BUSINESS CYCLES IN JAPAN, 1868—1962*

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I. *Introduction*

The Japanese economy has maintained the high rate of economic growth in the process of its modern development. The process was, however, not smooth but accompanied by cyclical fluctuations, and each period was characterized by its corresponding cycle. The purpose of this paper is (i) to make clear what kinds of business cycles are observed, and then to establish a chronology of business cycles since the Meiji Restoration in 1868, which marked the transition from the feudalistic to the capitalistic system in Japan, (ii) to observe whether there is any characteristic in the observed cyclical pattern and whether there occurred any change in the cyclical pattern in the chain of business cycles, and (iii) if we observe any change, then to seek hypotheses to explain it.

II. *Definition of the Business Cycle*

At first let us define the term the business cycle. The first thing we should notice is that characteristic exists in the circular process of the capitalist economy. In any age or under any social system there are three aspects in the circular process of the economy: production, distribution and expenditure. And it is the characteristic of our capitalist economy that activities in these three aspects of circulation are performed through the network of market mechanism. When the demand for and supply of a commodity are not in equilibrium, either the price or the level of inventory for it or both will be changed so that the gap between them may disappear. Then output will be changed to respond to the change in the price or inventory. That is, there occur price adjustment as well as output adjustment as far as the market is not in equilibrium.

Secondly, as countries in the world were industrialized and the working of market mechanism was penetrated into their economies as well as economies coming in contact with them, it became clear that they had experienced not steady growth or decline but alternative occurrence of upward and downward movements. Namely, according to previous experience cyclical fluctuations were produced almost simultaneously in the processes of adjustments in many markets.

The third trait to be noticed is the fact that cyclical fluctuations had a periodicity, as Clément Juglar made clear in the latter half of nineteenth century.[1]

[1] C. Juglar: *Des Crises Commerciales et de Leur Retour Périodique en France, en Angleterre et aux États-Unis*, 1889.

When we take the above points into account, we could say as follows. In a capitalist economy the demand for the commodity is not always in equilibrium with the supply in the market which connects the network of circular processes. As the result the market price and inventory for the commodity will be changed. At the same time output produced by firms will fluctuate in response to the relationship between the market price and the corresponding average cost including the normal profit, and/or to unintended inventory investment for the commodity. Therefore the gap between the demand for and supply of the commodity will be reflected in the rate of change in price and later in the rate of change in output through changes in inventory, and that between the price and the cost in the rate of change in output. Since the business cycle is related to all markets for commodities, it will be well grasped by means of the rate of change in *prices* and that in *total output*. Because these rates of change fluctuate in the same direction and because the rate of change in total value of output is comprised of them, it could be a comprehensive index for the business cycle. Although the commodity market plays the central role in the business cycle, firms selling their products in the commodity market should borrow funds from the market for loanable funds on the one hand, and hire necessary labor from the labor market on the other. Thereby the circular processes of the economy are connected by these markets as well. Therefore we should take into account the rates of change in the interest-rate, the amounts of loanable funds, wage-rate and employment in examining the business cycle. Thus we can define the business cycle as follows;

> The business cycle is cyclical fluctuations appearing almost simultaneously in the rates of change in price as well as output variables. The former includes prices, the rate of interest and the wage-rate, and the latter contains output, the amounts of loanable funds and employment. It has a considerably stable duration period longer than one year.

The main motive power of the business cycle is, we think, investment. There are three types of physical assets, each of which is adjusted to an optimal value with speeds differing from each other. Inventories will be able to be adjusted to the optimal in the short run, and producer's durable equipments in the long run in Marshallian sense. And buildings and constructions will need much longer time than durable equipments to be adjusted to the optimal level. Thus inventory investment, investment for producer's durable equipment and investment for buildings and construction will show different patterns of cyclical fluctuations. That is, the first will be of shorter and the third of longer duration than the second. It seems that we have three types of business cycle corresponding to the different behavior of the three types of investment, i.e. the Kitchin (or minor) cycle or the inventory cycle, the Juglar (major) cycle and the building (or building-transport) cycle. As we call the Kitchin cycle the inventory cycle, we may call the Juglar cycle the equipmemt cycle. And we shall express the building cycle by the name of construction cycle.

III. *The Rate of Change in Bank Debits and Business Cycles*

As shown above, the commodity market plays the central role in business cycles, so that the rate of change in the total amount of output is a comprehensive index of business cycles. Since the total amount of output can be represented by an aggregate relating to national income, say, *GNP*, we are able to approach business cycles by means of *GNP*, if there is

available a *GNP* series covering a fairly long period. However, unfortunately there are the following difficulties in this approach at present. The first is related to the accuracy of estimates of income. Statistics of national income since the Meiji era have been enriched by the great effort of many persons. Nonetheless it seems to be safe at least at present for us to confine ourselves to deriving from them only rough trends of income growth which covering a sufficiently long periods. Secondly, all pre-war series of income statistics are yearly figures. In order to investigate short cycles as inventory cycles, it is desirable that the unit period adopted to estimate data be shorter than one year as far as possible. Unfortunately the pre-war series of income statistics do not satisfy this requirement. Thirdly, national products include agricultural products produced and consumed by farms, and the farther we go back to the past, the greater the weight of the latter becomes. Therefore it is feared that our investigation is obscured by employing a series of national income on examining business cycles, because business cycles are related to phenomena appearing in markets, and the agricultural products mentioned above are not exchanged in the commodity market. Fourthly and finally, we can not grasp the circulation of funds by the concept of national income, even though national income contains the amounts of interest paid for service of loanable funds. This is the reason why statistics of flow-of-funds are prepared in many countries in the post-war period to complement national income statistics.

Taking these points into consideration, we shall attempt at first to capture the business cycles by means of the rate of change in debits to bank deposits.[2] We estimated a semiannual series of bank debits in Japan proper in the period of the latter half of 1879 through the latter half of 1940.[3] In Figure 1 the rate of change in bank debits is shown, where the rate of change is defined by the ratio of debits in the first (or second) half of a year to those in the preceding first (or second) half. Figure 1 shows vividly business cycles in Japan in the pre-World War II. There are high peaks and deep troughs in the behavior of the rate of change in bank debits, which reveal equipment cycles. And we can observe that inventory cycles are superimposed on equipment cycles and that each equipment cycle contains generally three inventory cycles. It seems that in the early Meiji period there is one more equipment cycle than

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[2] Bank deposits cover current deposits, ordinary deposits, deposit-bills, deposits to notice and special deposits, excluding interbank deposits. When holding balances of current deposits a person can pay by check. When he keeps an account of ordinary deposits in the bank, he can draw money from the bank at any time. But if he opens an account of deposits to notice, he should hold money in the account at least for several days (usually for a week) and give notice to the bank in advance (ordinarily two days before) when he wants to draw money from the bank. If he holds deposit-bills, he can pay with them. Special deposits are miscellaneous deposits. For example, when he requests a bank to collect a bill without keeping any account of deposits in the bank, it deals with money collected in the account of special deposits. We exclude time deposits from the coverage of bank deposits on estimating debits to bank deposits. If a person holds balance of time deposits, he can not withdraw money until the contracted period has ended, which is either three months or six months or one year. It is, we think, suitable to exclude time deposits in defining money.

In order to estimate bank debits statistics we utilized accounts of the Bank of Japan, Yokohama Specie Bank, Taiwan Bank, Chosen Bank, Nippon Kangyo Bank, Hokkaido Takushoku Bank, Industrial Bank of Japan, National Banks, Ordinary Banks (which include private banks as well as financial companies existing before the Bank Act was put into practice in 1893), Saving Banks, Agricultural and Industrial Banks and foreign banks. The original data to estimate bank debits are given in the Ministry of Finance: *Annual Report of Banking Bureau.*

[3] Japan proper does not include South Saghalien, Korea and Formosa.

FIG. 1.   BUSINESS CYCLES APPEARING IN THE RATE OF
CHANGE IN BANK DEBITS
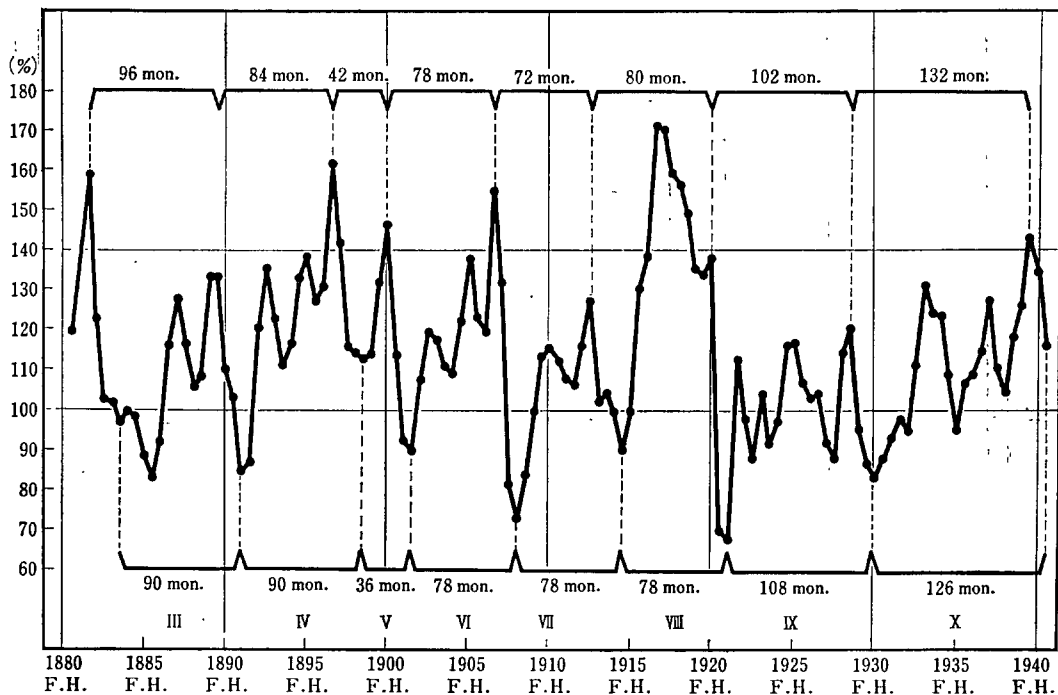
those appeared in Figure 1, as shown later, so that we numbered equipment cycles denoted as in Figure 1. In the pre-war (1868–1940) we have ten equipment cycles, among which there are not even three inventory cycles in the VIII equipment cycle. This would be because one of the downward movements in inventory cycles was so short that it vanished in the behavior of the semiannual rate of change in bank debits. In the VIII equipment cycle the peak of the rate of change in bank debits appeared in the latter half of 1916, but we assumed that the peak of this equipment cycle was reached in the first half of 1920.

Next, according to Figure 1 it seems that there is a trough not in the latter half of 1883 but in the latter half of 1885, which distinguishes between the II and the III equipment cycle, and that the latter cycle contains only two inventory cycles. However we should take into account the fact that the banking system developed rapidly till about 1884. That is, the number of National Banks increased quickly till 1880, reaching the limit provided by the Act of National Bank. Then private banks and financial companies increased rapidly until 1884. When the increase in the number of banks was stopped, the rate of growth of bank debits was suddenly dropped. It does not, however, always mean that the economy as a whole dropped the speed of growth; rather it shows a change in the developing path of banking sector. Thus we decided that the III equipment cycle began from the latter half of 1883, after investigating other statistics.

Although the duration of the V cycle is only 36 months, when we measure it from trough

FIG. 2. CONSTRUCTION CYCLES APPEARING IN THE RATE
OF CHANGE IN BANK DEBITS
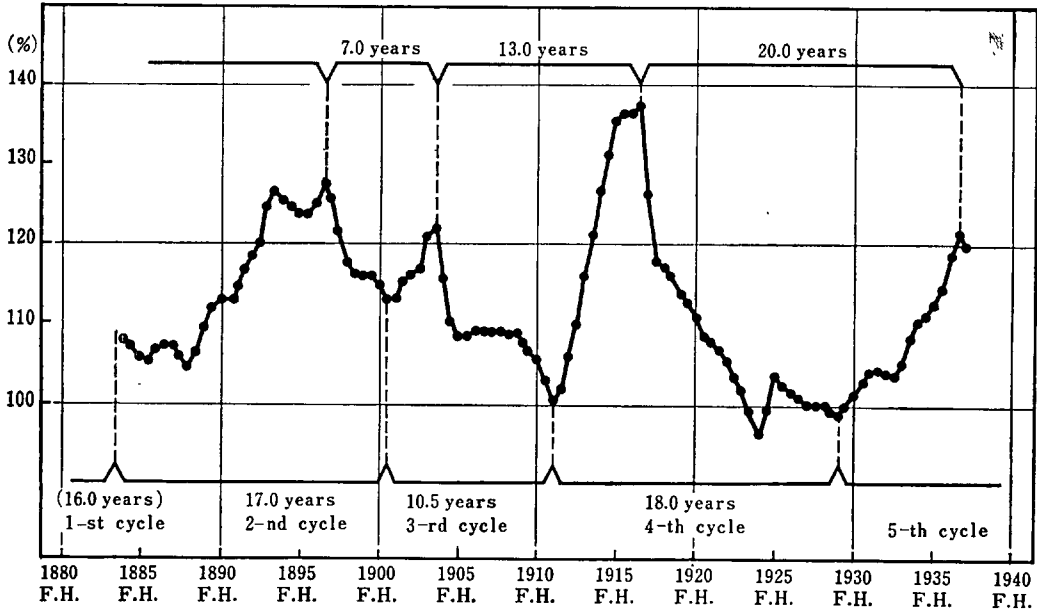
to trough, we regard it as an independent cycle corresponding to the equipment cycle, because the peak is so high and the troughs, which separate it from other cycles, are so deep. However we shall investigate the characteristics of this cycle later.

Now the average duration is 34 months in the first, 32 months in the second and 29 months in the third inventory cycle contained in the pre-war equipment cycles excluding the II, V and VIII ones. And the total average is 31.7 months. On the other hand, the duration of the equipment cycle is on the average 85.5 months (or 92.6 months when we exclude the V cycle), when we measure it from trough to trough. And we get 85.7 months (or 92.0 months when we exclude the V cycle) by measuring it from peak to peak. Thus in the pre-war period an equipment cycle was usually composed of three inventory cycles each of which had the duration of about 30 months, therefore having the duration of about seven years and half.

Although inventory cycles as well as equipment cycles appear clearly in Figure 1, it is not obvious whether the construction cycle exists or not. Therefore let us try at first to eliminate equipment cycles from the original semiannual series of bank debits by means of fifteen term moving average. And then let us compute the rate of change in bank debits defined by the ratio of year ago comparison. Figure 2 shows its behavior, and we can observe there three construction cycles and half in the period of 1883 to 1940. It is estimated that there was one more construction cycle between 1868 and 1883. The rate of change in bank debits did not fall deeply in the neighborhood of the trough connecting the second with the third construction cycle compared with other troughs. This fact will be explained from the point of view of

historical development. That is, it is related to the take-off phenomena in Japan, although we can not explain the point in detail here. During both 1923 and 1924 there was a big drop of the rate of change. It was an irregular movement caused by the Kanto Earthquake in 1923. Therefore we do not take it as a trough. If we can assume that the trough dividing between the first and the second construction cycle appeared in the latter half of 1883, the average duration of construction cycles following the second one is 15.2 years. Or when we assume that the first construction cycle began in 1868, and enter it into our calculations, the average duration becomes 15.4 years.

Usually a construction cycle is composed of two equipment cycles, in the first of which entrepreneurs are positively full of activities and want to reform the present situation in order to realize innovation or to repond to external impulses. In the second cycle there seems to appear a tendency to passively adapt or adjust to the economic environment. According to Table 1 the average rate of change in bank debits alternately rose and fell since the VI equipment cycle.[4] The construction cycle consists of these two types of equipment cycles. If we apply this point of view to situations before the VI equipment cycle, the V cycle corresponds to the equipment cycle with a low rate of change. However, the period for technological innovations had not yet fully finished by that time, so that bank debits showed still comparatively high rates of change in this cycle, but its duration was irregularly short. It seems that the upward movement in the V cycle meant a temporary interruption of the downward movement in the equipment cycle by means of an inflow of foreign capital and from the indemnity gotten by the Sino-Japanese War.

TABLE 1. THE AVERAGE RATE OF CHANGE IN BANK DEBITS IN EQUIPMENT CYCLES

Equipment Cycle	Rate of Change
III	109. 25%
IV	124. 33
V	114. 40
VI	115. 76
VII	106. 03
VIII	132. 50
IX	101. 37
X	113. 91

Now let us glance at the post-war behavior of the rate of change in both bank debits and GNP.[5] There apparently appears inventory cycles in Figure 3, whether we are using the behavior of rate of change in bank debits or that in GNP. However the existence of equipment cycles is obscure. Therefore let us pick up those economic statistics which respond sensitively to equipment cycles. And to eliminate inventory cycles let us calculate the rate of change of them over three years. In Figure 3 the rate of change in the production index of investment goods over three years is shown. It is estimated from its behavior that there exist two equipment cycles in the post-war, one of which occurs in 1945-55.

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[4] Because of the special situation of banking development already mentioned, there is a tendency for the rate of change in bank debits to become low in the III equipment cycle. To exclude the inadequate decline of the rate of change we show in Table 1 the average rate of change in bank debits in the period of the latter half of 1885 to the first half of 1891. We have to notice that in spite of that the rate of change in bank debits takes a rather low figure in the III equipment cycle.

[5] In the post-war it is limited to the period after 1960 that we are able to exclude debits to saving deposits from total bank debits. Therefore we are obliged to utilize figures including debits to saving deposits.

Fig. 3. Post-war Cyclical Fluctuations Appearing in
Various Rates of Change
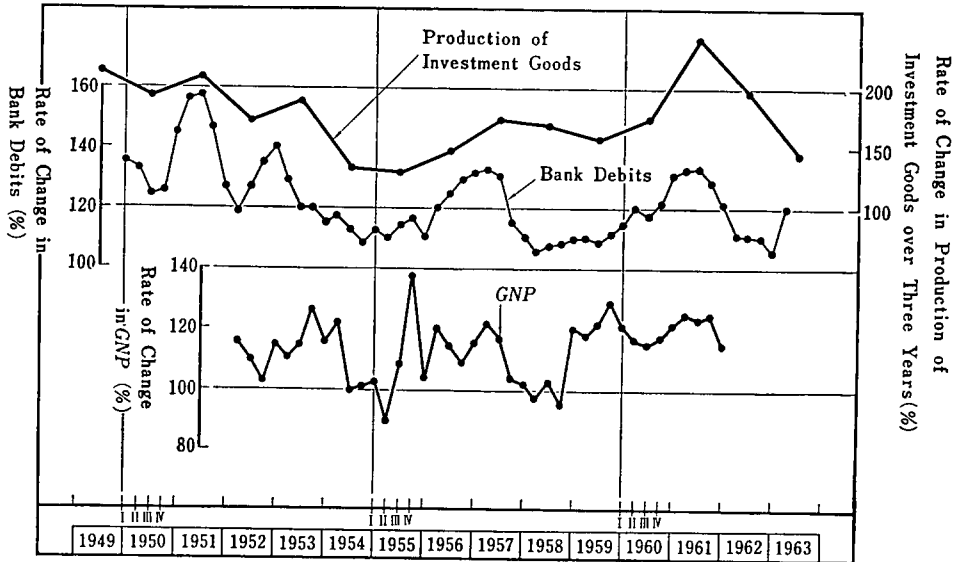
IV. Business Cycle Indexes

In order to examine business cycles comprehensively, we should analyze the monthly series covering or closely relating to the three markets for commodities, loanable funds and labor. The diffusion index is a kind of business cycle index and a useful tool for the purpose of our analysis. In the following we shall construct a few series of business cycle indexes including the diffusion index, which go back to the past as far back in time as possible, attempting to determine a chronology of business cycles by comparing these indexes with historical records.[6]

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[6] Statistical data used are as follows ;

A series, which has data for the period from January 1888 to February 1893 : (1) exports, (2) imports, (3) wholesale price index, (4) the amount of currency excluding currency held by banks, (5) the rate of interest on bank loans in Tokyo, (6) the rate of change in the amount of currency, (7) wage index, (8) balances of loans and discounts by the Bank of Japan, (9) balances of deposits from the private sector in the Bank of Japan, (10) the ratio of (8) to (9), (11) clearings of checks and bills in all clearing houses, (12) balances of bank loans and discounts, (13) the rate of change in (8), (14) the rate of change in (9), (15) the rate of change in (12).

B series, which has data for the period from October 1900 to May 1908. (16) price index for agricultural products, (17) price index for processed food stuffs, (18) price index for fertilizer, (19) price index for textiles, (20) price index for metals, (21) price index for ceramics, stone and clay products, (22) price index for construction materials, (23) stock of money, (24) the rate of change in (23), (25) volume of inventory of cotton yarns at business warehouses in Osaka and Kobe, (26) volume of inventory of raw cotton at business warehouses in Osaka and Kobe, (27) amounts of commodities forwarded from main business warehouses in Osaka, (28) amounts of inventories stored at main business warehouses in Osaka, (29) volume of production of cotton yarns, (30) wage-rate in the cotton spinning industry, (31) employment in the cotton spinning industry, (32) the rate of change in (28), (33) volume of inventory of raw

After eliminating seasonal variations by means of a centered twelve month moving average, we have calculated the diffusion index the quarterly average of which is shown in Figure 4 (see Statistical Appendix 1 at the end of this paper).[7] Its behavior visualizes quarterly business cycles in the pre-war similar to ones observed semiannually in the rate of change in bank debits. The fact that we should notice in Figure 4 is that the diffusion index drops deeply below 50% line only in periods of recession of equipment cycles on the one hand, and

FIG. 4. BUSINESS CYCLES APPEARING IN BUSINESS CYCLE INDEXES
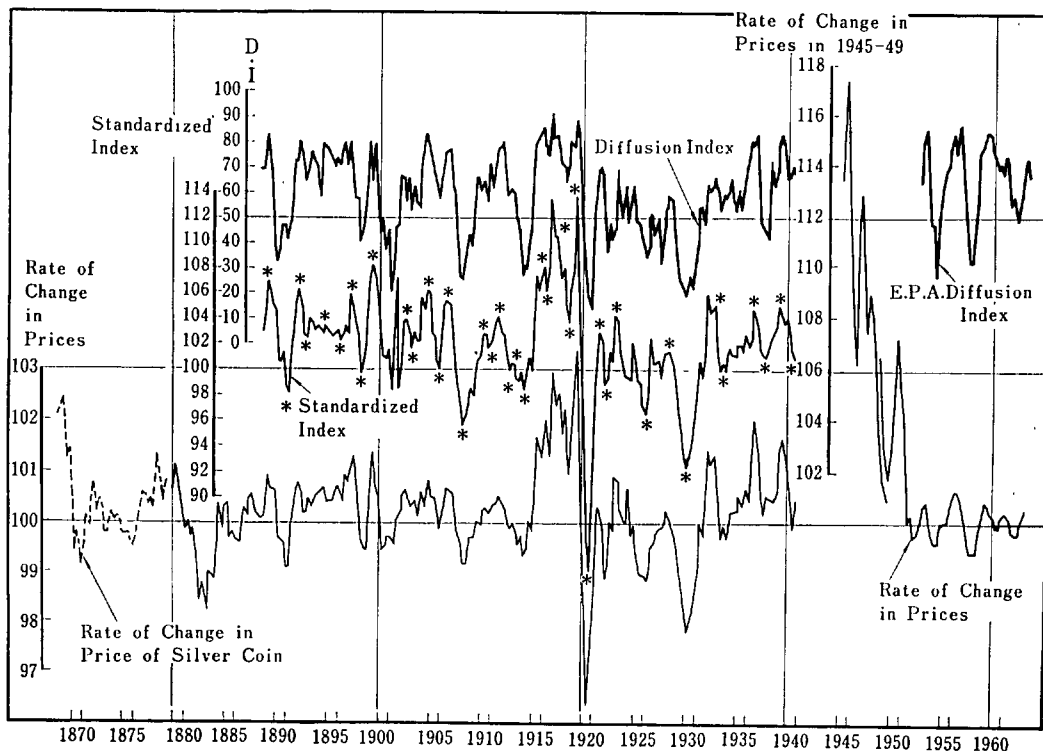
silk in Yokohama and Kobe, (34) volume of shipment of raw silk in Yokohama and Kobe, (35) sum of capital paid-up of newly established banks and business corporations and stocks and corporate bonds (or long-term debt) newly issued by already established banks and business corporations, (36) amounts of inventories stored at main business warehouses in Japan, (37) the rate of change in (36). (38) tonnage of commodities transported by the National Railways, (39) the call-rate.
C series, which has data for the period from January 1913 to January 1928, (40) volume of import of iron, (41) volume index of exports, (42) volume index of imports, (43) amounts of commodities forwarded from main business warehouses in Tokyo, (44) amounts of inventories stored at main business warehouses in Tokyo, (45) the rate of change in (44), (46) stocks and bonds newly paid up, (47) production of copper, (48) volume of inventory of copper, (49) employment index in mining and manufacturing, (50) volume of inventory of coal, (51) shipment of coal, (52) volume of inventory of cement, (53) production of cement, (54) production of pig iron, (54) production of paper, (56) volume of inventory of paper.

[7] The diffusion index is calculated as follows. If an economic variable is increased compared with the previous month, we give +1 to it, if it is unchanged, we give +0.5 to it, and if it is decreased, we give 0 to it. We then divide the sum of them by the number of the series to get the diffusion index.

declines slightly, remaining above 50% line in downward movements of inventory cycles on the other, except 1920's and 1937-38. On calculating the diffusion index we are concerned not with the degree of change but with the direction of change in economic statistics. For that reason we expected that both business cycles where the rate of change in economic statistics shows a great fluctuation and ones where the opposite is true would be uniformed. This would mean that high and low peaks or deep and shallow troughs are not distinguishable from each other. That is, we expected that we could clearly observe inventory cycles, but not equipment cycles. However this expectation was upset by the actual behavior of the diffusion index calculated. The diffusion index suggests us when a peak or a trough is reached, i.e., it is judged that when it cuts 50% line downwards (or upwards), a peak (or trough) will be reached. But if we apply the rule to the behavior of the diffusion index in the pre-war period, we can not find inventory cycles there. It is opposite to the fact that we can evidently observe inventory cycles on the one hand, and can not find equipment cycles in the behavior of the post-war diffusion index prepared by the Economic Planning Agency.[8]

However it is possible in a rapidly growing economy that various economic indexes show always upward movement, and only the degree of increase in them fluctuates up and down because of an imbalance between demand and supply in the market. If we take this point into account, we should interpret peaks or troughs of business cycles not on the basis of 50% line, but on the basis of peaks or troughs of the diffusion index itself. From this point of view we can observe inventory cycles even in the pre-war period. Even if we adopt this method to determine a chronology of business cycles, however, we can not eliminate the fact that equipment cycles were clearly observed but inventory cycles were obscured in the pre-war period compared with the post-war period. This will be a very important finding in characterizing the pattern of pre-war and that of post-war business cycles.

As pointed out in the above, the diffusion index is concerned not with the degree of change but with the direction of change in economic statistics. We are able to be released from the defect by which the diffusion index is accompanied, and to take into account the degree of change in economic statistics, if we construct an index by means of the rate of change itself. Denote the rate of change of the j-th series in the i-th period by x_{ji}, and the number of economic series by N. Then it is possible to construct a business cycle index in the i-th period by

$$\frac{1}{N} \sum_{j=1}^{N} x_{ji}.$$

However the magnitude gotten from it is influenced so much by series whose rate of change has large amplitude, that it assumes implicitly that they have important meaning for business cycles. And there does not exist any reason for expecting that it is true. If we can discover a set of suitable weights reflecting the degree of importance each series has in relation to business cycles, we could compose a suitable business cycle index by means of a weighted average of the rates of change in the relevant economic statistics. In the case of the price index or the production index what matters is the aggregation of prices or volumes of production of various commodities, each of which has same characteristic; as a result we can easily get the weights from the amounts of the transaction. In the case of the business cycle

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[8] It seems that both the pre-war and the post-war American diffusion index calculated by the National Bureau of Economic Research indicate us only the existence of inventory cycles. See diffusion indexes shown in *Business Cycle Indicators*, Vol. II, edited by G. H. Moore, 1961, pp. 176-177.

index, however, it is very difficult to decide upon weights, because what matters here is the aggregation of various series having different characteristics.

Thus let us give up getting weights for each series, and adjust the amplitude of the rate of change of each series so that it may have the average magnitude over all the series, and then try to construct a business cycle index where each series has the same average influence upon the magnitude of index. At first denote the number of rates of change of the j-th series by N_j, and let us define a_j by

$$a_j \equiv \frac{1}{N_j} \sum_{i=1}^{N_j} |x_{ji}-1| .$$

If we divide $(x_{ji}-1)$ by a_j, we can eliminate an amplitude particular to the series from it. Then denote the average of a_j over all the series by a, i.e.,

$$a \equiv \frac{1}{N} \sum_{j=1}^{N} a_j .$$

When we multiply $[(x_{ji}-1)/a_j]$ by a, each series has the average amplitude. Thus $[(x_{ji}-1)a/a_j+1]$ is the adjusted rate of change of the j-th series in the i-th period. Therefore we can construct a business cycle index by the following formula;

$$\frac{1}{N} \sum_{j=1}^{N} \left[(x_{ji}-1)\frac{a}{a_j}+1 \right] .$$

Let us call it the standardized index of the business cycle. Figure 4 shows us the behavior of the standerdized index which corresponds closely to that of the rate of change in the twelve month moving average of wholesale price index (see Statistical Appendix 2 at the end of this paper).[9] It tells us that the commodity market plays the central role for business cycles, so that the rate of change in prices is an important index to represent the phenomena of business cycles.

We decided on the following chronology of business cycles on the basis of behavior of the standardized index of the business cycle. Since it runs parallel with the rate of change in prices, we set up the chronology by depending on behavior of the latter in 1868-1888, where the former index is not available.[10] In Table 2 we assume that the I equipment cycle

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[9] The wholesale price index since 1887 is the series compiled by the Bank of Japan. Before 1887 we have constructed a new monthly series of wholesale price index in Tokyo.

[10] How long a time-span we use for measuring the standardized index or the rate of change in prices is very important in determining a chronology of business cycles. Because the shorter the time-span is, the more the resulting rate of change leads than otherwise, the time when the standardized index arrives at a peak or trough will be changed by the length of time-span we choose. And we have to take into account that if we adopt too short time-span, the magnitude of the rate of change will become unstable. At the same time we have to take into consideration that economic units will judge business conditions by depending upon their experiences in a certain past period. Thus we assume that the time-span of one year is suitable. Let us express a variable in the i-th month of the t-th year by x_{it}. And let us define the ratio of same year ago comparison of the variable by $(x_{it}/x_{i, t-1})$. Then the rate of change of centered twelve month moving average series from a month to the preceding month leads the ratio of same year ago comparison of original series by about six month. Therefore we fixed the date of the peak or the date of the trough six months later than the date of peak or trough of the standardized index. Before 1889 we utilized the rate of change in prices to decide the chronology as mentioned above, where we took directly the ratio of same year ago comparison of prices. Before December 1879 there is not available at present any monthly series of wholesale price index. However we can utilize the price of silver coin of one yen or gold coin of one yen valued by paper money. Before the government began to convert paper money by silver coin in January 1886, the price of silver coin valued by paper money was higher than one yen. At the same time the price of gold coin of one yen valued by paper money

began from January 1868. According to it the duration of equipment cycles is on the average 92.9 months, i.e., seven years and nine months in the pre-war except the V cycle. And the later inventory cycles contained in each equipment cycle, the shorter their rising periods are and the longer their declining periods are. The duration of inventory cycles was on the average 31.0 months, i.e., two years and seven months.

TABLE 2. CHRONOLOGY OF BUSINESS CYCLES IN PRE-WAR JAPAN

Equipment Cycle	Inventory Cycle	Trough		Peak		Trough	
I	1–st	Jan.	1868	Oct.	1869	Sept.	1871
	2–nd	Sept.	1871	Sept.	1872	Dec.	1873
	3–rd	Dec.	1873	Dec.	1874	Dec.	1876
II	1–st	Dec.	1876	Dec.	1877	Aug.	1878
	2–nd	Aug.	1878	Feb.	1879	Oct.	1879
	3–rd	Oct.	1879	Nov.	1880	Sept.	1883
III	1–st	Sept.	1883	Aug.	1885	Aug.	1886
	2–nd	Aug.	1886	March	1888	April	1889
	3–rd	April	1889	July	1890	Oct.	1891
IV	1–st	Oct.	1891	Jan.	1893	June	1893
	2–nd	June	1893	May	1895	April	1896
	3–rd	April	1896	Nov.	1897	Nov.	1898
V		Nov.	1898	Dec.	1899	June	1901
VI	1–st	June	1901	April	1903	Dec.	1903
	2–nd	Dec.	1903	June	1905	July	1906
	3–rd	July	1906	May	1907	Jan.	1909
VII	1–st	Jan.	1909	Dec.	1910	May	1911
	2–nd	May	1911	April	1912	April	1913
	3–rd	April	1913	Sept.	1913	Dec.	1914
VIII	1–st	Dec.	1914	Dec.	1916	March	1917
	2–nd	March	1917	March	1918	April	1919
	3–rd	April	1919	April	1920	April	1921
IX	1–st	April	1921	April	1922	Nov.	1922
	2–nd	Nov.	1922	Jan.	1924	Dec.	1926
	3–rd	Dec.	1926	March	1929	Nov.	1930
X	1–st	Nov.	1930	July	1933	Jan.	1934
	2–nd	Jan.	1934	Sept.	1937	April	1938
	3–rd	April	1938	Dec.	1939	May	1941

In the post-war period the Economic Planning Agency decides reference dates on constructing the diffusion index on the one hand, and the Bank of Japan gives dates of peaks or troughs of business cycles by means of its synthetic business cycle index on the other hand. Those dates are shown in Table 3. We can say that they are related exclusively to inventory cycles.

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had been almost always higher than one yen until the gold standard system was established in October 1897. And silver coin or gold coin was transacted in the market. We can suppose that their prices represented prices of commodities. Thus we decided the date of peak (or the date of trough) by the intermediate date between the date of the peak (or the date of the trough) of the ratio of same year ago comparison of price of silver coin in terms of paper money and that of price of gold coin in terms of paper money. During the period of January 1868 to April 1874, however, we depended upon just the behavior of the rate of change in the price of silver coin to determine the date of the peak or the trough, because there were not available price data of gold coin in this period.

TABLE 3. DATES OF BUSINESS CYCLES IN THE POST-WAR

Business Cycle		Trough	Peak	Trough
1-st cycle	E. P. A. B. J.		June 1951 May 1951	Oct. 1951 Sept. 1952
2-nd cycle	E. P. A. B. J.	Oct. 1951 Sept. 1952	Jan. 1954 Feb. 1954	Sept. 1954 June 1955
3-rd cycle	E. P. A. B. J.	Sept. 1954 June 1955	June 1957 May 1957	April 1958 Sept. 1958
4-th cycle	E. P. A. B. J.	April 1958 Sept. 1958		

* E. P. A. indicates the Economic Planning Agency, and B. J. shows the Bank of Japan.

V. Business Cycles and Development of Industries

Now let us investigate the relationship between business cycles, especially equipment cycles and the development of various industries. Figure 5 shows the behavior of the rate of change in such statistics that represent the capacity of each industry, or if they are not available, the statistics for the volume of production.[11] It is evident from it that each industry shown in it enjoys a wave of the rate of change having a remarkably wide amplitude in the early stage of its development, and that the wave shifts among industries successively. Cycles of the rate of change in capacity or in production and their durations in various industries are shown in Table 4, where the notation ≪ ≫ indicates the period in which the concerned industry showed an extremely high rate of growth, and the notation < > the period in which it experienced a relatively high rate of growth ranking next to the first case. When we compare these periods with our chronology of business cycles, we find that each equipment cycle has the corresponding huge wave (or waves) of the rate of change in capacity or production in a particular industry (or particular industries). Although we can not here explain in detail, a new production function was established and innovation took place in those industries during the concerned periods. For example, the wave of development appeared in the postal service (and banking) in the II equipment cycle, in railroads and machine made silk reeling industry in the III cycle, in the machine made silk reeling industry and cotton spinning industry in the IV cycle, in iron and steel industry as well as electric power industry (especially hydroelectric power industry) in the VI cycle, next in the V cycle whose duration was exceptionally short and whose characteristic was specific as described above, and in electric power industry and ammonium sulphate industry, whose development was stimulated by the decline of tariff of electric power, in the VII cycle. The inorganic chemical industry and the iron and steel industry developed in the VIII cycle, and the chemical industry continued to develop in both the XI and the X cycle. Regarding the post-war period, we can say that the machinery industry was the leading industry for development in the XII cycle next to the period for reconstruction, although we do not show here any evidence for it.

It is evident from Table 4 that the duration of cyclic waves of industrial development is

[11] In the railway and the electric power industry we adjust the mileage of railroads or the capacity for generating electric power expressed in kW so as to include that under construction.

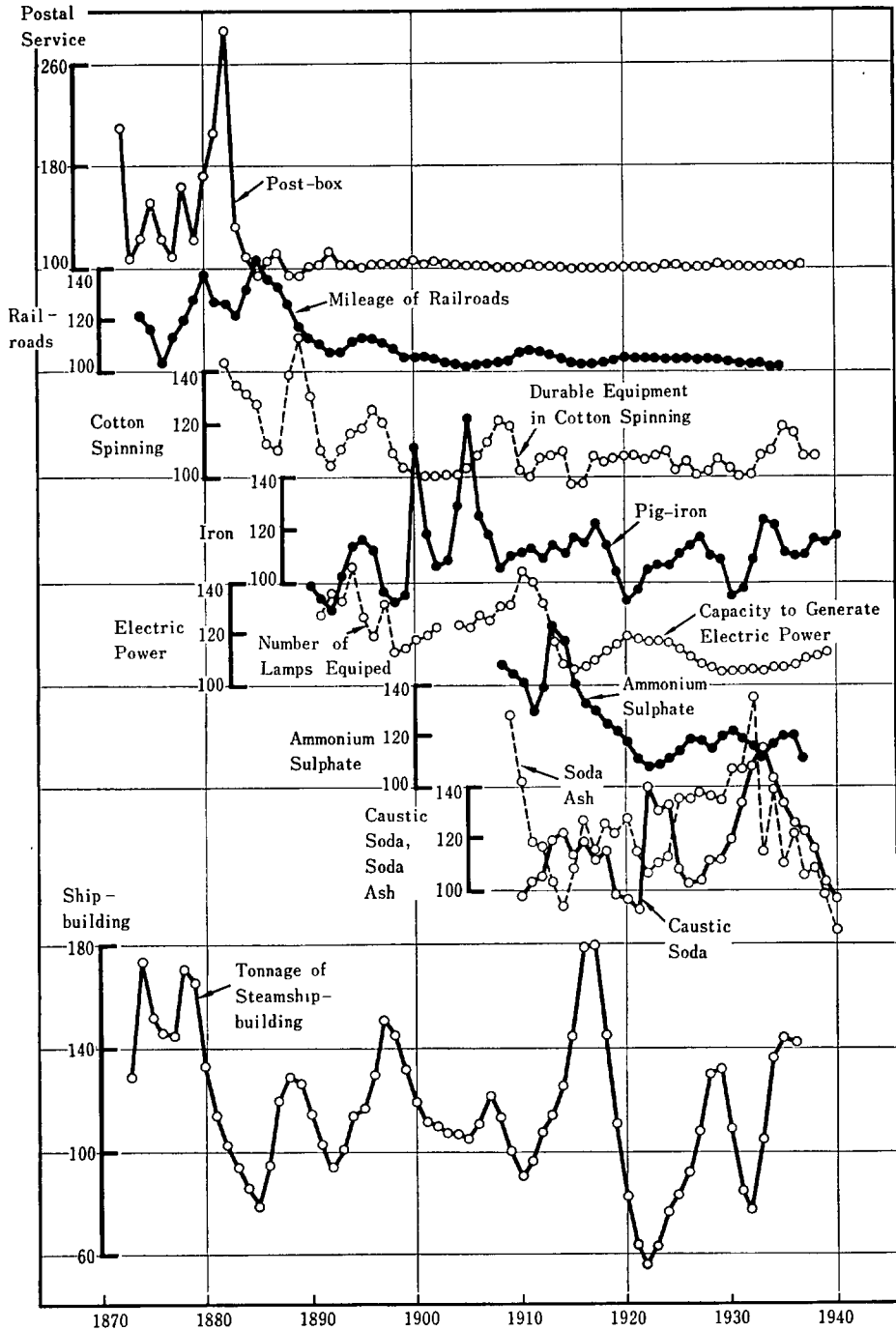Fig. 5.   Waves of Development in Various Industries

TABLE 4. CYCLES OF THE RATE OF GROWTH AND THEIR DURATIONS
IN MAIN INDUSTRIES

Industry	Cycles and their Durations
Postal Service	≪1873-1885≫ (12 years)
Railroads	≪1876-1893≫ (17 years) ; <1892-1905> (13 years) ; 1905-1916 (11 years)
Machine Made Silk Reeling	≪1882-1889≫ (7 years) ; ≪1889-1895≫ (6 years) ; 1895-1904 (9 years) ; 1904-1914 (10 years) ; 1914-1921 (7 years) ; 1921-1931 (10 years) ; 1931-1940 (9 years)
Cotton Spinning (including Cotton Textiles Sector Operated by Cotton Spinning Firms)	<1887-1892> (5 years) ; ≪1892-1901≫ (9 years) ; <1901-1911> (10 years) ; 1911-1915 (4 years) ; 1915-1927 (12 years) ; 1927-1931 (4 years) ; <1931-1937> (6 years)
Iron and Steel	1892-1898 (6 years) ; ≪1898-1908≫ (10 years) ; <1908-1920> (12 years) ; 1920-1930 (10 years) ; 1930-1940 (10 years)
Electric Power	1886-1898 (12 years) ; ≪1898-1915≫ (17 years) ; 1915-1929 (14 years)
Chemical Industry Ammonium Sulphate Caustic Soda Soda Ash	≪1911-1922≫ (11 years) ; 1922-1933 (11 years) ≪1910-1921≫ (11 years) ; 1921-1926 (5 years) ; ≪1926-1940≫ (14 years) ≪1914-1922≫ (8 years) ; ≪1922-1940≫ (18 years)
Shipbuilding	1870-1885 (15 years) ; 1885-1910 (25 years) ; 1910-1922 (12 years) ; 1922-1938 (16 years)

about fifteen years in railroads and the electric power industry, whose expansion should be put into practice mainly through investment for construction, and therefore continues for a longer period than that in other industries. It is observed in the shipbuilding industry that cycles corresponding to equipment cycles are superimposed on ones corresponding to construction cycles. There does not, however, exist any period in which the rate of growth jumps to an extremely high level. In Table 4 we show cycles corresponding to construction cycles in the shipbuilding industry. In other industries than the above three, cycles of the rate of growth have a duration of about seven years, which corresponds to that of equipment cycles. These facts suggest that there are different patterns of fluctuations between investment in durable equipments and investment in construction, so that equipment cycles have a different duration from that of construction cycles.

VI. *Patterns of Business Cycles and Changes in the Market Mechanism*

Now we arrive at the place to ask the reason why equipment cycles are clearly observed but inventory cycles are not in the pre-war on the one hand, and the opposite is true in the post-war on the other. We shall analyze the problem from two points of view. The first is to seek the reason in changes in the market mechanism, and the second to seek it in changes

in the mechanism for adjustment of the international balance of payments.

Because business cycles are phenomena related with the three market for commodities, loanable funds and labor, the pattern of business cycles will be transformed if there occurs any change in the market mechanism. Therefore we must ask at first whether there occurred any change in the market mechanism in the course of economic development. For this purpose we have to make clear how much the response of the rate of change in the relevant price variable to a given excess demand (or excess supply) varied in the course of time. Un-fortunately we can not, however, get an index indicating the degree of excess demand (or supply) over a fairly long period in each of the three markets, respectively.[12] Therefore we are obliged to utilize a simple formula to examine the problem. That is, we calculate variance of the rate of change in the relevant price variable in each equipment cycle to measure the width of its actual amplitude. Since the width reflects not only the change in workability of the market mechanism but also the degree of excess demand (or supply) from cycle to cycle, we should be careful in judging the implication of changes in the width.

According to Table 5,[13] the variance of the rate of change in prices seems to have become

TABLE 5. VARIANCE OF THE RATE OF CHANGE IN PRICE VARIABLES

Equipment Cycle	Rate of Change in Prices	Rate of Change in Interest Rate	Rate of Change in Wage-rate
I	110. 06		
II	147. 46	268. 90	
III	51. 01	404. 76	
IV	35. 16	322. 15	
V	69. 63	422. 07	
VI	26. 28	103. 93	21. 20
VII	20. 19	124. 21	3. 86
VIII	407. 69	162. 56	289. 46
IX	84. 23	7. 88	19. 81
X	160. 78	8. 52	32. 38
XI			
XII	15. 96	11. 17	18. 36

Note : In the early period the price of one yen silver coin or that of one yen gold coin in terms of paper money, whose amplitude of the rate of change was adjusted to that of whole-sale price index compiled by the Bank of Japan, is used instead of the wholesale price index. Similarly the wholesale price index estimated by the author was adjusted to the latter and used in the III cycle to get variance of the rate of change in prices. The interest rate is the rate of interest on bank loans in Tokyo in the pre-war period, and the average rate of interest in all banks in the post-war period. Regarding the wage-rate we used the wage-rate index compiled by the Ministry of Commerce and Industry.

somewhat larger than before in the course of time except during the early Meiji era contain-ing the I and II cycles, in which the economic system was transformed from the feudalistic

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[12] We have measured the degree of response of price adjustment to excess demand by using the ratio of inventory for final products to sales. See S. Fujino : "Some Aspects of Inventory Cycles", *Review of Economics and Statistics*, May 1960, Vol. XLII, pp. 203-209.

[13] The period for calculation of variance is determined according to specific equipment cycles appear-ing in the rate of change in the relevant price variable.

to the capitalistic, and the period of 1914 to 1921 including World War I. And after World War II it decreased drastically, although it was tremendously large in the XI cycle because of the post-war inflation. It should be noticed in investigating the tendency of change in variance of the rate of change in prices that rice, grains other than rice, raw silk, dried cocoons, cotton yarns, raw cotton, cotton textiles and so forth, which were transacted in the clearing market speculatively, played a central role in the pre-war market mechanism for commodities. That is, representative industries in the pre-war like the cotton spinning and the silk reeling industry were closely related with the markets that responded sensitively to the change in conditions of demand and supply. In the early stage of economic development the weight of agricultural products in total production was so high that the flexibility of price of agricultural products made the market mechanism in the economy as a whole sensible to the change in demand and supply. As the economy developed, however, the production of raw silk or cotton yarns expanded, and the flexibility of their prices contributed to that of the general price level. And after that the increase in the weight of the metal industry including iron and steel, achieved the flexible behavior of prices through the flexibility of metal price. In the process the tendency toward monopolization was observed in individual industries. For instance, the cotton spinning industry started at first from a condition of nearly perfect competition and gradually approached oligopoly. However industries like the iron and steel industry, which we can not judge as monopolistic at least in the pre-war period, developed so that it seems that the flexibility of prices did not decrease in the pre-war.[14] Except for the I, II and VIII cycles we might rather say that there occurred a gradual increase in variance of the rate of change in prices in the pre-war. This tendency could be partly explained by the increase in flexibility of change in demand brought about by industrialization of the economy. The demand for products of heavy-chemical industries is, in general, more elastic with regard to income than that for products of light industries, and the latter more elastic than that for agricultural products. Therefore, as the economy develops, and the weight of light industries in the economy increases at first, and then that of heavy-chemical industries rises, a given change in income will cause a greater shift in demand, so that the amplitude of fluctuation in the rate of change in prices will become larger than otherwise, other things being equal. When we take this into account, we might say that the degree of response of the rate of change in prices to a given excess demand (or supply) remained almost constant in the pre-war period.

In the post-war period, however, the magnitude of variance of the rate of change in prices suddenly decreased, although the change in demand caused by a given change in income became, we expect, more violent than in the pre-war because of a rapid increase of the heavy-chemical industries. It is one of the characteristics of the post-war economy that the pre-war growing industries, which had been deeply related with the clearing market, became stagnant, and the role played by them in the market mechanism as a whole was remarkably decreased. In addition the post-war system of maintaining prices of agricultural products weakened strikingly the operation of the market mechanism. Furthermore most of the leading industries

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[14] We analyzed the market structure of the cotton spinning industry in S. Fujino: "The Market Structure and Business Cycles" (in Japanese), *Analyses of the Japanese Economy*, edited by S. Tsuru and K. Ohkawa, Vol. 2, 1955, pp. 319–354 and S. Fujino: *Business Cycles in Japan—A Theoretical, Statistical and Historical Analysis of the Process of Cyclical Development* (in Japanese), 1965, pp. 318–332. Regarding the iron steel industry see S. Fujino, *op. cit.*, pp. 416–434.

in the recent equipment cycle belong to the machinery industry which is oligopolistic to some degree. Where products are of great variety, the imperfectness of competition seems to be greater than in industries producing products with comparatively few variaties or brands, such as the cotton spinning industry. It seems that there are the previously described reasons behind the sudden post-war decrease of the variance of the rate of change in prices.

Secondly, let us examine shifts in the variance of the rate of change in the interest rate. It decreased from 300–400 to 100–150 in the VI cycle, and then to about 10 in the X cycle. The remarkable fact occurring in the first period of transition is that commercial banks suddenly decreased their dependence on the Bank of Japan. Because the Banking Act was put into practice in 1893, National Banks had to be altered to ordinary banks and to redeem national bank notes for several years after 1893 so that the banks' liquidity situation was very tight. It happened at that time that the indemnity gotten from the Sino-Japanese War flowed into Japan, and it was released to finance the expansion of armaments. Thus the liquidity position of commercial banks turned good. In addition foreign capital inflowed into Japan so that the above tendency was strengthened. That is, the degree of overloan in ordinary banks defined by the ratio of their loans from the Bank of Japan to the sum of their own capital, balances deposited in them and their loans from the Bank of Japan decreased from 13 percent in 1895–1900 to 5 percent in 1901, which level remained unchange until about 1935.[15] Or when we define the degree of dependence of commercial banks to the Bank of Japan by the ratio of ordinary credits to ordinary deposits in the Bank of Japan, it declined from 255 per cent in 1900 to 42 per cent in 1904. The flexibility of the rate of interest will be decreased in such situation. When we derive the supply curve of bank loans by commercial banks from their behavior for profit maximization under a few specific assumptions, it takes an S-like shape as shown in Figure 6 (S curve).[16] Before 1900 the banks' liquidity position

FIG. 6.
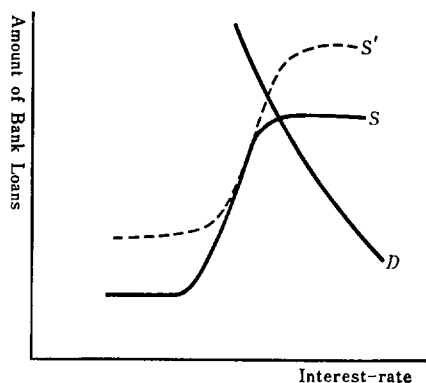
was very tight as shown above, and it seems that the supply curve of bank loans crossed with the demand curve in its inelastic segment with regard to the rate of interest. Therefore the rate of interest flexibly changed in response to shifts in the demand curve for bank loans.

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[15] See *Monthly Survey of the Bank of Japan*, Feb. 1952, pp. 1–39.

[16] See S. Fujino: "Behavior of Commercial Banks and the Supply of Money", *Hitotsubashi Journal of Economics*, Vol. 2, Sept. 1961, pp. 42–55.

After 1900, however, it seems that the supply curve of bank loans shifted from the S to the S' Curve in Figure 6 because the banks' liquidity position turned good. Therefore the demand curve crossed the supply curve in the elastic part of the latter with regard to the rate of interest. As a result, the rate of interest became less flexible than before, even under the same shift of the demand curve.

Next it is the concentration of banks that we should take into consideration regarding the further decline of amplitude of the rate of change in the interest rate occurring after World War I. The number of ordinary banks decreased from 1799 in 1922 to 782 in 1930, and various degrees of concentration of banks were increased rapidly after the financial crisis in March 1927. For example, the degree of concentration of the five big banks increased in deposits from 21.8 percent at the end of 1926 to 31.0 percent at the end of 1930. It jumped from 19.7 percent to 28.2 per cent in loans and discounts during the same period. Such a tendency to monopolize the market for bank loans seems to have narrowed the width of fluctuation of the rate of change in the interest rate.[17]

In the post-war period a ceiling on the rate of interest has been put into practice by the Provisional Act for Adjustment of the Interest Rate, so that it has not been able to fluctuate freely. Even if it could change freely, however, the amplitude of the movement would not be remarkably great, for it seems that agreement between banks by cartel would restrict the change in the interest rate in that case.

Thirdly let us investigate the size of fluctuation of the rate of change in the wage-rate in each equipment cycle. According to Table 5, it sticks to a level of about 20 since the VI cycle except for the VIII cycle which includes World War I. Although the post-war development of trade unions transformed decisively the labor market, it has no influence upon the amplitude of fluctuation of the rate of change in the wage-rate. The rate of increase in the wage-rate in the post-war period was higher than in any pre-war period except the period of World War I, but the fluctuation around the high rate of increase was not so large. The post-war labor market differentiated from the pre-war one by the change in the condition of supply of labor. It seems that the labor supply curve to the non-agricultural sector is composed of two parts: (1) in which labor supply is perfectly elastic with regard to the wage-rate, (2) in which it is perfectly inelastic. Although we can not here describe in details, we have evidence that in the pre-war period the demand for and supply of labor intersected in the perfectly elastic part of labor supply curve except for World War I, and that in the post-war period, however, they intersected in the intermediate part between the elastic and the inelastic section in recessions and in the inelastic part during upward movements of business cycles.[18] In the post-war case it is natural that the rate of change in the wage-rate should show relatively large fluctuations. In spite of that, it seems that its amplitude is narrowed by the development of trade unions. As a result its variance remains nearly same as in the pre-war.

Thus the flexibility of price variables in the post-war was lost in the markets for commodities, loanable funds and labor compared with that of the per-war period. We might say that the market mechanism as a whole changed so that the change in demand or supply might

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[17] We analyzed the degree of concentration in banking and competitive conditions in the market for bank loans in S. Fujino: "The Financial Structure and Accumulation of Capital in Japan," (in Japanese), *Studies in Capital Accumulation in Japan*, edited by I. Nakayama, 1956, pp. 23-55.

[18] An analysis concerning this point is given in S. Fujino: *Business Cycles in Japan—A Theoretical, Statistical and Historical Analysis of the Process of Cyclical Development* (in Japanese), 1965, pp. 499-510.

be not reflected sufficiently on the behavior of price variables. It seems that it is closely con-
nected with the difference between the pre-war and the post-war pattern of business cycles
which we found previously. When the commodity market is monopolized, the movement of
price will become sticky. And the gap between demand and supply is not reflected in price
fluctuations only when the firm absorbs it into its unintended change in inventories, from
which inventory cycles will occur. As Lloyd A. Metzler points out, "the theory of inventory
cycles is applicable principally to monopolistic or imperfectly competitive markets where prices
are set by individual producers or groups of producers".[19]

In addition, if competition is restricted in the market for loanable funds and if big firms
occupying large proportions of production of commodities get an advantageous position in the
market for loanable funds, their ability to absorb the gap between demand for and supply of
commodities by changing the level of inventories will become large, because they need funds
to keep inventories. In this case inventory cycles will appear more precisely than otherwise.

Furthermore, when trade unions attempt to stabilize the level of employment, the change
in production will be confined to a narrow range at least in the short run. Namely, it is
difficult for firms to change quickly the level of production in response to the change in
demand or in price, so that cycles with low peaks and shallow troughs will appear.

VII. Business Cycles and Changes in the Mechanism for the Adjustment of the Balance of Payments

The above is the first hypothesis to explain the transformation from the pre-war to the
post-war pattern of business cycles. But we have the second hypothesis. In the post-war
Japanese economy upward movements of inventory cycles were always checked by the ag-
gravation of the balance of payments. In the pre-war period, however, we observe that the
balance of trade responded fairly not to inventory cycles but to equipment cycles. Figure 7
shows the behavior of the ratio of exports to imports in March, June, September and December
of each year. (Other series shown in this figure are similarly related to the figures for March,
June, September and December.) It seems to suggest that the post-war pattern of the balance
of payments was different from the pre-war one. We expect that imports will be increased in
upward movements of inventory cycles through the income effect as well as the money
multiplier effect.[20] Then, if the price mechanism can not work so as to increase exports which
will match the increase in imports, the balance of payments will fluctuate counter-cyclically to
inventory cycles. In the pre-war period, however, we have reason to think that price flexibility
canceled the potential tendency for the balance of payments to fluctuate within inventory cycles.
We should point out here that the terms of trade had a tendency to decline through the period
from 1907 to World War II, although it was interrupted sometimes by the short-run movements

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[19] L. A. Metzler: "Factors Governing the Length of Inventory Cycles", *Review of Economic Statistics*,
Feb. 1947, Vol. 29, p. 11.

[20] The increase in the money supply especially to the firm will stimulate investment through the firm's
preference between the holding of money and the holding of physical assets. We call this effect the money
multiplier effect. We analyzed it theoretically and empirically in S. Fujino: *Business Cycles in Japan—
A Theoretical, Statistical and Historical Analysis of the Process of Cyclical Development*, 1965, pp. 150–
203 & pp. 251–289.

in the opposite direction. On the contrary the post-war terms of trade shows an upward tendency. (See Figure 8.) The tendency for the terms of trade to decline in the pre-war period resulted from successive establishment of new production functions in new firms and new industries. Especially the decline of price in raw silk, cotton yarns and cotton textiles was brought about by innovations in producing cocoons, cotton yarns and cotton textiles, and played the most important role in the above tendency for the terms of trade to decline. Our hypothesis asserts that it canceled cyclical fluctuations in the balance of payments in inventory cycles in the pre-war period.

Before 1907 the terms of trade remained on the same level or increased somewhat so that the above hypothesis can not be applied. However, instead of a tendency for the terms of trade to decline, the foreign exchange rate changed flexibly until the gold standard was established in October, 1897. This would eliminate fluctuations of the balance of payments corresponding to inventory cycles. In additon, even if the elimination was imperfect, gold and silver accumulated before the Meiji Restration in 1868 outflowed from Japan, canceled the

FIG. 7. RATIO OF EXPORTS TO IMPORTS, RATES OF CHANGE
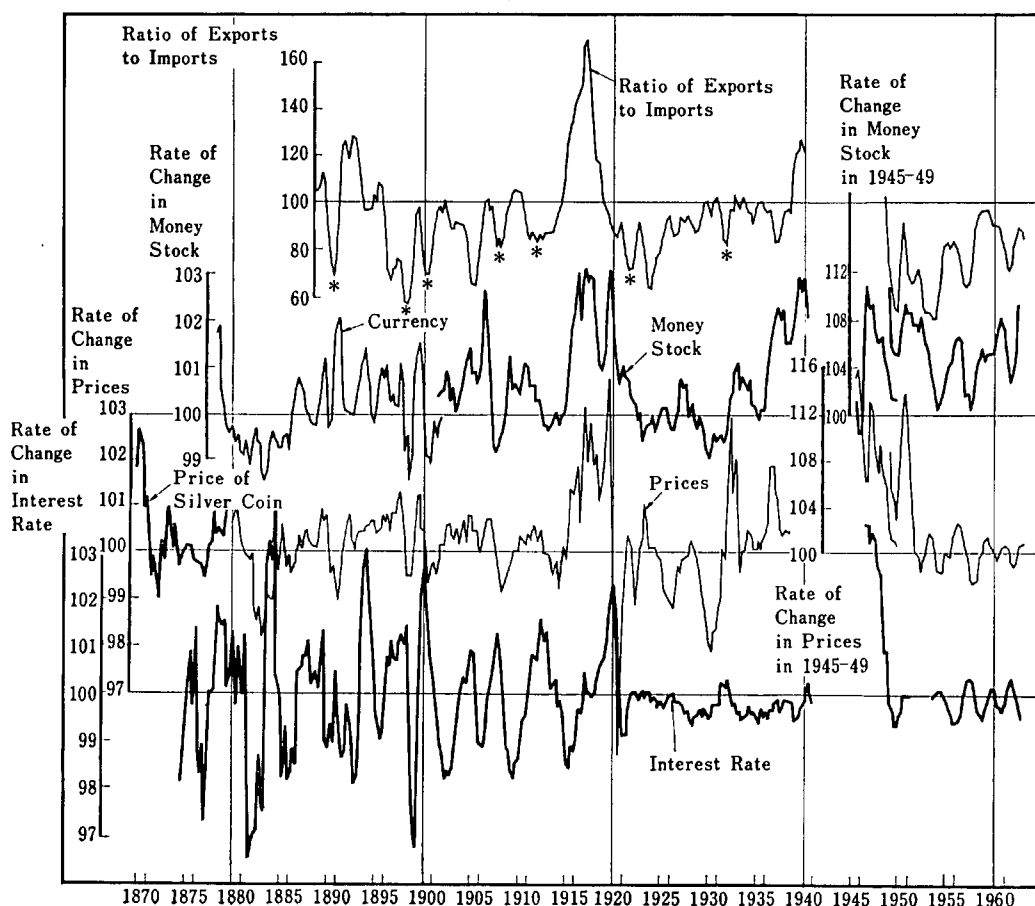IN MONEY STOCK, PRICES AND INTEREST RATE

FIG. 8.   TERMS OF TRADE (1913=100) AND GOLD PRICE OF PAPER MONEY
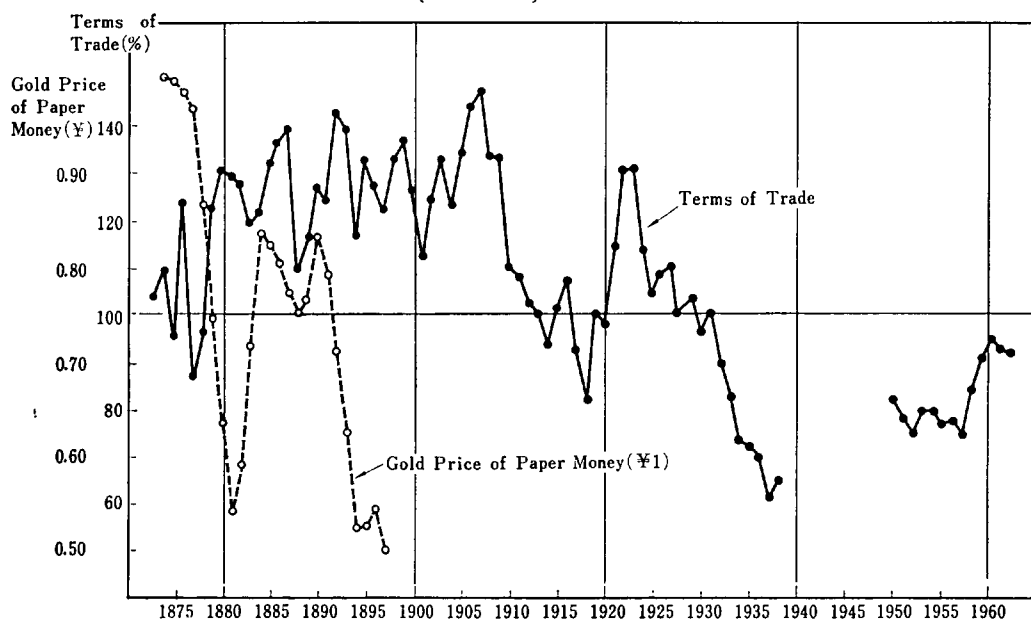
deficit in the balance of payments, and interrupted the repercussions on other economic variables. But there is a period in which both the declining terms of trade and the flexible exchange rate were not workable. It is the period 1892–1907. In this period, however, an indemnity from China was obtained as a result of the Sino-Japanese War, and afterwards foreign capital flowed into Japan. It is certain that these pushed up the ceiling of the balance of payments for business cycles. It seems that the balance of payments did not strongly restrict upward movements in at least inventory cycles, even if it showed fluctuations corresponding to inventory cycles. Thus in the whole pre-war period there were some factors which offset the potential or actual fluctuations of the balance of payments in inventory cycles.

On the other hand, in the post-war period there is a strong tendency toward domestic disequilibrium between the demand for and supply of commodities to be reflected in foreign trade, because the market mechanism became unworkable compared with that of the pre-war period. In addtion the system of fixed exchange rate makes it impossible to adjust the deficit in balance of trade in the foreign exchange market, and the rising tendency of terms of trade intensifies the above result. The effect of post-war innovations does not yet result in a decline in the terms of trade.

If the post-war mechanism for the adjustment of the balance of payments has been trans-formed from the pre-war one as examined above, the transformation has an important implication for the change in the pattern of business cycles. As shown in Figure 7, the rate of change in the supply of money or the stock of currency lagged behind the ratio of exports to imports.[21] It should be noticed that the latter fluctuated more cyclically than the former

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[21] The supply of money is defined by the sum of currency outside banks and balances of current deposits, ordinary depostits, deposit-bills, depostits to notice and special deposits excluding interbank deposits, being estimated by the author. In the postwar the Bank of Japan estimates a series for the stock of money similarly defined, which begins from 1954. Before 1954 we estimated a series linked with that given by the Bank of Japan.

in the processes of inventory cycles. It is also of note that, generally speaking, it took positive value in inventory cycles except in 1920's and that it turned negative in downward movements of equipment cycles. On the other hand, in the post-war period it was always positive except the period of the switchover from the old to the new yen system in 1946.

The change in money supply gives a positive effect on investment through the money multiplier, therefore influences both output and prices. In fact, when we compare the rate of change in money supply with that in prices, the former led the latter by 6.2 months on the average in peaks and troughs of cycles except after 1930.[22] In the post-war period too we can observe a similar phenomenon. Since the rate of change in prices behaves similarly with the standardized index of business cycles, the above fact shows the influence of money supply upon business cycles.

Furthermore, as shown above the pre-war balance of payments was inclined to fluctuate counter-cyclically in the processess of equipment cycles. When the balance of payments turns unfavorable so that foreign exchange reserves are diminished, the monetary authority is apt to adopt a tight money policy. Thus it seems that the availability of credits was restricted near peaks of equipment cycles in the pre-war. As observed in Figure 7, the rate of change in the interest rate on bank loans lagged behind the standardized index of business cycles (or the rate of change in prices) by 12.7 months on the average in peaks and troughs of equipment cycles. This will give us an evidence for the above deduction because it is an index to express the tightness in the market for loanable funds.

On the other hand in the post-war period the Japanese economy was obliged to adjust its economic activity in such a way as to make clear the existence of inventory cycles. This was because the balance of payments deteriorated every inventory cycle, so that the availability of credits was decreased with every downward movement of the inventory cycles. This will be indicated by the fact that the rate of change in the interest rate showed fluctuations corresponding to the inventory cycles.

Let us sum up the above investigation. In the process of the pre-war inventory cycles the rate of change in money supply was positive, and the availability of credits did not work as a restriction on the level of economic activity, because the balance of payments did not show counter-cyclical fluctuations corresponding to inventory cycles. Even if they fluctuated in the process of inventory cycles, their effect was offset by the inflow of indemnities or foreign capital. Thus inventory cycles were obscured in the pre-war period. On the other hand, in the pre-war equipment cycles the rate of change in money supply changed from positive to negative values. At the same time the availability of credits restricted the level of economic activity in the downward movements. Therefore equipment cycles appeared clearly in the pre-war period.

In the post-war inventory cycles the availability of credits worked as a ceiling on economic activity, although the rate of change in money supply took positive values. Therefore the economy was obliged to be adjusted in such a way as to make inventory cycles explicit. At the same time a similar type of adjustment appeared in the post-war equipment cycles. Thus the distinction between the downward movements of inventory cycles and those of equipment cycles became obscure so that only inventory cycles appeared strongly.

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[22] After 1930 the opposite was observed. But it was caused by the issue of deficit-covering bonds to finance government expenditures for the Manchurian Incident, because under this system for issuing money the government demand for commodities led the issue of money.

STATISTICAL APPENDIX 1: TENTATIVE DIFFUSION INDEX, 1888-1940

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1888	—	—	—	—	—	—	—	60.0	58.3	91.7	58.3	58.3
1889	58.5	75.0	75.0	91.7	83.3	75.0	66.7	75.0	75.0	75.0	66.7	50.0
1890	50.0	33.3	33.3	50.0	33.3	16.7	25.0	41.7	41.7	41.7	41.7	58.5
1891	50.0	50.0	41.7	33.3	33.3	58.5	41.7	50.0	50.0	41.7	58.5	66.7
1892	66.7	75.0	75.0	66.7	75.0	75.0	75.0	85.7	78.6	78.6	64.3	78.6
1893	71.4	64.3	57.1	64.3	64.3	78.6	85.7	75.0	66.7	73.3	76.7	70.0
1894	80.0	70.0	63.3	63.3	66.7	63.3	63.3	56.7	56.7	66.7	76.7	93.3
1895	76.7	76.7	80.0	76.7	70.0	80.0	76.7	66.7	80.0	66.7	80.0	63.3
1896	73.3	73.3	73.3	70.0	73.3	70.0	76.7	76.7	76.7	86.7	80.0	73.3
1897	63.3	63.3	86.7	73.3	83.3	83.3	76.7	63.3	70.0	53.3	53.3	66.7
1898	66.7	53.3	53.3	26.7	40.0	56.7	60.0	40.0	36.7	53.3	33.3	66.7
1899	56.7	50.0	73.3	76.7	86.7	80.0	56.7	63.3	73.3	86.7	80.0	70.0
1900	63.3	60.0	60.0	56.7	33.3	43.3	46.7	56.7	46.7	30.0	46.7	36.7
1901	36.7	46.7	50.0	26.7	15.9	15.9	18.2	28.3	37.5	37.5	45.8	54.2
1902	45.8	45.8	50.0	62.5	66.7	68.8	72.9	61.5	61.5	59.6	53.8	55.8
1903	65.4	63.5	67.3	55.8	51.9	51.9	57.7	64.5	64.1	46.9	57.8	64.1
1904	53.1	50.0	60.9	62.5	73.4	78.1	79.7	67.2	82.8	85.9	84.4	76.6
1905	78.1	73.4	79.7	73.4	67.2	70.3	69.7	67.6	66.2	67.6	61.8	60.3
1906	55.9	57.4	61.8	61.8	70.6	60.3	67.6	73.5	75.0	76.5	76.5	75.0
1907	82.4	77.9	69.1	61.8	63.2	64.7	61.8	55.7	60.0	52.9	44.3	35.7
1908	32.4	21.4	26.5	18.6	31.4	28.6	28.6	31.9	35.1	36.5	47.4	46.2
1909	34.6	34.6	47.4	52.6	34.6	47.4	51.3	56.4	65.4	70.5	64.1	64.1
1910	64.1	55.1	62.8	65.4	62.8	64.1	59.0	60.3	61.5	57.7	52.6	59.0
1911	69.2	75.6	67.9	64.1	60.3	61.5	61.5	70.5	80.8	74.4	79.5	78.2
1912	73.1	78.2	83.3	79.5	79.5	80.8	75.6	69.2	61.5	65.4	56.4	53.8
1913	59.0	56.4	66.7	66.7	61.5	51.3	51.3	50.0	57.1	53.6	44.0	41.7
1914	40.5	38.1	39.3	32.1	28.6	22.6	23.8	33.0	34.4	26.7	42.2	40.0
1915	35.6	43.3	56.7	64.4	67.8	75.6	83.3	81.5	70.7	80.4	75.0	84.8
1916	82.6	83.3	82.3	81.3	84.4	86.5	81.3	77.1	78.1	76.0	71.9	81.3
1917	96.9	89.6	87.5	86.5	81.3	78.1	78.1	82.3	85.4	79.2	78.1	75.0
1918	67.7	78.1	69.8	71.9	68.8	69.8	67.7	64.6	61.5	63.5	67.7	80.2
1919	82.3	78.1	78.1	74.0	80.2	82.3	87.5	88.5	85.4	89.6	83.3	68.8
1920	54.2	37.5	35.4	39.6	40.6	31.3	24.0	16.7	14.6	13.5	14.6	16.7
1921	25.0	30.2	34.4	45.8	51.0	57.3	66.7	60.4	67.7	68.8	64.6	71.9
1922	74.0	70.8	56.3	51.0	45.8	47.9	37.5	34.7	38.8	42.9	46.9	53.1
1923	49.0	42.9	32.7	37.8	51.0	50.0	70.4	69.6	64.7	60.8	58.8	53.9
1924	45.1	48.0	56.9	60.8	63.7	62.7	54.9	46.1	44.1	51.0	46.1	55.9
1925	59.8	62.7	63.2	52.8	48.1	46.2	42.5	52.8	48.1	46.2	42.5	44.3
1926	42.5	40.6	38.7	40.6	32.1	32.1	41.5	36.8	38.7	47.2	54.7	48.1
1927	39.6	46.2	43.4	40.6	45.3	52.8	50.9	51.9	45.4	37.0	25.9	34.3
1928	34.3	50.0	54.6	58.3	52.8	50.0	50.0	63.4	59.3	60.2	56.5	54.5
1929	59.8	48.2	33.0	31.3	37.5	33.0	21.4	25.0	31.3	25.9	22.3	25.9
1930	21.4	15.2	21.4	20.5	20.5	25.9	29.0	26.0	22.0	24.0	25.0	18.0
1931	26.0	29.0	33.0	39.0	41.0	41.0	46.0	56.0	59.0	55.0	52.0	54.0
1932	40.0	49.0	52.0	61.0	64.0	63.0	64.0	58.0	59.0	62.0	61.0	62.0
1933	67.0	64.0	67.0	67.0	63.0	53.0	48.0	53.0	60.0	61.0	60.0	59.0
1934	57.0	56.0	60.0	58.0	58.0	62.0	67.0	64.0	62.0	60.0	59.0	51.0
1935	49.0	52.0	59.0	60.0	63.0	61.0	53.0	52.0	56.0	54.0	57.0	69.0
1936	69.0	69.0	70.0	70.0	72.0	70.9	68.6	74.4	79.1	83.7	79.1	76.7
1937	81.0	80.8	81.6	69.7	68.4	57.9	53.9	51.4	38.9	31.9	48.5	50.0
1938	41.2	39.7	47.1	52.9	51.5	65.6	65.0	75.0	70.7	63.8	62.1	62.1
1939	72.4	65.5	69.6	76.8	80.4	82.7	89.6	79.2	79.2	77.1	75.0	83.3
1940	75.0	63.6	61.4	67.5	62.5	69.4	70.0	60.0	80.0	70.0	60.0	70.0

STATISTICAL APPENDIX 2: TENTATIVE STANDARDIZED INDEX OF THE BUSINESS CYCLE, 1888-1940

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1888	—	—	—	—	—	—	—	103.10	103.19	103.30	102.70	103.06
1889	103.20	103.76	105.14	106.89	107.13	106.84	105.99	106.12	105.83	105.58	104.68	105.14
1890	106.26	105.48	102.63	101.66	101.09	99.61	99.80	100.42	101.70	102.22	101.60	100.25
1891	99.11	98.88	98.25	97.35	97.56	99.99	101.03	101.58	102.06	102.18	103.24	103.92
1892	104.62	105.37	105.76	106.07	106.18	106.40	106.41	104.76	103.19	103.38	102.86	102.07
1893	102.16	102.52	102.97	103.33	103.98	104.61	103.82	103.07	102.65	103.16	102.85	103.38
1894	103.78	103.22	103.07	103.38	103.47	102.84	102.82	102.74	102.91	103.28	103.60	103.53
1895	103.03	102.75	103.03	102.89	102.46	102.99	103.03	102.76	101.95	101.78	103.14	103.35
1896	103.14	103.27	102.70	102.51	102.39	102.16	102.56	102.60	102.93	104.31	103.20	102.12
1897	102.65	102.78	103.13	105.20	106.48	105.55	105.20	104.43	104.39	102.91	103.41	104.70
1898	104.39	102.81	101.93	99.90	98.95	100.36	99.91	100.18	101.02	101.95	100.95	101.99
1899	102.15	102.38	104.72	105.21	107.12	109.20	109.10	107.73	107.75	108.44	107.91	105.62
1900	105.99	106.76	104.67	104.37	102.26	100.71	100.32	101.51	101.35	100.18	101.25	101.04
1901	96.06	105.79	102.93	102.80	96.41	96.10	95.38	97.07	97.94	97.62	98.50	98.86
1902	98.81	98.54	98.55	99.20	100.27	101.78	103.45	103.42	104.03	104.47	103.65	103.59
1903	103.59	102.76	102.66	102.27	101.51	101.32	101.98	103.45	103.44	101.98	102.53	102.34
1904	101.79	101.97	102.93	104.31	105.62	107.03	106.35	103.65	103.82	105.63	106.47	106.76
1905	106.69	106.28	104.93	103.58	102.90	102.38	102.70	102.37	102.31	101.61	100.59	99.98
1906	99.78	99.89	100.26	103.41	104.09	102.47	104.63	105.29	104.94	105.35	105.43	105.41
1907	105.24	104.82	105.15	102.52	102.03	103.33	101.06	99.99	100.32	99.62	98.32	97.29
1908	97.37	97.22	96.76	95.67	95.74	95.57	95.15	97.01	96.50	95.33	97.87	98.04
1909	97.88	98.06	99.08	99.11	97.18	97.78	99.27	99.84	100.44	100.80	100.58	100.76
1910	101.16	101.03	101.14	101.63	102.74	103.80	103.80	102.29	101.91	102.11	101.50	101.59
1911	101.85	102.25	102.46	102.66	102.97	102.80	103.19	103.73	104.19	104.31	104.09	104.13
1912	103.79	102.96	102.24	102.38	102.94	102.72	102.57	101.57	99.82	99.65	99.86	100.16
1913	100.56	99.91	101.00	100.93	100.40	99.79	99.00	99.45	99.69	99.53	99.20	98.76
1914	98.89	99.96	100.40	99.54	98.16	97.78	97.83	99.44	100.23	100.05	101.42	101.14
1915	100.33	99.81	99.63	101.10	102.92	105.62	108.24	107.60	106.48	106.58	105.71	106.03
1916	106.47	106.96	107.50	107.19	108.21	109.37	107.77	105.52	105.37	106.20	107.74	110.25
1917	112.53	114.06	113.66	112.26	110.46	108.63	108.87	110.64	111.96	111.43	109.73	108.27
1918	107.14	106.79	107.82	108.22	108.00	107.84	106.99	105.21	103.28	102.59	103.32	105.05
1919	106.63	106.50	105.55	106.26	108.08	110.38	111.82	113.51	115.74	116.08	112.76	107.52
1920	103.11	100.80	99.35	97.19	95.27	92.42	89.49	85.72	84.92	81.54	83.69	87.44
1921	90.08	91.48	93.22	96.37	98.24	99.98	101.42	101.02	102.14	103.76	102.76	102.45
1922	102.64	102.49	101.43	99.47	98.28	98.65	98.40	98.96	100.32	100.83	101.18	101.56
1923	100.56	99.41	102.00	104.19	104.27	104.02	104.77	103.99	102.64	101.84	101.37	100.65
1924	100.26	100.80	100.00	99.00	99.51	100.07	99.81	99.22	99.05	98.88	98.59	100.19
1925	102.00	102.33	101.57	100.89	100.35	99.88	99.17	99.21	99.19	99.02	99.21	98.40
1926	97.69	97.36	96.99	96.87	96.44	96.39	98.58	96.98	98.15	102.52	103.85	100.99
1927	100.52	100.57	100.20	100.43	100.45	100.35	100.87	100.54	100.46	99.35	98.91	100.11
1928	100.09	101.07	100.97	101.33	101.26	101.01	101.09	100.99	101.44	101.04	100.69	100.41
1929	100.78	100.42	99.60	98.97	98.68	98.13	96.99	96.43	96.14	95.49	95.08	94.53
1930	93.56	93.00	93.09	92.62	92.31	92.70	92.77	93.32	93.24	93.80	94.60	94.52
1931	95.10	95.95	96.21	96.61	97.28	98.36	99.87	100.76	101.32	100.25	98.63	99.28
1932	99.81	100.53	102.71	104.66	106.07	106.67	105.60	103.90	103.70	104.30	104.85	105.43
1933	106.13	105.25	103.55	102.36	101.13	99.60	99.17	99.85	100.32	100.34	100.40	100.00
1934	99.40	99.82	100.41	100.71	101.26	101.57	101.71	101.55	101.48	101.17	101.22	101.05
1935	100.95	100.94	101.19	101.68	101.87	101.88	101.61	101.99	101.92	101.38	101.54	101.86
1936	102.56	102.70	102.50	101.72	101.55	102.04	102.43	101.80	102.50	103.87	103.60	103.35
1937	103.33	103.77	103.85	103.34	103.02	102.56	102.01	101.57	101.04	100.66	101.28	101.66
1938	101.11	100.63	100.82	101.23	101.60	102.06	102.20	102.39	102.52	102.48	102.71	102.88
1939	103.30	103.08	103.29	103.97	104.49	106.47	104.81	103.64	103.88	103.91	103.05	103.55
1940	104.34	103.86	103.33	103.41	102.83	102.73	101.51	101.26	100.91	101.08	100.63	100.95