Technology and Long-run Economic Growth in Asia

Estimates of the Long-run Economic Growth of

Taiwan Based on Revised SNA (1901-2000) Statistics

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(1) Introduction

The Taiwanese economy has achieved rapid growth since the end of the Second World War (WWII). The annual growth rate of GDP was about 8.3% from 1950 to 2000 according to the estimates by DGBAS (Directorate-General of Budget, Accounting and Statistics).[1] In an earlier paper, we suggested that the economy grew steadily but at a moderate pace before WWII.[2] The annual rate of real GDP growth was about 3.5% from 1905 to 1940. This growth was accompanied by changes in industrial structure. The composition of GDE also varied as the real GDP increased.

In this paper, we provide data for studies on the economic growth of Taiwan from 1901 to 2000 on the basis of SNA estimates. For this purpose, it is necessary to construct a database containing long-run time-series economic data. The amount of information available differs over time. Five periods can be distinguished: (a) 1901-1911, (b) 1912-1940, (c) 1941-1950, (d) 1951-1960 and (e) 1961-2000. DGBAS has published official SNA reports for periods (d) and (e) and economic data are therefore abundant. Data for period (c) are scarce and less reliable. Fortunately, semi-official estimates of the production accounts were published by the staff of DGBAS during this period. Official SNA estimates were not published for period (b), but relatively large amounts of basic data were published by the Government General of Taiwan. Also available are a number of academic studies providing estimates of SNA series for this period. Data are scarce and less reliable for period (a), so our estimates here remain preliminary.

In this paper, we examine previous contributions and consolidate them into long-run SNA tables. Some additional estimates are required for this purpose as is shown in the next section. These SNA tables and additional estimates will be published by Toyo Keizai Shinposha in Japanese in the near future and the contents of this book are shown in the appendix of this paper.

[1]) Directorate-General of Budget, Accounting and Statistics <u>Report of National Income Statistics, 1995,</u> 1995.and <u>Report of National Income Statistics, 2001,</u> 2001.

[2]) Mizoguchi, Toshiyuki "Long-term National Accounts Data-base of Japan, Taiwan and Korea" in Odaka, Konosuke, Yukihiko Kiyokawa and Masaki Kuboniwa (eds) <u>Constructing a Historical Macroeconomic Database for Trans-Asian Regions (International Research Workshop on the Asian Historical Statistics Database)</u>, Institute of Economic Research, Hitotsubashi University.

（２）Review of Previous Estimates

    Our objective is to estimate long-run SNA statistics for the twentieth century (1901-2000). Various kinds of basic data are necessary to obtain consistent series. However, as the amount of information available for each period differs, the method of estimation also varies by period.

(2.1) Official Estimates of SNA (1951-2000)

    For this period, we rely on the SNA officially published by DGBAS.[3] In the 1950s and 1960s, most developed countries constructed national income statistics following the system recommended by the United Nations in 1952. In 1953, DGBAS began preparing national income statistics on an annual basis for the Taiwan Area starting from 1951. The system was improved through discussions with and review by economists and adjusted to the special needs and circumstances of Taiwan. The Commission on National Income Statistics has played an important role in these improvements since 1965.

    The United Nations revised the standard national economic accounts system in 1968 (68SNA), combining national income statistics, I-O tables, flow of funds accounts, etc. In Taiwan, the system was implemented in 1986. Nominal and real series are classified into three accounts (i.e. production, expenditure, and distribution accounts). They have been revised every five years and linked to previous estimates. It is fortunate for our purposes that the DGBAS has published retroactive SNA series back to 1951.[4]

    We can safely use the official SNA series as our basic information for periods (d) and (e) mentioned in Section 1. But some remarks on the characteristics of Taiwanese SNA data are still in order here. The first concerns the application of the commodity flow method. While the UN recommends that the commodity flow method be adopted for the estimation of 68SNA statistics, DGBAS follows a family budget data approach to estimate private consumption expenditure. Data on capital expenditure are used to estimate capital formation by enterprises.

    The second remark concerns the treatment of statistical discrepancies. Theoretically speaking, the three accounts of the SNA should be balanced. But owing to the scarcity of information, some gaps are found between accounts. There are two

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[3])Regarding the development of National Accounts in Taiwan, see the preface of DGBAS, National Income in Taiwan Area of the Republic of China, 1996: National Accounts for 1951-1995.

[4]) See DGBAS, National Income in Taiwan Area of the Republic of China, 1996: National Accounts for 1951-1995.

possible ways to address the problem. One is to settle the item of 'statistical discrepancies' in the SNA tables. The other is to adjust estimates to make the discrepancies zero. In the Taiwanese SNA reports, the estimates seem to be adjusted not only in the nominal accounts but also in the real accounts.

The third remark concerns the revision of estimates. In Taiwan, SNA estimates have been revised every five years. In these revisions, both nominal and real values were revised back to the previous revision year. The nominal values before the previous revision were left untouched. In each revision, the base year of deflators was newly settled, so the real figures were also revised back to 1951. But the old estimates of real GDP (or GDE) were linked to the new estimates under the condition that the growth rate of real GDP (or GDE) be kept the same as on the basis of the previous base year.

Finally, a comment should be made here on the estimates for period (d). Because the national income estimates were carried out on the basis of 1952 SNA in the 1950s, there were insufficient basic data to obtain the retrospective series based on the 68SNA. The implicit deflators were not published for the pre-1960 production accounts. There are some gaps between the pre-1960 and the post-1961 data. Some minor corrections are necessary for the pre-1960 series to make the linkage more reliable.

(2.2) Estimates of SNA (1912-1950)

Since no official SNA estimates for period (b) and (c) have been published, it is necessary to construct our own SNA tables referring to previous studies. Several SNA estimates for period (b) are available. Regarding production accounts, the pioneering work is the appendix of Teng-hui Lee's PhD dissertation in 1966 cited in Samuel Ho's review.[5] However, details of the method of estimation were not published. The JCRR (Joint Committee of Rural Reconstruction) examined long-run series of agricultural production data by the Government General of Taiwan, Japan and the Provincial Government of Taiwan, Republic of China. The JCRR constructed nominal and real series of value added for periods (b), (c) and (d).[6] Shinohara examined manufacturing

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[5]) Lee.Teng-hui   Intersectoral Flows in the Economic Development of Taiwan, 1895 - 1960, PhD dissertation in Cornell University cited by Samuel P.S. Ho Economic Development of Taiwan, 1860-1970, Yale University Press, 1978.

[6]) Chen, Yueh-en and You-tsao Wang (1982) "Secular Trend of Output, Input and Productivity: A Quantitative Analysis of Agricultural Development in Taiwan" in Hou, Chi-ming and Tzong-shian Yu (eds.) Agricultural Development in China, Japan and Korea, Academia Sinica. See also Shigeru Ishikawa, Estimates of Agricultural Production (Database), Discussion Paper, Institute of Economic Research, 1970. The JCRR work greatly depends on Ishikawa's work.

production data in period (b), while Ho provided estimates of the production index of manufacturing for periods (b), (c) and (d).[7]

Wu published the first firm production accounts for periods (b) and (c).[8] Based on previous results on primary and secondary industry, Wu tried to complete the production accounts including tertiary industry and government services. Wu estimated the value added of the transport and communication industry and the government sector following orthodox methods. As is well known, historical data are scarce on other tertiary industries such as wholesale and retail trade and service industry. Wu overcame such difficulties using the information of regressions on postwar data. The results are very useful to provide a general indication of economic trends in Taiwan during periods (b) and (c).

However, two tasks remain. The first is a detailed study on period (c). After the end of WWII, Taiwan suffered economic and social confusion as well as bouts of rapid inflation, so that some margin of error seems inevitable in estimates for this period. The staff of DGBAS tried to estimate production accounts for the period 1938 to 1951,[9] adopting the 1951 official GDP accounts as the benchmark data, and extrapolating them to 1938 using fragmental information.

The second problem concerns Wu's estimates of tertiary industry production. His work is a remarkable achievement, presenting the first systematic estimates of production accounts. Methodologically, the use of regression methods is an interesting approach to filling the gaps in historical data. But it is also true that there remain areas to be reexamined using more orthodox approaches. One example is the new estimate of government service provided by Li.[10] It is also possible to estimate the value added of traditional service sectors. These estimates are discussed in more detail in the following section.

Several estimates of expenditure accounts for period (b) are available. Terasaki provided an estimate of nominal private consumption based on the commodity flow

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[7] Shinohara, Miyohei "Estimates of Manufacturing Production (Database)", Discussion Paper, Institute of Economic Research, 1969. See also Ho (1978).

[8]) Wu, Tsong-Win "An Estimate of Taiwan's Gross Domestic Product, 1910-1950", Taiwan Economic Review, 19-2, 1991.

[9]) Kuo, Fong-Yew, Chen-Yen Tsui, Ming-Tzu Lin and Grace Jong "Estimates of Gross Domestic Product: 1937-1950" in Taiwan National University, Department of Economics, and DGBAS Proceedings of Conference on the Economic Conditions in the 1940's Taiwan, 1997.

[10]) Li, Jian Chen "An Estimate of Value Added in the Government Section", Discussion Paper, Taiwan National University, 2001(in Chinese).

method.[11] Emi and Mizoguchi examined capital formation for period (b).[12] Nojima constructed a database on Taiwanese foreign trade classified according to the International Standard Classification.[13] These studies can be used in our long-run estimates of SNA series.

（3）Construction of the Long-run SNA Database

This section aims to revise previous estimates of Taiwanese GDP from 1901 to 1940 and to link them with the post-WWII series (1951-2000) provided by DGBAS and the semi-official GDP estimates for 1938-1951 by the staff of DGBAS. We tried to tackle this issue previously, but the work remained at a preliminary stage.[14] Two kinds of tasks are required. The first task of this section is to improve the estimates of SNA series for periods (a) and (b). Agricultural production and manufacturing industry production data have been examined in detail in previous studies, and these output estimates can be used as the basic data. But it is necessary to re-examine the output of the other industries. Regarding the expenditure accounts, some revisions are also required. The second task is to construct the long-run SNA accounts based on 68SNA. In the process, we confront the problem how to reconcile the matrix consistency in the SNA with the revisions of base years. The problem is more serious in our long-run SNA series than in the case of the official estimates used in the short-term comparisons.

(3.1) Revisions of Previous Estimates

In our revision of estimates for period (b), we can adopt the 1940 data of the semi-official SNA data as the bench mark figures. While there have been a large number of revisions of the methodology, we here report only the major improvements. Regarding the output of the transportation industry in the pre-WWII period, Wu published good estimates using railway transportation data.[15] We tried to revise his

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[11]) Terasaki, Yasuhiro, "Estimate of Consumption Level of Taiwan, 1912-1938", <u>Journal of the Department of Arts and Science of Nagasaki University,</u> 21-2,1981.
[12]) Mizoguchi, T. <u>Economic Growth of Taiwan and Korea,</u> Iwanami shoten, 1976(in Japanese). Emi, Koichi "Capital Formation by Government General of Taiwan", <u>Discussion Paper, Institute of Economic Research, Hitotsubashi University,</u> 1973 (in Japanese).
[13] Nojima, Noriyuki "Database on Foreign Trade of Taiwan", <u>HUE Journal of Economics,</u> 21-4, 1999 (in Japanese).
[14] Mizoguchi, T. "A Long-term National Accounts Database of Japan, Taiwan and Korea", in Odaka, Konosuke, Yukihiko Kiyokawa and Masaaki Kuboniwa (eds.) <u>Constructing a Historical Macroeconomic Database for Trans-Asian Regions,</u> Institute of Economic Research, Hitotsubashi University,2000.
[15]) See footnote 8.

estimates using the traditional transportation data shown in the administrative reports by the Police Bureau, the Government General of Taiwan.[16] The results can be calculated both in nominal and real terms.

There are few data on the output of the wholesale and retail sale industry. We divide the 1940 output figure into (1) wholesale, (2) retail, and (3) foreign trade, and then extrapolate using the indexes of the corresponding activities.[17] The output of the construction industry is also estimated by extrapolating the benchmark figures. The reference index for the extrapolation is the real construction investment index in the expenditure accounts, obtained by the commodity flow method.

In previous estimates, the output of the financial industry was assumed to be zero because most bank income is canceled out by the imputed interest (a minus item in the SNA). In our revision, we explicitly include the output of the financial industry. Further, output was estimated for the insurance industry and traditional financial industry. The output estimate for the real estate industry remains less reliable than for other industries. Owing to the scarcity of housing data, the imputed rent of own houses in 1940 was extrapolated using total private consumption expenditure.

The service industry is composed of household services and business services. Output of the former is taken from the services expenditure in the private consumption data. The latter output is estimated by using the number of professionals registered with the Police Bureau of the Government General of Taiwan. The estimate of government services is based on Lee's paper.[18] In her estimate, the output of government services increased significantly after 1950, but this was the result of definitional modifications. Before 1949, defense expenditures were not included in the GDE of Taiwan because they were part of the budget of the Central Government of Japan (1901-1945) or the Central Government of Republic of China (1945-1950). There remain gaps in both government consumption in the expenditure accounts and government service output in the production accounts. But these gaps are not adjusted for in our long-run SNA series.

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[16]) A good study on Taiwanese transport activity was published after our own study and should be taken into account in the future revision of our estimates. See Guo Xing Xie "Railway and Road Transportation in Colonial Taiwan", in Hori, Kazuo and Satoru Nakamura (eds.) Japanese Capitalism and Korea and Taiwan, Kyoto Daigaku Shuppankai, 2004 (in Japanese).

[17]) The division was based on the information shown in the 1939 Census of Commerce. In our extrapolation, we use production indexes of agriculture and manufacturing industry for (1), the index of private consumption expenditure for (2) and indexes of foreign trade for (3).

[18]) See footnote 10.

The amount of data available for period (a) is very limited. We need to extrapolate 1912 estimates using various kinds of data. However, our results are preliminary and to be improved in the near future.[19]

(3.2) Consolidation to SNA Tables

To begin with, let us describe the principles on which the construction of our long-run SNA data are based. For the sake of international comparability, the editorial board of the COE project formulated two principles regarding the construction of each country's SNA series. The first requirement is to construct the accounts on the basis of the 68SNA. The second is to select 1960 as the reference year for the deflators.

It is fortunate that the official SNA of Taiwan adopts the 68SNA. We can take the nominal series from 1961 to 1990 from the official report of 1996. These can be linked to the series from 1991 to 2000 which is included in the official report published in 2002,[20] In order to link these series to the pre-1960 data, we should take into accounts small gaps between the post-1961 and the pre-1960 series in some items. For example, the coverage of accommodation expenditures in the private consumption data was extended after 1962. Furthermore, the definition of the real estate industry was modified in the 1981 revision of the official SNA report. We made some simple adjustments in these cases, but the effects of these adjustments were generally small.

The official SNA has three kinds of accounts: production, expenditure, and distribution accounts. As was mentioned before, DGBAS seems to adjust to make the statistical discrepancies zero not only in the nominal accounts but also in the real accounts. Because our long-run SNA series embody (encompass?) the official SNA data, we shall take this approach for the overall period.

Nominal production accounts were published for the period 1938-1951 in the semi-official national accounts estimates. [21] The accounts started from the 1951 accounts in the official SNA report. As was noted in Section (3.1), nominal production and expenditure accounts for period (b) were estimated. In our original calculations, there were some statistical discrepancies between these two accounts. But the size of the discrepancies was less than 5% of nominal GDP. Both accounts were adjusted to make the gaps zero. Our 1940 nominal GDP estimates are similar to the

[19]) A detailed explanation will be provided in our final version in Japanese, but the information can be provided on request

[20]) DGBAS, National Income in Taiwan Area of the Republic of China, 1996, National Accounts for 1951-1995 and National Income in Taiwan Area of the Republic of China, 2002, National Accounts for 1991-2001.

[21]) See footnote 9.

corresponding figures in the semi-official SNA estimates mentioned above. The long-run nominal series are shown in Table 1.[22]

In the estimates of the real series, especially when the basic series are summed up as aggregated items such as net value added by industry or GDP, we confront the index number problem. It is well known that the growth rate of real GDP differs significantly according to the index formula for the deflators. The problem is serious because our estimates cover long periods. In the estimation of real GDP and its components, basic real series are estimated from quantity data by individual commodity. But in our long-run study, it is difficult to follow this method owing to the scarcity of data. Instead, as the proxy of quantity of a commodity, we calculate the real value index for groups of commodities which can be used as time series for the overall period. Let us call these series the 'basic series' for the aggregation. The basic series are composed of items shown in recent SNA reports but we decompose some item groups into more detailed classifications. For example, in our long-run comparison, agriculture is an important industry, so production is calculated based on relatively small commodity groups. The list of basic series is shown in Table 6.

We take basic series of the 1951-2000 expenditure accounts and the 1961-2000 series of production accounts from official SNA reports and other related data sources. The base years for the deflators were 1991 in the 1996 report and 1996 in the 2002 report. When we linked these two series, the figures of 1991 were used as benchmarks, and at the same time the most detailed industry classification in the report was adopted. Because real series of the production accounts were not published from 1951 to 1961, we estimate them using production indexes for primary and secondary industry, and price deflators for tertiary industry.[23] The major basic series of the production accounts for period (c) can be taken from the semi-official estimates mentioned above, but some supplementary work is required to obtain some of the detailed categories.

The real basic series for period (b) are calculated using 1940 as the base year for both production and expenditure accounts and referring to previous studies. The production series are linked directly to the semi-official estimates. The 1940 expenditure series are linked to the official series which start from 1951 using the deflators calculated by the author. The real series by category are adjusted to make the

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[22]) Note that the Taiwanese currency was revalued in 1949. The rate was 1 NT$(New Taiwan Dollar) = 40000 OT$ (Old Taiwan $ or Yuan). In 1945, 1 Japanese Yen was equal to 1 OT$. In Table 1, data in Yen or OT$ are converted to NT$ using these conversion rates.

[23]) A detailed explanation will be provided in our final publication in Japanese, but the information is available on request.

reference year 1960.[24]

　　Aggregated items such as GDP are calculated using the basic series. In the case of nominal accounts, we can obtain aggregated items by summing the basic series. In other word, matrix consistency is maintained in the nominal accounts. However, the results are different when using the aggregation formula in the case of real items. There are some alternative methods of aggregation. The simplest one is to sum up basic series as in the nominal accounts. Using this method, the long-run series of real values are calculated in 1960 prices. The constant price evaluation is useful for a short tem comparison. But the constant price evaluation tends to overestimate growth rates in the long-run. To overcome these difficulties, the base years of the SNA deflators have been revised at constant year intervals.

　　We calculated three real series using alternative approaches: (A) the simple sum of basic series (constant price evaluation), (B) the link of different base years with 5 years intervals, and (C) the Fisher link index method (the base years are revised every year). Note that method (B) is used in the official SNA reports for the post-1961 series, so let us call (B) as "DGBAS method." These three alternative methods are characterized as follows.

Method	Growth rate of aggregates	Growth rate of Basic series	Matrix Consistency
(A)	Laspeyres bias	Original level	Valid
(B)	Moderate	Modified in revision years	Valid
（C）	Moderate	Original level	Invalid

　　The estimates of GDP are compared in Table 1. Note that 1960 is the base year for method (A) and the reference year for methods (B) and (C). Method (A) seems to overestimate the growth rate during the period after 1960. This could be explained by the well-known Laspeyres bias. However, the different results obtained using the different methods of aggregation, while not negligible, are not very serious. Further examinations are necessary on these differences but we shall preliminarily adopt series (B) in the next section..

（4）　Some Findings from the Consolidated Tables.

　　The major objective of this paper is to supply data consolidated in the form of the

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[24]) Real series by category are adjusted by the ratio of calculated real values and the nominal values in 1960.

68SNA. Real and nominal national accounts data at ten-year intervals are shown in Tables 2 and 3. Annual data can be provided on request. The data can be used in various analyses. For example, the data can be used for growth accounting or for econometric modeling. Such analyses are left for future studies. Here we just provide a simple analysis of the long-term economic growth of Taiwan using the estimated SNA data.

Figure 1 shows the long-run trend in Taiwan's GDP and per capita GDP. To eliminate irregularities, original figures are smoothed using 5-years moving averages. In the 1940s, growth rates fluctuate wildly owing to the economic dislocation brought on by WWII. The impact of population increases was remarkable in the mid-1940s owing to the migration from mainland China. As is well known, the Taiwanese economy has grown steadily since the end of WWII. Growth accelerated after the 1960s and remained high until 1980 except for the blip due to the oil crisis. It should also be noted that the economy registered sustained growth before WWII, expanding at an average rate of more than 3%. Similarly, per capita GDP also increased steadily before 1940. What is more, these growth rates for the pre-WWII period were high by international standards.

Economic growth was supported by changes in industrial structure and the composition of foreign trade. The growth of manufacturing industry played an important role in the economic development of Taiwan as is shown in Table 3.B. The structure of manufacturing industry has changed as is shown in Table 4. The ratio of foreign trade to GDP was high before WWII, sharply declined in the 1940s and 1950s, but then rose again. In the 1980s, the sum of the export and import ratios exceeded 100% of GDP (see Figure 2).

The tables and figures allow us to gain an overview of Taiwan's economic record. Table 2 shows the changes over time in the composition of nominal GDP. Prior to WWII, primary industry, consisting mainly of agriculture, occupied a large share. The productivity of Taiwanese agriculture was high. Two agricultural products (rice and sugar cane) occupied large shares in this sector. Primary industry retained a relatively important position in GDP until the 1980s. This is in contrast with the case of Japan and South Korea where the role of primary industry declined significantly in the post-WWII period. Manufacturing industry accounted for a relatively high share (about 25%) of GDP before WWII. But the sugar industry occupied a major share in manufacturing production, so other manufacturing industries were still not very developed. Table 4 indicates these changes by ISIC category.[25] The composition of foreign trade reflects the industrial structure. Table 5 shows that the major export

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[25]) Yasuhiro Hara reclassified the pre-WWII production data by the Government General of Taiwan by the ISIC. Table 4 is based on his unpublished results.

goods were rice and sugar (included in food and animals), while consumer goods accounted for a large share of imports.[26]

Secondary industry, consisting mainly of manufacturing, increased its share after WWII. In the 1950s and 1960s, light industries such as textiles and related products saw an increase in their share in total industrial production. Imports of textile raw materials (included in chemical and related goods) increased. Production gradually shifted from import substitution to export orientation.

In the next phase, during the 1970s and 1980s, the structure of manufacturing industry changed again, with the emphasis shifting from light industry to machinery. The chemical industry developed enough to supply raw materials for the textile sector. The machinery industries became established and began to export their products. These facts are observed in the rise of the export shares of machinery and transport equipment and manufactured goods classified by materials. The import of capital goods increased significantly in line with these developments.

Tertiary industry played an important role after the 1980s. The share of the finance and insurance industry and the service industry in GDP increased. The transportation and communication industry occupied a relatively stable share in GDP during the entire century, while the structure of industry changed significantly in this period.[27]

The analysis in this section is just a very simple one, but as shown in the appendix of this paper, our database provides annual figures for a range of national accounts statistics that can serve as the basis for more substantial research. This volume provides some research, but it is our hope that researchers will use our results for more systematic studies.

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[26]) In 1900, 1910 and 1920, the export share of 'chemical and related products' was high. We should note that most of these goods consisted of traditional goods such as Chinese medicine.

[27]) It is very difficult to calculate the growth rate of the communication industry because the rate of technical change in the communication sector is so rapid. In Taiwan, studies on production indexes suggest that the growth rate of this industry has been underestimated in the official SNA statistics. But more studies are required to correct the official series.

Appendix　Contents of Final Publication (in Japanese)

<u>Long-run Economic Statistical Database of Taiwan</u> (title may be changed)

Edited by Toshiyuki Mizoguchi

Authors: Konosuke Odata, Osamu Saito, Tadayoshi Taniguchi, Noriyuki Nojima, Masahiro Sato, Hiroshi Ikegami、I-Ling Liu, Yasuhiro Hara

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Chapter 1 Characteristics of Taiwanese Statistics and Development of Statistical System
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Chapter 9 Foreign Trade Statistics
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CDR (Appendix)　Basic data and copies of previous contributions referred to in this volume.

Table 1　　Long-run Estimates of GDP

Year	Nominal GDP (Million NT$)	Real GDP by Aggregation Method, Million NT$ (1960 Prices)		
		A Simple Sum	C Fisher Link Indexes	B DGBAS method
1901	0.00248	6,883		7,608
1902	0.00291	7,638		7,787
1903	0.00326	9,180		9,309
1904	0.00305	8,884		9,010
1905	0.00278	7,441		7,607
1906	0.00313	8,211		8,020
1907	0.00366	9,153		9,199
1908	0.00370	9,378		9,401
1909	0.00432	10,547		10,692
1910	0.00553	10,832		11,351
1911	0.00547	9,891		10,257
1912	0.00577	10,196	8,689	10,585
1913	0.00588	10,962	8,772	11,101
1914	0.00548	10,978	8,950	11,139
1915	0.00599	10,902	9,138	11,388
1916	0.00710	11,708	10,122	12,336
1917	0.00887	12,555	10,445	13,762
1918	0.01104	12,036	9,739	13,553
1919	0.01449	12,967	9,900	13,597
1920	0.01552	13,459	10,324	13,980
1921	0.01326	14,200	10,791	14,860
1922	0.01286	15,240	11,874	16,266
1923	0.01377	15,459	12,231	17,193
1924	0.01573	16,579	13,081	18,331
1925	0.01720	18,120	14,232	19,414
1926	0.01695	19,292	14,685	20,221
1927	0.01624	19,364	14,721	20,096
1928	0.01787	20,106	15,831	20,424
1929	0.01837	21,680	17,166	21,946
1930	0.01652	22,722	17,527	22,778
1931	0.01437	22,274	17,566	23,335
1932	0.01666	23,393	18,313	24,066
1933	0.01664	23,434	18,820	24,075
1934	0.01850	23,932	19,641	24,939
1935	0.02181	26,821	22,012	27,559
1936	0.02364	28,163	23,135	28,877
1937	0.02526	28,297	23,819	29,026
1938	0.02903	29,391	25,497	30,173
1939	0.03398	28,805	25,222	29,492
1940	0.03545	27,870	24,283	28,417
1941	0.03814	28,241	25,211	27,294
1942	0.04143	28,566	28,375	28,630
1943	0.04707	22,271	22,261	26,526
1944	0.05988	14,742	15,174	22,362
1945	0.10391	8,505	10,154	11,945
1946	1.20553	19,236	18,985	12,626
1947	5.21945	19,104	18,558	15,475
1948	44.78049	23,437	23,397	20,045
1949	3013	26,431	23,942	24,166
1950	7659	30,785	29,115	29,321
1951	12,457	33,140	30,522	31,669
1952	17,430	37,027	36,829	35,462
1953	23,206	40,770	40,308	38,771
1954	25,476	43,663	42,843	42,470
1955	30,288	47,608	45,698	45,912
1956	34,768	48,787	47,505	48,439
1957	40,610	53,332	51,889	52,004
1958	45,447	58,588	56,367	55,494
1959	52,374	60,153	58,411	59,740
1960	63,111	63,111	63,111	63,111
1961	70,269	66,957	67,456	67,452
1962	77,423	71,611	71,710	72,783
1963	87,553	78,086	78,332	79,591
1964	102,294	89,921	91,426	89,301
1965	112,975	102,258	104,281	99,244
1966	126,403	112,492	110,594	108,089
1967	146,249	126,268	126,871	119,667
1968	170,408	139,376	142,766	130,642
1969	197,440	153,056	158,410	142,333
1970	227,496	172,462	181,002	158,517
1971	264,474	197,502	203,901	178,958
1972	317,104	225,816	231,231	202,790
1973	411,524	258,052	266,230	228,814
1974	551,152	266,877	282,647	231,472
1975	591,369	271,108	267,343	242,880
1976	709,657	313,471	318,746	276,545
1977	831,250	342,349	344,486	304,724
1978	994,159	398,870	391,786	346,148
1979	1,198,898	428,734	431,269	374,442
1980	1,495,036	459,352	448,581	401,781
1981	1,773,931	488,554	467,304	426,542
1982	1,899,971	498,484	470,264	441,689
1983	2,100,005	552,195	522,315	478,998
1984	2,343,078	611,192	578,642	529,770
1985	2,473,786	630,164	594,760	556,007
1986	2,855,180	723,180	692,387	620,736
1987	3,237,051	830,592	816,868	699,826
1988	3,523,193	890,048	897,515	754,697
1989	3,938,826	960,714	965,651	816,833
1990	4,307,043	986,780	1,004,678	860,891
1991	4,810,705	1,052,040	1,091,839	925,929
1992	5,338,952	1,139,576	1,194,264	995,257
1993	5,918,376	1,218,294	1,282,578	1,065,063
1994	6,463,600	1,314,991	1,356,689	1,140,768
1995	7,017,933	1,410,731	1,425,013	1,214,051
1996	7,678,126	1,498,354	1,516,571	1,288,135
1997	8,328,780	1,636,591	1,651,267	1,374,142
1998	8,938,967	1,721,976	1,728,122	1,436,946
1999	9,289,929	1,889,216	1,828,542	1,514,885
2000	9,663,388	2,017,986	1,857,040	1,603,633

Table 2　　Nominal Accounts of SNA

	GDE (million NT$)	Composition of Expenditure Accounts(%)				Exports	Imports	Adjustment item
		Private consumption	Government consumption	Capital formation	Increase in stocks			
1905	0.00278	94	6	4	0	22	22	−3
1910	0.00553	81	7	8	0	26	21	0
1920	0.01552	73	5	20	0	33	27	−5
1930	0.01652	75	8	11	0	35	25	−4
1940	0.03545	82	7	9	0	39	33	−4
1950	7659	64	24	18	0	9	14	0
1960	63111	68	19	16	4	11	19	0
1970	227496	56	18	22	4	30	30	0
1980	1495036	51	16	31	3	53	54	0
1990	4307043	55	17	22	1	47	42	0
2000	9663388	62	13	23	−1	54	52	0

	GDP (million NT$)	Composition of Production Accounts (%)				
		Primary industry	Secondary industry	Tertiary industry	Government services	Adjustment item
1905	0.00278	42	17	38	4	−1
1910	0.00553	38	24	35	4	−1
1920	0.01552	35	24	45	4	−8
1930	0.01652	39	22	39	5	−5
1940	0.03545	36	26	38	4	−3
1950	7659	35	18	33	12	2
1960	63111	28	27	32	11	1
1970	227496	15	37	34	12	2
1980	1495036	8	46	36	10	0
1990	4307043	4	41	45	12	−2
2000	9663388	2	32	58	11	−4

	GDP　Shares of Major Industries (%)							
	Agriculture	Manufactur-ing	Energy supply	Construction	Wholesale & Retail Sale	Transportation Communication	Finance and real estate	Services
1905	41	14	0	1	15	4	9	9
1910	37	21	0	2	14	4	9	8
1920	32	16	1	7	14	5	18	9
1930	35	15	1	4	14	5	14	7
1940	32	17	2	3	12	5	16	5
1950	31	13	1	3	13	4	10	6
1960	25	19	2	4	15	5	9	4
1970	13	29	2	4	14	6	10	4
1980	6	36	3	6	13	6	12	5
1990	3	33	3	5	14	6	17	8
2000	2	26	2	3	19	7	20	12

Table 3　　　Real Accounts of SNA
(A.)　　　　Real Values (Millions NT$ in 1960 Prices)

(A.1)	GDE	Composition of Expenditure Accounts						
		Private consumption	Government consumption	Capital formation	Increase in stocks	Exports	Imports	Adjustment item
1905	7,607	7,653	168	318	0	912	1,250	−194
1910	11,351	10,361	328	965	0	2,065	2,353	−14
1920	13,980	12,792	310	2,290	0	3,174	3,882	−703
1930	22,778	19,371	378	2,598	0	8,200	6,614	−1,156
1940	28,417	22,221	547	3,127	0	12,181	8,712	−947
1950	29,321	21,247	5,288	3,488		1,923	2,625	0
1960	63,111	43,229	11,992	10,327	2,250	7,168	11,855	0
1970	158,517	90,008	22,136	44,728	7,077	48,842	54,275	0
1980	401,781	189,955	36,732	141,779	13,834	200,083	180,602	0
1990	860,891	433,662	74,687	275,041	9,093	541,772	473,364	0
2000	1,603,633	791,522	86,888	633,249	−42,026	1,211,963	1,077,963	0

(Note) The increases in stocks are included other expenditure items from 1905 to 1950.

(A.2)	GDP	Composition of Production Accounts				
		Primary industry	Secondary industry	Tertiary industry	Government services	Adjustment item
1905	7,607	3,602	787	3,150	67	−88
1910	11,351	4,427	1,817	4,973	134	−159
1920	13,980	6,151	2,355	6,331	132	−988
1930	22,778	10,489	4,266	8,886	186	−1,048
1940	28,417	11,248	6,577	10,963	360	−731
1950	29,321	12,170	4,614	9,228	2,711	598
1960	63,111	17,898	16,852	20,432	7,065	864
1970	158,517	30,106	60,719	50,268	13,045	4,379
1980	401,781	30,696	211,247	134,686	22,403	2,750
1990	860,891	33,022	444,424	339,059	41,820	2,565
2000	1,603,633	27,962	842,047	719,148	59,741	−45,265

(A.3)	Production of Major Industries (Net Value Added)							
	Agriculture	Manufacturing	Energy supply	Construction	Wholesale & retail sale	Transportation and communication	Finance and real estate	Services
1905	3,075	503		93	1,312	87	772	979
1910	3,537	1,307		247	2,271	167	1,123	1,413
1920	3,868	1,246	11	655	2,628	279	2,128	1,296
1930	6,093	2,849	38	731	4,095	390	2,829	1,572
1940	6,431	4,112	196	1,044	3,922	728	4,333	1,980
1950	11,042	2,956	298	889	3,564	636	2,831	2,197
1960	15,647	11,965	1,041	2,439	9,625	2,951	5,411	2,445
1970	22,986	48,845	3,692	5,946	21,632	9,285	15,597	3,754
1980	23,790	173,389	11,457	23,632	45,011	26,722	52,518	10,435
1990	27,493	379,723	26,186	36,077	108,527	53,500	148,911	28,122
2000	23,436	752,638	42,750	44,611	230,902	124,708	302,874	60,664

(B) Annual Growth Rates

(B1)	GDE	Composition of Expenditure Accounts				
		Private consumption	Government consumption	Capital formation	Exports	Imports
1905–10	8.3	6.2	14.3	2.1	17.7	13.5
1910–20	2.1	2.1	−0.6	2.1	4.4	5.1
1920–30	5.0	4.2	2.0	2.1	10.0	5.5
1930–40	2.2	1.4	3.8	2.1	4.0	2.8
1940–50	0.3	−0.4	25.5	2.1	−16.9	−11.3
1950–60	8.0	7.4	8.5	2.1	14.1	16.3
1960–70	9.6	7.6	6.3	2.1	21.2	16.4
1970–80	9.7	7.8	5.2	2.1	15.1	12.8
1980–90	7.9	8.6	7.4	2.1	10.5	10.1
1990–00	6.4	6.2	1.5	2.1	8.4	8.6

(Note) The increase in stocks is added to the capital formation.

(B2)	GDP	Composition of Production Accounts			
		Primary industry	Secondary industry	Tertiary industry	Government services
1905–10	8.3	4.2	18.2	9.6	14.8
1910–20	2.1	3.3	2.6	2.4	−0.2
1920–30	5.0	5.5	6.1	3.4	3.5
1930–40	2.2	0.7	4.4	2.1	6.8
1940–50	0.3	0.8	−3.5	−1.7	22.4
1950–60	8.0	3.9	13.8	8.3	10.1
1960–70	9.6	5.3	13.7	9.4	6.3
1970–80	9.7	0.2	13.3	10.4	5.6
1980–90	7.9	0.7	7.7	9.7	6.4
1990–00	6.4	−1.6	6.6	7.8	3.6

(B.3)	Production of Major Industries (Net Value Added)							
	Agriculture	Manufacturing	Energy supply	Construction	Wholesale & retail sale	Transportation and communication	Finance and real estate	Services
1905–10	2.8	21.1		21.6	11.6	13.8	7.8	7.6
1910–20	0.9	−0.5		10.2	1.5	5.3	6.6	−0.9
1920–30	4.6	8.6	13.0	1.1	4.5	3.4	2.9	1.9
1930–40	0.5	3.7	17.8	3.6	−0.4	6.4	4.4	2.3
1940–50	5.6	−3.2	4.3	−1.6	−1.0	−1.3	−4.2	1.0
1950–60	3.5	15.0	13.3	10.6	10.4	16.6	6.7	1.1
1960–70	3.9	15.1	13.5	9.3	8.4	12.1	11.2	4.4
1970–80	0.3	13.5	12.0	14.8	7.6	11.1	12.9	10.8
1980–90	1.5	8.2	8.6	4.3	9.2	7.2	11.0	10.4
1990–00	−1.6	7.1	5.0	2.1	7.8	8.8	7.4	8.0

Table 4 Nominal Value Added of Manufacturing Production

	Nominal manufacturing production Million NT$	Composition of Manufacturing Production (%)								
		Food	Tobacco	Textile mill products	Wearing apparel & accessories	Leather & fur products	Pulp, paper & paper products	Printing & processing	Wooden products & furniture	Petroleum & coal products
1912	0.0006316	63.34	1.76	0.35	3.38	0.66	1.67	0.27	3.06	0.00
1920	0.0023045	70.61	1.63	0.30	0.58	0.78	1.08	0.20	3.25	0.00
1930	0.0024318	69.42	1.46	0.42	1.60	0.88	1.28	0.35	6.40	0.00
1940	0.0058655	59.45	2.55	1.14	1.67	1.20	2.15	0.38	7.04	0.00
1950	1,041	52.68	5.77	7.31	0.90	0.16	1.23	0.53	5.25	2.45
1960	11,925	32.31	9.20	11.92	2.71	0.28	5.04	2.17	4.26	4.51
1970	66,168	17.88	5.09	11.48	4.38	0.37	3.02	1.30	4.30	10.72
1980	537,089	9.60	2.73	9.29	5.46	1.65	3.22	1.39	2.92	6.81
1990	1,434,545	8.57	1.67	6.70	4.15	1.29	2.59	1.41	2.67	4.66
2000	2,550,380	4.70	1.06	5.41	1.80	0.46	2.08	0.80	1.40	6.79

	Composition of Manufacturing Production (%)					Machinery, equipment and repairing				Miscellaneous
	Chemical matter & rubber prod.	Plastic products	Non-metallic mineral products	Basic mineral products	Fabricated metal products	General	Electrical & electronic	Transport	Precision	
1912	16.13	0.00	5.76	0.93	0.64	0.81	0.00	0.09	0.29	0.87
1920	9.97	0.00	6.45	1.27	0.49	1.76	0.00	0.74	0.14	0.77
1930	6.74	0.00	5.90	1.02	0.68	2.63	0.00	0.31	0.18	0.73
1940	7.68	0.00	5.07	2.91	3.37	4.37	0.00	0.37	0.39	0.27
1950	10.17	1.12	3.13	0.46	0.88	1.28	0.32	0.87	0.63	4.87
1960	5.54	1.02	7.15	4.39	1.46	1.70	1.84	3.23	0.21	1.06
1970	10.79	0.86	4.71	2.89	2.03	2.83	9.48	4.39	0.58	2.88
1980	12.88	1.38	4.58	6.49	3.90	2.89	12.02	5.90	1.15	5.75
1990	8.38	7.91	4.42	6.86	5.94	4.46	15.93	7.50	1.12	3.78
2000	8.72	5.67	2.75	7.38	7.40	5.74	28.19	6.62	0.90	2.14

Table 5 (A) Composition of Foreign Trade: Exports (SITC)　　　　　　　　　　　　　　　　(%)

	Food and animals	Beverages and tobacco	Crude materials, inedible, except fuels	Mineral fuels, lubricants and related materials	Animal and vegetable oils and fats	Chemicals and related products	Manufactured goods classified chiefly by material	Machinery and transport equipment	Miscellaneous manufactured articles
1900	68.31	0.05	5.04	0.73	0.00	23.14	0.26	0.00	0.53
1910	83.08	0.01	2.82	0.11	0.01	11.40	1.79	0.03	0.52
1920	79.80	0.10	1.66	4.84	0.06	9.05	2.73	0.05	0.88
1930	86.95	0.02	3.60	1.52	0.02	3.81	2.34	0.08	0.90
1940	72.35	0.40	7.38	2.09	0.28	6.26	8.20	0.40	2.56
1950	87.67	0.00	5.05	0.47	0.00	4.99	0.68	0.09	1.06
1960	63.89	0.24	5.52	1.53	0.07	5.05	19.86	0.78	3.03
1970	18.38	0.17	3.99	0.65	0.02	2.35	29.36	16.67	28.08
1980	8.55	0.07	1.69	1.45	0.02	2.58	22.88	23.57	39.19
1990	3.98	0.03	1.75	0.03	0.03	4.08	19.55	38.13	32.29
2000	1.17	0.03	1.26	1.12	0.02	6.24	19.45	58.39	12.13

Table 5 (B) Composition of Foreign Trade: Imports (SITC)　　　　　　　　　　　　　　　　(%)

	Food and animals	Beverages and tobacco	Crude materials, inedible, except fuels	Mineral fuels, lubricants and related materials	Animal and vegetable oils and fats	Chemicals and related products	Manufactured goods classified chiefly by material	Machinery and transport equipment	Miscellaneous manufactured articles
1900	17.02	7.21	10.69	5.65	1.12	18.01	22.82	2.02	14.55
1910	16.82	5.52	8.82	2.63	0.22	13.92	29.66	13.33	8.51
1920	30.33	5.05	9.27	2.67	0.52	13.59	25.13	7.48	5.60
1930	23.34	5.29	8.40	3.09	0.77	14.20	30.33	7.10	7.22
1940	22.55	3.81	13.73	2.92	0.49	14.20	25.85	8.87	7.49
1950	23.78	0.62	4.34	2.68	2.54	14.66	29.90	17.79	3.43
1960	14.09	0.91	16.98	7.57	1.61	15.26	12.40	27.13	3.82
1970	8.46	0.89	20.39	4.45	0.36	10.09	16.36	35.14	3.39
1980	6.12	0.52	13.44	25.47	0.24	9.72	12.45	27.49	3.66
1990	4.59	0.56	8.05	8.70	0.18	13.20	16.18	37.98	5.67
2000	2.44	0.63	3.70	9.31	0.11	11.13	11.10	50.18	9.71

Source: Nojima (1999).

Table 6 List of Basic Series for Real Series Aggregation

| High level aggregates	Low level aggregates	Basic series
GDP (Production accounts)		
Primary industry	Agriculture	Rice
		Other cereals
		Sugar canes
		Other commercial crops
		Vegetables
		Fruits
		Livestock
	Forestry	Forestry
	Fishery	Fishery
Secondary industry	Manufacturing	19 industries in Table 4
	Mining	Coal
		Other mining products
	Energy supply	Electricity
		Other energy supply
	Construction	Residential construction
		Other construction
Tertiary industry	Transport and communica	Railway transport
		Other land transport
		Water transport
		Air transport
		Communication
	Wholesale and retail trade	Wholesale domestic trade
		Retail trade
		Foreign trade
		Restaurant and hotel
	Finance, insurance and real estate	Banks
		Other financial institutions
		Brokerage
		Dwellings
	Service	Service for business
		Service for households
Government & other producers	Government	Central government
		Local governments
	Other producers	Other producers
GDE (expenditure accounts)		
Private consumption	Household consumption	Food
		Beverages
		Tobacco
		Clothing and footwear
		Fuel and power
		Rent and water charges
		Furniture, furnishing & equipments
		Household operation
		Medical & health care
		Recreation & education
		Transport & communication
		Other goods and services
	Other consumption	Consumption of nonprofit institutions
Government consumption		Compensation of employees
		Consumption of fixed capital
		Intermediate consumption
Capital formation	Fixed capital formation	Construction
		Machinery and equipment
	Increase in stocks	Increase in stocks
Foreign trade	Exports of goods	9 items shown in Table 5
	Imports of goods	9 items shown in Table 5
	Service trade	Service trade

Figure 1 Growth Rates of GDP and Per Capita GDP
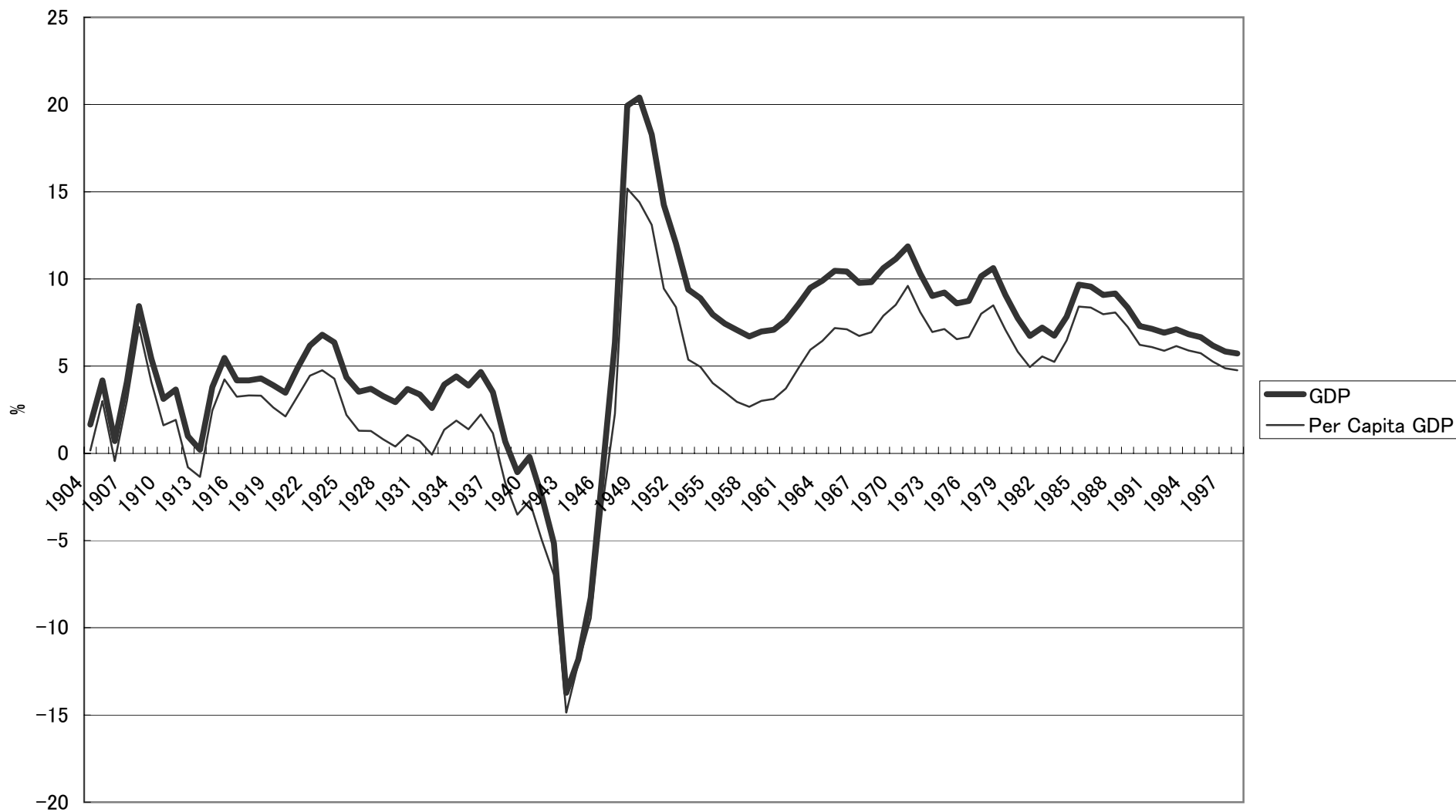
Figure 2 Share of the foreign trade in GDP