

JAPANESE GAINS FROM TRADE, 1878-1932¹

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The gains from trade may be measured in terms of three criterions, that is, the terms of trade, the balance of trade and foreign trade multiplier. In this paper we will try to apply these criterions to Japanese economy, 1878 through 1932, and evaluate her gains from trade. In the period 1878 through 1932 Japanese foreign trade developed quite rapidly within the framework of free competitive mechanism. Government control of foreign trade and exchange did not play any important part. Foreign exchange control began in 1933 and trade control later in 1937. So this period may be said to present us an appropriate scene where we can comfortably analyse the normal relationship between Japanese national economy and her foreign trade.

The analysis of the gains from trade relevant to this research consists of two parts. In the first part we apply each criterion separately to the relevant data available and measure the results. In the second part we compare these results and try to evaluate the Japanese gains from trade. The second part is, I think, more important than the first. The results obtained in the first part sometimes involve contradictory statements among themselves. The terms of trade show clearly a declining tendency, the balance of trade is normally unfavourable, but the multiplier effect of foreign trade is considerably high. If we could disregard the first two criterions and evaluate Japanese gains from trade exclusively in terms of the third criterion, our task is rather easy to handle with. But such a procedure is not a proper way of interpreting a dynamic economic phenomenon. There is a close relationship between the unfavourable terms of trade, the rather heavy deficits in the balance of trade and the high multiplier effect of foreign trade. These are nothing but various aspects of one dynamic phenomenon. We must interpret the relative role of these three aspects, each of which contributes in its own way to the development of Japanese national economy. This is a problem we tackle with in the later sections of this paper.

I. *Trend in the Terms of Trade*

Let us first try to apply the first criterion, that is, the terms of trade index to Japanese foreign trade, and investigate whether it is possible to evaluate the

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gains from trade in terms of this criterion.

Japanese terms of trade index has shown a downward trend from 1878 through 1932. This downward movement becomes rather marked from the first decade of the twentieth century. Table 1 shows the ten years moving average index numbers of the terms of trade, the original indices of which are calculated by

Table 1 Three major index numbers relating to Japanese foreign trade

Periods	Volume of exports	Volume of imports	Terms of trade
I (1878-1887)	10.76	10.51	124.41
II (1883-1892)	16.35	15.77	125.58
III (1888-1897)	22.99	26.54	124.24
IV (1893-1902)	31.79	40.78	125.50
V (1898-1907)	45.12	58.56	129.80
VI (1903-1912)	61.38	70.87	125.37
VII (1908-1917)	94.23	81.32	107.36
VIII (1913-1922)	119.79	109.33	101.38
IX (1918-1927)	133.46	154.83	108.47
X (1923-1932)	170.42	183.85	104.78

Original annual index numbers are calculated by Tōyōkeizai Shimpo Sha (Oriental Economist Co.)

Source: *Nihon Boeki Seiran* (written in Japanese).

Tōyōkeizai Shimpo Sha (Oriental Economist Co.) taking 1913 as the base year. The whole periods, 1878 through 1932, are divided into ten, each of which covers ten years and moves from period to period with an interval of five years. From period I through period VI the terms of trade remain rather steady. The annual rates of variation are comparatively small. These rates are as follows: 0.2% up from period I to period II, 0.2% down for period II to period III, 0.2% up for period III to period IV, 0.6% up for period IV to period V and 0.7% down for period V to period VI. The amplitudes of fluctuations are rather small. But after period VI suddenly there appear wide fluctuations among the terms of trade. The annual rates of variation are large, such as; 3.1% down for period VI to period VII, 1.1% down for period VII to period VIII, 1.4% up for period VIII to period IX and 0.7% down for period IX to period X. And from period VI through period X a marked downward trend is discernible.

Table 1 also shows the ten years moving average index numbers of the volumes of exports and imports, the original indices of which are also prepared by the same company taking 1913 as the base year. These index numbers move upward steadily from period to period. The upward trends are indicated by the following equations

$$\log x = 1.6285 + 0.1352(t - V)$$

$$\log y = 1.6603 + 0.1344(t - V)$$

where x is the quantity index of exports, y is of imports, t the number of periods and V is the base period. The average annual rates of growth are almost the same for exports and imports. The rates are 6.4%.

Compared with these conspicuous upward trends in the volume of foreign trade, the downward trend among the terms of trade presents us several questions. Are these unfavourable terms of trade the necessary prices we must pay in developing our foreign trade? Do these terms imply our losses from foreign trade? And so on. These are important questions we will endeavour to answer in the following sections. But before attempting to answer these questions, it would be better for us to break down the terms of trade into their component factors and make clear which factors play dominant parts in making the terms of trade decline.

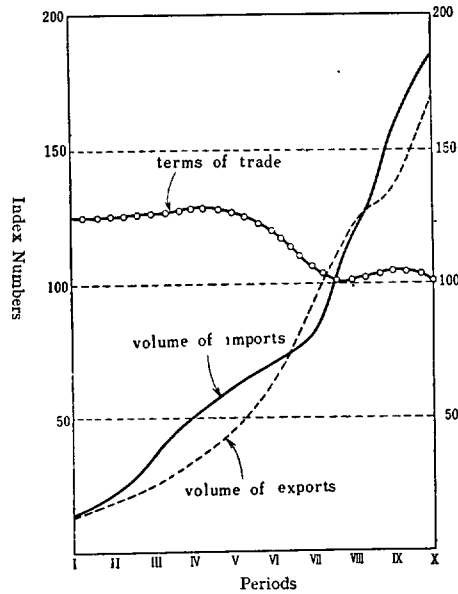


Figure 1 Three Major Index Numbers relating to Japanese Foreign Trade

Disparities in exchange rates and relative prices

The terms of trade are composed of two factors. One is the exchange rate and the other is the relative price level of import and export commodities. To clarify the relation between the terms of trade T , disparity in exchange rates D_e and discrepancies in relative price D_p , let us first define the respective terms as follows:

$$[\text{Terms of trade index}] \quad T \equiv \frac{eP_{01}}{iP_{01}} \cdot E \dots \dots \dots (1)$$

while eP_{01} is the average price index for export commodities, iP_{01} is for import commodities in terms of foreign currencies and E is for actual exchange rate.

[Disparity index in exchange rates]

$$D_e \equiv \frac{E}{E_0} = E \cdot \frac{dP_{01}}{jP_{01}} \dots \dots \dots (2)$$

while dP_{01} is the index number for domestic general price level, jP_{01} the foreign general price level and E_0 the equilibrium exchange rate.

[Discrepancy index in relative prices]

$$D_p \equiv \frac{{}_dD_p}{{}_fD_p} = \frac{{}_eP_{01}}{{}_dP_{01}} / \frac{{}_iP_{01}}{{}_fP_{01}} \dots\dots\dots(3)$$

while ${}_dD_p$ is the discrepancy index in relative prices among domestic economy and ${}_fD_p$ the foreign economy.

From equations 2 and 3 it follows

$$D_p \cdot D_e = \left(\frac{{}_eP_{01}}{{}_dP_{01}} / \frac{{}_iP_{01}}{{}_fP_{01}} \right) \left(\frac{{}_dP_{01}}{{}_fP_{01}} \cdot E \right) = \frac{{}_eP_{01}}{{}_iP_{01}} \cdot E$$

$$\therefore D_p \cdot D_e = T$$

Therefore we obtain the equation

$$T \equiv D_p \cdot D_e = \frac{{}_dD_p}{{}_fD_p} \cdot D_e \dots\dots\dots(4)$$

From this equation it is clear that we can estimate the value of ${}_fD_p$, if the values of T , D_e and ${}_dD_p$ are known. This is quite a convenient relationship. The value of these three coefficients can be measured mainly from the domestic data, if the general price indices of dominant foreign countries are available, and then the value of the fourth coefficient estimated without much trouble. Thus the movement in terms of trade can be analysed mainly in terms of the changes in domestic economy without bothering much about the complicated movements among the foreign countries which have trade relationship with us.

Two conditions are necessary for the terms of trade to remain constant. One is the equilibrium rate of exchange, that is, E is equal to E_0 . The other is that there are no discrepancies between the general price level and the price levels of import and export commodities, that is, D_p is equal to unity. Thus it is clear that there are two cases for the terms of trade to become unfavourable. Case one is that the exchange rates are maintained in equilibrium level, but the average price of export commodities is low, or that of import commodities high, relative to general price level. Case two is that the relative price levels are stabilized, but the exchange rates are lower than the equilibrium rates.

Then which factor is dominant in making our terms of trade unfavourable? Table 2 shows the results of our analysis. From this table we may obtain the following informations. (1) The period VII makes a turning point in the relative movements of these two factors, that is, D_e and D_p . So it is convenient for us to divide the whole periods into two; one covers period I through period VII and the other period VIII through period X. (2) In the earlier periods both the sterling rate and the dollar rate are generally lower than the equilibrium rates, but in the later periods the rates of exchange become high. (3) The relative price level of our export commodities shows clearly the downward trend. In the earlier periods the prices of export commodities are comparatively high, but in the later periods they decline considerably. (4) The former the foreign countries import Japanes commodities dear, and the latter cheap, relative to their general price levels. (5) Based on these informations, we may conclude that the comparatively favourable terms of trade in the first half of the periods are brought about by the higher price level of our export commodities, and the

Table 2 Disparities in exchange rates and relative prices 1913=100.00

Periods	Relative prices index ${}_aD_p$	Disparity index		$T \cdot {}_fD_p$		Terms of trade
		dollar exchange rate ${}_aD_e$	sterling exchange rate ${}_bD_e$	${}_aD_p \cdot {}_aD_e$	${}_aD_p \cdot {}_bD_e$	T
I (1878-1887)	130.39	81.31	77.49	106.02	101.04	124.41
II (1883-1892)	125.06	86.56	83.63	108.19	104.59	125.53
III (1888-1897)	128.10	87.86	84.72	112.55	108.53	124.24
IV (1893-1902)	129.23	89.65	85.99	115.85	111.12	125.50
V (1898-1907)	122.28	96.11	95.85	117.52	117.21	129.80
VI (1903-1912)	111.11	97.82	102.71	108.69	114.12	125.37
VII (1908-1917)	101.40	95.27	92.60	96.60	93.90	107.36
VIII (1913-1922)	97.98	107.62	97.85	105.45	95.87	101.38
IX (1918-1927)	100.87	122.49	116.62	123.56	117.63	108.47
X (1923-1932)	96.70	111.01	117.78	107.35	113.89	104.78

(1) Relative price index=average export price index \div general price index

(2) Disparity index=actual exchange rate index \div equilibrium exchange rate index

Please notice that this disparity index 100.00 does not imply that actual exchange rate is strictly equal to equilibrium exchange rate, but there is no disparity relative to that in base year, 1913. However fortunately there is almost no disparity in exchange rate in 1913, when actual sterling exchange rate is 100.15%, and dollar rate 100.77%, of equilibrium exchange rate respectively.

Source: (1) average export price index is that of Tōyōkeizai Shimpo Sha; (2) General price index is that of the Bank of Japan; (3) equilibrium exchange rate is taken from: "Monthly Movements in General Price, Exchange Rate, Purchasing Power Parity and Foreign Trade during recent 50 Years" (in Japanese) Nagoya Commercial College, Industrial Research Bulletin, Vol. XVII, No. 3.

unfavourable terms of trade in the latter half by the lower price level. The former the gains in the price level of export commodities are greater than the losses in the exchange rates, and the latter the gains in the exchange rates are smaller than the losses in the price level of export commodities. Thus the movement of our terms of trade is brought about by the relative changes in the two factors, the price level of export commodities and the exchange rates. Then, let us proceed to analyse the conditions underlying the movement of these two factors respectively.

The movement of the relative prices is easily explained by the changes in the composition by groups of our export commodities. In the first half of the periods the relative prices are high, and in the latter low. This change is brought about by the rise in the relative importance of manufactured goods among our exports. Table 3 shows the relative price indices of three groups of our exports. The statistical data cover only period VI through period X. Before period VI the data are not available. All these indices show downward trend. But the rates of decrease are different among them. The relative prices of finished goods decline most severely, those of raw materials also decline but only slightly. Thus it is clear that the more important become our exports of finished manufactured goods, the more severely decline the relative price level of our export commodities.

Table 3 Relative prices and terms of trade

1913=100.00

	Relative price indices			Terms of trade		
	raw materials	semifinished goods	finished goods	raw materials	semi-finished goods	finished goods
VI (1903-1912)	97	110	112	109	130	143
VII (1908-1917)	102	98	95	113	95	97
VIII (1913-1922)	99	96	89	122	89	70
IX (1918-1927)	92	101	92	112	108	71
X (1923-1932)	90	95	89	107	116	62

Original data are taken from: *Nihon Boeki Seiran* (Oriental Economist Co.)

The terms of trade by groups also show similar movement. The same explanation may be applied to the movement of the terms of trade. The relative rise in the exports of finished goods causes the downward movement of the general terms of trade.

The movement of the exchange rates may be explained in terms of the balance of trade or some other institutional factors relating to monetary system. From period I through period IV the relative level of our exchange rates is exceptionally low. The average actual rate is about 15% lower than the equilibrium rate. From period V through period VII the relative level is still low, but the gap between the actual rate and the equilibrium rate becomes smaller. It is clear that the end of the nineteenth century makes a turning point in the movement of our exchange rate. What is the cause of this marked change? Our balance of trade also changes its behaviour around this period. But its change is in inverse direction, that is, from the favourable balance to heavy deficit. While our balance of trade is comparatively favourable, our exchange rate is low, and our balance becoming unfavourable, our exchange rate begins to move upward. Thus, the movement of our exchange rate can not be explained adequately in terms of our balance of trade. We must seek another way of explanation.

The major factors determining the behaviour of our exchange rate is the changes in our monetary system. In 1871 the Meiji government enacted a new Monetary Law and adopted formally the gold standard. But, because of the heavy drain of gold, it was difficult for the government to maintain the gold standard. Our official exchange rate of gold to silver was considerably lower than the ratio prevailing in the international market. The result was obvious enough—gold flowed out and silver flowed in. In 1878 the government had to allow the silver dollar to circulate in domestic, as well as foreign, trade market. Since then our monetary system became de facto silver standard. Thus the price ratio of silver to gold became a major factor determining the level of our exchange

rate. In the end of eighteen sixties the price ratio was 1 to 15, in 1891 1 to 20.9 and in 1894 1 to 32.5. The relative price of silver declined severely. This made our exchange rate unfavourable. In 1897 our monetary system returned to the gold standard and this time it was, in fact, maintained. This is the main cause for the recovery of our exchange rate around the end of the century.

During the two decades, ranging from the end of the Sino-Japanese War to the outbreak of the World War I, Japan executed vigorously the industrial revolution. Our imports of various types of machineries and raw materials increased markedly and, in spite of the also rapid growth in exports, the balance of trade recorded a heavy deficit. To maintain the exchange rate the government planned, and succeeded in, the importation of foreign capital. This is the only one period when Japan imported foreign capital in a substantial amount before the World War II. Hardly had the industrial revolution been completed when the World War I broke out, and an unprecedented large export surplus was recorded. After the War the exports declined and the balance of trade became again unfavourable. But the exchange rate was maintained high through spending up the gold reserve accumulated during the War. Thus the movement in exchange rate is closely related to the monetary policy of our government.

II. *Terms of Trade and the Elasticities of Exports and Imports*

Are these unfavourable terms of trade the necessary prices we must pay in developing our foreign trade? This is a question we will try to answer in this section.

The behaviour in the terms of trade may be interpreted in terms of three economic factors, that is, the comparative growth rate of national income, the income elasticities of reciprocal demand and the price elasticities of imports and exports. Thus the unfavourable terms of trade may be caused by three factors. The first is the comparatively high growth rate of national income. The second is the comparatively high income elasticity of import demand relative to that of foreign countries. The third is the comparatively low price elasticity of imports relative to that of exports. The first two of these coefficients must be evaluated comparatively in relation to those in foreign countries. This makes our analysis extremely difficult. We can measure these two coefficients relating to our country. But, to evaluate these coefficients, we must also measure the weighted average of these figures relating to various foreign countries which enter into trade relationship with us. The shares of these countries in our foreign trade change from period to period. This makes our measurement of the weighted average coefficients almost impossible. As to the first two coefficients we confine ourselves mainly to the measurement of Japanese coefficients. In interpreting the figures obtained, we will rely on some simplifying assumptions and endeavour to state, as a first approximation, rather tentative judgments. As to the third

coefficient the task is much easier to manage. The evaluation required here is that of the comparative level of our price elasticities of imports and exports. These elasticities are not difficult to measure. And the comparative evaluation is also easy. Our interpretation relating to this third factor is, I hope, more reliable than the former ones.

Growth rate of national income and income elasticities

The foreign countries, which have trade relationship with us, may roughly be divided into two groups. The one is the group of countries, the trading shares of which are declining through time, and the other is the group gaining in importance among our foreign trade. Most European countries belong to the first group and Asian and American countries to the second group. Around the end of the nineteenth century Europe, Asia and America share almost equally among them our total value of foreign trade. But since then European countries decline, and Asian and American countries gain, in the shares of our foreign trade. In this section the first declining group is represented by the United Kingdom and the second by the United States of America.

Table 4 shows the growth rates of national income of three countries, that is, the United Kingdom, the United States of America and Japan. From this

Table 4 Growth rates of national income
—United Kingdom, United States of America and Japan

	United Kingdom	United States	Japan	g_3/g_1	g_3/g_2
	g_1	g_2	g_3		
Period A	2.4%	3.5%	3.0%	1.25	0.86
Period B	0.5	2.5	3.9	7.80	1.56

(1) Period A is 1877–85 through 1911–13 for United Kingdom, 1879–88 through 1909–18 for U. S. A. and 1878–87 through 1908–17 for Japan

(2) Period B is 1911–13 through 1924–29 for United Kingdom, 1909–18 through 1924–33 for U.S.A. and 1908–17 through 1923–32 for Japan

(3) Growth rates are average annual rates.

Source: U.K. from Colin Clark, *Conditions of Economic Progress*, U. S. A. from Simon Kuznets, *National Income, a Summary of Finding*, and Japan from Yūzo Yamada ed. *Japanese National Income Estimates* (written in Japanese)

table we may obtain two informations. (1) Our growth rate is comparatively high. (2) After the World War I our growth rate rises relatively to those of the other two countries. This upward trend in our growth rate may be one of the factors causing the downward movement in our terms of trade.

Next we will measure our income elasticity coefficient of import demand. The results are: 1.97 for the period 1894 through 1915, 1.16 for 1919 through 1928 and 0.93 for 1928 through 1937. These results are obtained from the following

equations.

(1) For the period 1894-1915 we analyse the relation between the three years moving averages of logarithmic series of the volume of imports x_1 , and those of real income x_2 , and obtain the regression equation

$$\log x_1 = 1.9705 \log x_2 - 1.9289$$

$$r^2 = 0.7459$$

(2) For the period 1919-1928 we analyse the relation between the logarithmic annual series of the volume of imports x_1 , and those of real income x_2 , and obtain the equation

$$\log x_1 = 1.1622 \log x_2 - 0.2963$$

$$r^2 = 0.8923$$

(3) For the period 1928-1937

$$\log x_1 = 0.925 \log x_2 - 1.9289$$

$$r^2 = 0.864$$

Our income elasticities of import demand are considerably high. These high income elasticity coefficients, together with the high growth rate of national income, bring about the high rates of increase in import demand. Thus these two factors may be used to explain why the level of our terms of trade are generally low. But this way of explanation is not satisfactory for our purpose. Because it can not explain why our terms of trade move downward. This peculiar behaviour of our terms of trade is what we endeavour to explain. The income elasticity coefficients move downward from the eighteen nineties through the nineteen thirties, and the terms of trade also decline during this period. How can we explain the relation between these two movements? One possible explanation is that the decline in the value of elasticity coefficients is more than amply counterbalanced by the rise in the growth rate of national income. But unfortunately this is not true. The former being greater than the latter, the growth rate of our import demand also shifts downward. Thus, unless the downward shift in the growth rate of the import demand among foreign countries is more severe than ours, we cannot interpret the downward movement of our terms of trade in terms of import demand. The comparison in the movement of import demand becomes our next task. This problem is also difficult for us to solve satisfactorily. We have to resort to an easy and rough method. Let us confine ourselves to the comparison between the United States of America and Japan.

The import volume index x in the United States increase annually 1.1% from 1919 through 1933, as is indicated by the equation

$$\log x = 2.1662 + 0.0047(t - 1926)$$

During the same period the import volume index x in Japan shows the following tendency

$$\log x = 2.2305 + 0.0136(t - 1926)$$

Japanese growth rate is 3.2%, which is almost three times as high as in the United States of America. Of course, these are the growth rate of the quantities imported, but not of the import demand schedules. But the difference in the figures

between two countries is so large that we may be allowed to infer from this the relative movement in import demand. Japanese growth rate in import demand has shown a downward movement after the World War I, but, compared with the rate in the United States, it is still high. And the United States is one of the most rapidly advancing countries. So it is probable that the growth rate of our import demand is comparatively high relative to those among the foreign countries which have trade relationship with us. This comparative highness in the growth rate of our import demand may be one of the major causes for our declining tendency in the terms of trade.

Price elasticities of imports and exports

Next we will examine the values of price elasticities of imports and exports. If the elasticity coefficient of imports is smaller than that of exports, we may safely infer that the terms of trade are likely to become unfavourable. Measuring the price elasticities of imports and exports, we obtain the following results.

(1) For the period 1894–1915 we analyse the relation between the three years moving averages of logarithmic series of the volume of imports x_1 , those of the volume of exports x_2 , and those of the terms of trade x_3 , and obtain the equation

$$\log x_1 = 0.8129 \log x_2 + 0.7568 \log x_3 - 1.1834$$

$$R^2 = 0.9661$$

The price elasticity coefficient of imports is 0.7568. Reversing the variables, we obtain

$$\log x_2 = 1.1884 \log x_1 - 1.0000 \log x_3 + 1.6738$$

$$R^2 = 0.9803$$

The price elasticity coefficient of exports is 1.0000.

In this period the coefficient of import is lower than that of exports. Our import demand is less elastic than our export demand to the changes in the terms of trade. This period roughly covers the above mentioned period IV through VII when our terms of trade index is still high. These comparatively favourable terms of trade suppress the volume of exports to the lower level than that of imports (see the table 1)

(2) For the period 1919–28 we analyse the relation between the logarithmic annual series of these three variables and obtain the equation

$$\log x_1 = 0.8238 \log x_2 + 1.0798 \log x_3 - 1.7492$$

$$R^2 = 0.8954$$

The price elasticity coefficient is 1.0798. Reversing the variables, we obtain

$$\log x_2 = 1.0819 \log x_1 - 1.2642 \log x_3 + 2.3197$$

$$R^2 = 0.9084$$

The coefficient of exports is 1.2642, which is again higher than that of imports. This period correspond to the above mentioned period IX, when our terms of trade index becomes lower than those in period IV through VII. In spite of the unfavourable terms of trade the volume of imports index is larger than the volume of exports index.

(3) For the period 1928-1938 we obtain

$$\log x_1 = 0.5714 \log x_2 + 0.2857 \log x_3 + 0.2653$$

$$R^2 = 0.8914$$

$$\log x_2 = 0.9648 \log x_1 - 0.9377 \log x_3 + 1.9752$$

$$R^2 = 0.9680$$

The coefficient of imports is 0.2857 and that of exports 0.9377. Our imports become extremely inelastic to the decline in the terms of trade while our exports are still relatively elastic. This period covers the time of the Great Depression and Recovery. Please notice that our exchange rate severely declined in 1932 through the suspension of gold remittance and the terms of trade also become quite unfavourable. This abrupt decline in exchange rate is not so effective in checking our imports, but considerably strengthens the competitive power of our export commodities. Our exports expand rapidly and precipitate our recovery from the Great Depression.

Compared with the elasticity coefficient of exports, that of imports is always lower and the difference between them becomes larger from nineteen twenties through nineteen thirties. This declining tendency in the relative value of import elasticity coincides with the same tendency in the terms of trade. Thus the movement in the terms of trade can be explained in terms of the relative value of price elasticities. This approach is more satisfactory than the former ones.

III. *Terms of Trade, Imports of Raw Materials and Exports of Finished Manufactured Goods*

In section I we have indicated that the rise in the importance of finished goods among our exports may be one of the major factors making our terms of trade unfavourable. In this section we will further pursue this relation.

Figure 2 shows the movements of the output of manufacture (excluding that of domestic industry), the exports of finished goods, the imports of raw materials and the terms of trade for the period 1903 through 1931. Please notice that the terms of trade here is not the general terms of trade, but that of the exports of finished goods relative to the imports of raw materials; and that they are plotted inversely in the graph, so that the rise in curve implies the drop in the index.

From this figure we obtain two important informations.

(1) Three indices—the output of manufacture, the exports of finished goods and the imports of raw materials—show similar upward trend. The average annual rates of growth are 7.0% for the output of manufacture, 6.5% for the exports of finished goods and 6.4% for the imports of raw materials.

(2) While the output of manufacture and the imports of raw materials increase rather smoothly, the exports of finished goods show a considerable fluctuation, the cycle of which is similar to that of the terms of trade. The behaviour of exported finished goods curve corresponds to that of inversed curve of terms of trade. From this we may infer that the imports of raw materials are quite in-

elastic, but the exports of finished goods are rather elastic, to changes in the terms of trade.

The movement in the output of manufacture may be duely explained in terms of the imports of raw materials. We analyse the correlation between these two indices and obtain the equation

$$\log m = 1.0748 \log r - 0.0779$$

$$r^2 = 0.9469, \quad r = 0.982$$

where m is the index number of the output of manufacture and r is that of imports of raw materials. The elasticity of output is 1.075. 10% increase in the imports of raw materials induces normally 10.75% rise in the output.

What, then, is the relation between the output of manufacture and the exports of finished goods? The next equation answers this question.

$$\log f = 0.0338 + 0.9858 \log m$$

$$r^2 = 0.9333, \quad r = 0.9627$$

f is the index number of the exports of finished goods. The elasticity of exports is 0.986. 10% increase in the output of manufacture induces normally 9.8% rise in the exports of finished goods. Thus 10% increase in the imports of raw materials induces 10.6% rise in the exports of finished goods. If the terms of trade play no parts in this relation, Japanese economy can grow rapidly through the increase in the imports of raw materials while keeping her balance of trade stable. But unfortunately this is not true. The terms of trade do play her part. We have already noticed in the figure 2 that there is a similar cycle in the terms of trade and the exports of finished goods. Analysing this relation, we obtain the equation

$$\log f = 0.9435 \log m - 0.3692 \log t - 0.0779$$

$$R^2 = 0.9435, \quad R = 0.9714$$

where t is the index number of the terms of trade. The price elasticity of our exports of finished goods is 0.36. The value of elasticity is rather small. Nevertheless it is clear that the rise in the terms of trade checks the increase in our exports of finished goods.

In order to increase our output of manufacture it is inevitable for us to increase our imports of raw materials, and in order to increase our exports of manufactured goods it is also necessary for us to take the unfavourable terms of trade.

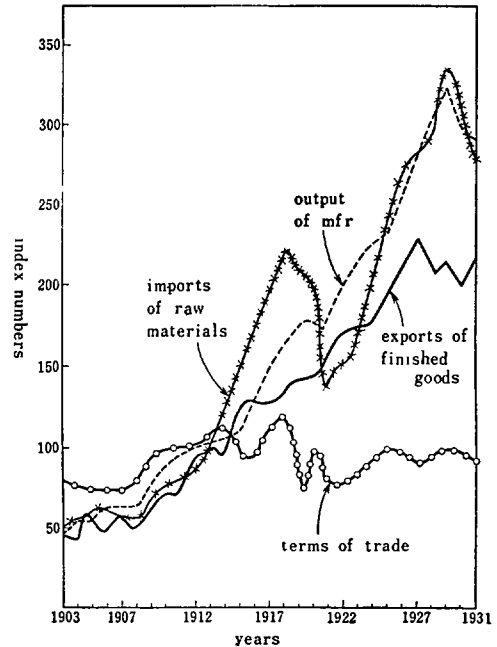


Figure 2 Output of Manufactures, Volume of Trade and Terms of Trade

Its main results are two. One is unfavourable balance of trade. Another is economic fluctuation. As to the former we will analyse in the later sections. As to the latter we may notice the following. Production, real national income and the volume of imports grow almost smoothly in Japanese economy. Nevertheless our national economy has experienced economic fluctuations, the major cause of which may be found in the changes in our exports related to the instability in the behaviour of our price movement.

IV. *Terms of Trade and Gains from Trade*

Our terms of trade have moved downward in the course of development in foreign trade. If the terms of trade are the adequate criterion for evaluating the gains or losses from trade, our foreign trade may be deemed to have incurred considerable losses upon our national economy. We must investigate further whether such a judgment is valid or not.

The unfavourable terms of trade imply *ceteris paribus* losses from trade. But in the dynamic process of trade other things do not remain constant. One of the most important factors among the "other things" is, of course, the comparative costs. We will take this factor out from the box of *ceteris paribus*.

Theoretically speaking, the terms of trade T is, under equilibrium condition, related to the average comparative costs C through the equation

$$T = \eta C$$

where η is the elasticity of the comparative costs as to the increase in output. The terms of trade correspond to the marginal comparative costs, which is, in turn, no less than the product of the average comparative costs and the said elasticity coefficient. If this coefficient is equal to unity, we can not obtain any gains from trade. But as the competition among trading countries is not perfect, this coefficient is ordinarily greater than unity and the gains from trade become obtainable. We may safely assume that this elasticity coefficient is an indicator of the gains from trade. Let us call this coefficient the degree of gains from trade. If the comparative costs schedule remains stable and only the reciprocal demand schedule shifts to right, the terms of trade become unfavourable and the degree of gains smaller. Under such conditions the declining terms of trade imply the narrowing margin in gains from trade. Supposing that both the comparative costs schedule and reciprocal demand schedule shift to right, the result is rather complicated. In this case the terms of trade may become unfavourable, but we cannot judge from this movement alone whether the degree of gains becomes smaller or not. An additional information is necessary. That is, we must evaluate the comparative shift in these two schedules.

In section II we have analysed the factors causing the movement in terms of trade. Among the three factors we may take out the comparative growth rate of national income as the strategic shift variable relating to the reciprocal demand schedule. Then, what is the shift variable in comparative costs schedule?

The comparative growth rate of productivity is that variable. As in the case of the factors relating to the terms of trade, the modifying adjective "comparative" attached to the variables makes our measurement of them extremely difficult. The measurement of the comparative growth rate of productivity is no less difficult than that of national income. Here again, let me allow the placing of the measurement in foreign countries into the *ceteris paribus* closet, and confine myself to the comparison in two shift variables relating to Japanese economy. The variables treated here are the growth rate of national income and that of labour productivity in manufacturing industry. The former is related to our import demand schedule and the latter to our costs schedule in export industry. This is only a first and rough approximation. But we are not certain whether any second and better approximation lies within our means.

Relying upon such simplifying assumptions, we proceed to state the following relationship as the working hypothesis. If the growth rate of national income is greater than that of labour productivity and at the same time the terms of trade decline, it is almost impossible to maintain gains from trade. Under such conditions the losses in terms of trade may not be counterbalanced by the rise in productivity among export industry. But if the labour productivity grows more rapidly than the national income, the gains from trade can be maintained in spite of unfavourable terms of trade.

Table 5 Growth rate of national income and that of labour productivity

	Growth rate of		Terms of trade
	national income	per capita income in mfr.	
1878— 87→1883— 92	5.1%	△ 0.4%	0.2%
1883— 92→1888— 97	3.6	0.9	△ 0.2
1888— 97→1893—1902	2.1	0.8	0.2
1893—1902→1898—1907	0.9	△ 2.1	0.6
1898—1907→1903— 12	2.1	△ 0.6	△ 0.7
1903— 12→1908— 17	3.2	3.7	△ 3.1
1908— 17→1913— 22	4.0	4.0	△ 1.1
1913— 22→1918— 27	3.8	4.7	1.4
1918— 27→1923— 32	4.4	4.1	△ 0.7

Source: (1) income data from: Y. Yamada ed. *Japanese National Income Estimates* (written in Japanese)
 (2) terms of trade from; Tōyōkeizai Shimpo Sha, *Boeki Seiran* (written in Japanese)

Table 5 shows these two shift variables together with the rate of variation in our terms of trade. In section I we have indicated that our terms of trade

remain almost stable in the first half of the whole periods under consideration and then become unfavourable in the latter half. From Table 5 it is clear that while in the first half the national income grows more rapidly than the labour productivity in manufacture, this relation is reversed in the latter half. The rise in productivity becomes more pronounced than the growth rate of national income, and the terms of trade begin to decline markedly. Thus the period of declining terms of trade coincides with that of rising productivity. This is not a mere coincidence. We may be allowed to state that the relative shift in the movement of our national income induces the terms of trade to decline, but the losses in terms of trade is more than amply compensated by the gains in productivity in manufacturing industry. Of course this statement is only tentative and open to questions. But we may at least safely say this much. In spite of unfavourable terms of trade Japanese economy gathers gains from trade through the improvement in productivity.

V. Terms of Trade and Wage Rate

The unfavourable terms of trade are, of course, not agreeable things. They are the burdens Japanese economy has to bear. Who bears these burdens? It is commonly believed that they are mainly born by labourers with low wages. Let us call this view the cheap labour theory. Then how far is this theory verified by the facts?

Figure 3 shows the movements in the terms of trade, labour productivity of factory industry, real wage rate and per capita real agricultural income in terms of index numbers (with 1913 as the base year) in the course of 27 years, 1903 through 1930. Please notice that here again, as in section III, the terms of trade are that of finished goods exported relative to raw material imported and plotted inversely in the graph.

The real wage rate of so called cheap labour rises at the average annual rate of 4.8% during this period. This rate of increase is undoubtedly high. But compared

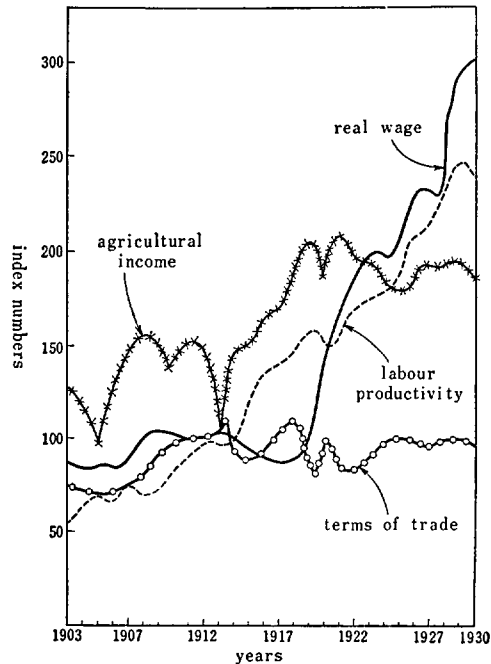


Figure 3 Real Wage, Labour Productivity and Agr. Income

to the rate of increase in the labour productivity in factory industry it is lower. The labour productivity rises annually at the rate of 5.3%. Comparatively speaking Japanese labour is cheap. But this does not mean that the real wage rate is tied down to the minimum level of subsistence.

Analysing the relation between the labour productivity and the real wage rate with one year lag, we obtain the equation

$$\log w = 0.3306 + 0.8552 \log p$$

$$r^2 = 0.7252, \quad r = 0.8516$$

where w is the real wage rate index and p the labour productivity index. The elasticity coefficient of real wage rate is 0.855. 10% rise in the labour productivity induces with one year lag 8.6% up in the real wage rate. Let us add one more variable to the equation. A variable to be added is, of course, the terms of trade index. The result is shown by the equation

$$\log w = 0.9367 + 0.9226 \log p + 0.3824 \log t$$

$$R^2 = 0.7486, \quad R = 0.8653$$

where t is the terms of trade index. The value of productivity elasticity coefficient of real wage rate rises somewhat and becomes 0.923. This implies that if the terms of trade remain constant, 10% rise in productivity induces 9.2% up in real wage rate. But if the terms of trade decline, the real wage rate is depressed. The relevant elasticity coefficient is 0.382. 10% decline in the terms of trade induces 3.8% decrease in the real wage rate. This is the real meaning contained in the cheap labour theory.

During this period the labour forces employed in factories grow at the annual rate of 2%. This rate is greater than the population growth rate. Population grows at the annual rate of 1.3%. How can the capitalists employ the increasing number of labourers with comparatively low wages?

Farm population supplies the additional labour forces with low wages. The low level of living among them depresses their supply price of labour to urban factories.

Per capita real agricultural income rises slowly at the annual rate of 0.3% during this period. Analysing the relation between the real wage rate of factory labourers and per capita real agricultural income, we obtain the equation

$$\log a = 1.61833 + 0.2808 \log w$$

$$r = 0.6775$$

where a is the per capita real agricultural income index. The relevant elasticity coefficient is 0.281. 10% rise in the real wage rate in urban area induces only 3% up in the real agricultural income in rural area. Thus rise in real wage rates enlarges the gap between the levels of living in urban and rural areas. This is the reason why labour forces always move from rural to urban area whenever job opportunities are offered there.

The story of the unfavourable terms of trade leads us to the door of the cottage of small peasants. We are tempted to open the door and interview our ordinary peasants. But we must return to the statistical measurement and ask what is the multiplier effect of our foreign trade.