Sanitation Bureau Annual* shows declines in 1931 and 1932 on a medical insurance benefits payments basis, apparently influenced by the decline in health insurance budgets

58. From the Mitsukoshi 54th Term Annual Report. Regarding these developments, the *Toyo Keizai Shimpo* newspaper wrote, "Department stores earned unexpected benefits as the reinstitution of the gold embargo took place during the year-end sales season. Each store announced at once that it would not raise prices, but that prices would rise in the spring, easily prompting demand at the end of the year" (Toyo Keizai Shimposha [1932a, p. 327]). In fact, such sales growth was no longer seen in 1932.

59. It is also worth noting that department stores' share of retail sales rose substantially along with their rapid growth during the 1920s. According to figures quoted by Matsuda (1939, p. 141), the percentage of Tokyo retail sales by Tokyo department stores (five companies) was 9.0 percent in 1922. In a subsequent survey conducted by the city of Tokyo, department stores accounted for 25 percent of Tokyo retail sales and for 61.6 percent of fabric and clothing sales in 1931–32 (Tokyo Municipal Government [1933]). Amid these developments, the confrontation between existing stores and department stores became more intense, and in 1932 the department stores jointly announced a "Declaration of Self Restraint" including self-restraint on direct sales at customers' locations. As the conflict did not ease from such self-restraint measures, a Department Store Bill restricting department stores' commercial activities was proposed in 1933 and put into effect in 1937.

from fiscal 1931 following the government policy to reduce expenditures adopted in fiscal 1930.[60]

The full-scale increases in government expenditures under the Takahashi economic policy only began with the supplementary budgets from the middle of 1932,[61] and there was certainly some time lag before this change in policy resulted in actual growth in personal consumption expenditures.

Personal consumption expenditures growth picked up in 1933 and 1934, with some fluctuation in clothing expenditures. Adjusted real GDP rose by a solid 7.8 percent in 1933 and 8.9 percent in 1934. The growth in personal consumption expenditures eased in 1935, but because the slump in personal consumption under the original LTES turns to positive growth with the re-estimation, adjusted real GDP posted a high growth rate of 7.2 percent in 1935 as well (versus 5.2 percent on an LTES basis). Personal consumption expenditures, which increased slightly behind the macroeconomic business conditions, supported GDP growth following the Showa Depression, just like the typical business cycle pattern in postwar Japan.[62]

V. Conclusion

This paper examines the LTES personal consumption expenditures, which have a high weight in total GDP expenditures, and re-estimates several items. It presents the problems with imputations, and calculates adjusted real GDP focusing on the market economy. The results show some changes to the economic fluctuations as depicted by the LTES. By and large, adjusted real GDP follows the LTES during the 1920s, with comparatively high growth in 1924–28, but shows different economic trends after the Showa Depression. Specifically, adjusted real GDP shows negative growth in 1931, when the gold embargo was repealed. While clothing expenditures did post some growth in the second half of 1931, viewed in terms of adjusted real GDP, which focuses on the market economy, the image of continued growth in the Japanese economy changes as the actual economy suffered a clear slump going beyond a mere "price recession."

Thereafter, while the LTES shows rather wide fluctuations in personal consumption expenditures including large negative growth in 1932, the adjusted real GDP personal

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60. In fiscal 1931, the annual per capita contracted patient compensation received by the Japan Medical Association declined by approximately 40 percent from the previous year, Moreover, "Amid social confusion, illicit billing for sickness benefits by individuals capable of working became commonplace, and cases were discovered in which health insurance doctors submitted fictitious billings for non-existent patients"; accordingly, the government tightened compensation emphasizing patient cooperation (Ministry of Health and Welfare Insurance Bureau [1953, pp. 417–418]).

61. The original fiscal 1932 budget was based on the draft prepared by the Wakatsuki Administration, and even after adding the supplementary budget for the Mukden Incident approved at the 61st Diet session in March 1932, the expenditures under the budget implemented by the Inukai administration totaled ¥1.46 billion (compared with ¥1.477 billion in fiscal 1931). In contrast, after the Saito Administration took office, a supplementary budget of ¥300 million was approved at the 62nd Diet session in June 1932, followed by additional funds for relief policy and further funding at the 63rd and 64th Diet sessions. In the end, the expenditures in fiscal 1932 totaled ¥2.02 billion (Ministry of Finance, Showa Economic History Editorial Office [1964, pp. 141–147]).

62. This paper does not specifically carry out comparisons with postwar economic fluctuations. The role of personal consumption expenditures in postwar economic developments described here is the common understanding, with any precise comparison left as a subject for future research.

consumption expenditures maintain high growth from 1932 through 1935. Thus, the adjusted real GDP figures present a clearer picture of high growth under the Takahashi economic policy following the slump during the Showa Depression. These results remain robust when considering the bias from the deflator formula.

Of course, this approach does not imply that we should ignore areas outside the market economy, which had a large weight in the overall Japanese economy prior to World War II. Agricultural districts pose structural problems, which require further discussion. It is also obvious that Japan definitely did not experience such harsh conditions as Western countries did at that time, even with negative growth in Japan's market economy. Regardless, considering the characteristics of the SNA and the measurement errors, it does appear that the LTES overestimated Japan's personal consumption expenditures during the Showa Depression, suggesting that the prior research may have underestimated the severity of the Showa Depression.[63]

Finally, it should be noted that the above re-estimations do not overcome all the problems with the LTES. Just considering personal consumption expenditures, movies and other recreation expenses—which are believed to have risen along with urbanization—cannot actually be estimated.[64] There may also be an error in the deflator used for the conversion of services expenditures to a real basis, because few services price indices are available. Moreover, capital investment and other expenditures components lie outside the scope of this paper. In that sense, there is room for further examinations on the statistical accuracy of the LTES, and these are left as topics for future research.

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63. Determining whether the common perception of the Japanese economy during the Showa Depression—presented by such analysts as Takafusa Nakamura and Juro Hashimoto—also needs to be revised is left as an outstanding issue here, because it requires analyses from a broader perspective.

64. For "other miscellaneous expenses" and "recreation and other expenses" that cannot be estimated, the Shinohara (1967) estimates assume a 3.1 percent share in total consumption expenditures from 1874 to 1909 and then assume that this gradually increases linearly to 5 percent in 1940. While the amount of total consumption expenditures changes from the re-estimation in this paper, we do not revise the "recreation and other expenses" figures of the Shinohara (1967) estimates in line with these revised total consumption figures.

APPENDIX: ADJUSTED REAL GDP AND ITS COMPONENTS

¥ millions; 1934–36 prices

	Adjusted real GDP						LTES-basis real GDP	
		Personal consumption expenditures	Government expenditures	Private fixed capital formation	Exports of goods and services	Imports of goods and services		Personal consumption expenditures
1917	8,902	6,344	1,050	1,298	1,477	1,267	10,079	7,521
18	9,679	6,706	1,139	1,720	1,606	1,492	10,922	7,949
19	10,226	7,449	1,473	1,804	1,276	1,776	11,473	8,697
20	10,172	7,312	1,669	1,828	1,100	1,737	11,426	8,566
21	10,873	7,845	2,240	1,448	977	1,637	12,160	9,132
22	10,457	8,300	2,209	1,285	1,050	2,388	11,855	9,698
23	9,707	8,267	2,012	968	896	2,435	11,308	9,867
24	10,224	8,639	1,940	1,225	1,166	2,745	11,658	10,073
25	10,862	8,795	1,961	1,264	1,397	2,555	12,338	10,271
26	11,066	9,000	2,087	1,330	1,496	2,846	12,483	10,417
27	11,505	9,366	2,340	1,358	1,679	3,238	12,857	10,718
28	12,278	9,623	2,672	1,290	1,798	3,104	13,686	11,030
29	12,350	9,561	2,612	1,424	1,970	3,217	13,745	10,956
30	12,503	9,608	2,500	1,406	1,975	2,986	13,900	11,005
31	12,355	9,650	2,892	1,148	2,049	3,384	13,952	11,247
32	13,113	9,653	3,278	1,006	2,447	3,271	14,545	11,085
33	14,136	9,931	3,492	1,248	2,663	3,198	16,047	11,842
34	15,397	10,604	3,343	1,674	3,439	3,663	17,382	12,589
35	16,511	10,806	3,469	1,989	4,033	3,787	18,285	12,580
36	16,948	11,208	3,545	2,149	4,121	4,076	18,649	12,910

Notes: 1. Personal consumption expenditures in adjusted real GDP are re-estimations after deducting imputations (but not including inventory adjustments).
　　　 2. Government expenditures are the sum of government current expenditures and government fixed capital formation.

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