

ECONOMIC FLUCTUATIONS IN PREWAR JAPAN: A Preliminary Analysis of Cycles and Long Swings.*

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Introduction

Quantitative analysis of Japanese economic development has, up to now, focused mainly on trends. By now, these have been fairly safely established for the major macro-economic components, and the time appears ripe to turn our attention toward somewhat shorter movements—one might say to the rhythm of growth. Although our findings and conclusions are still tentative,¹ we believe that the data can establish the following points: the existence of a “short” cycle lasting on the average seven years,² and the presence of long swings or Kuznets Cycles.

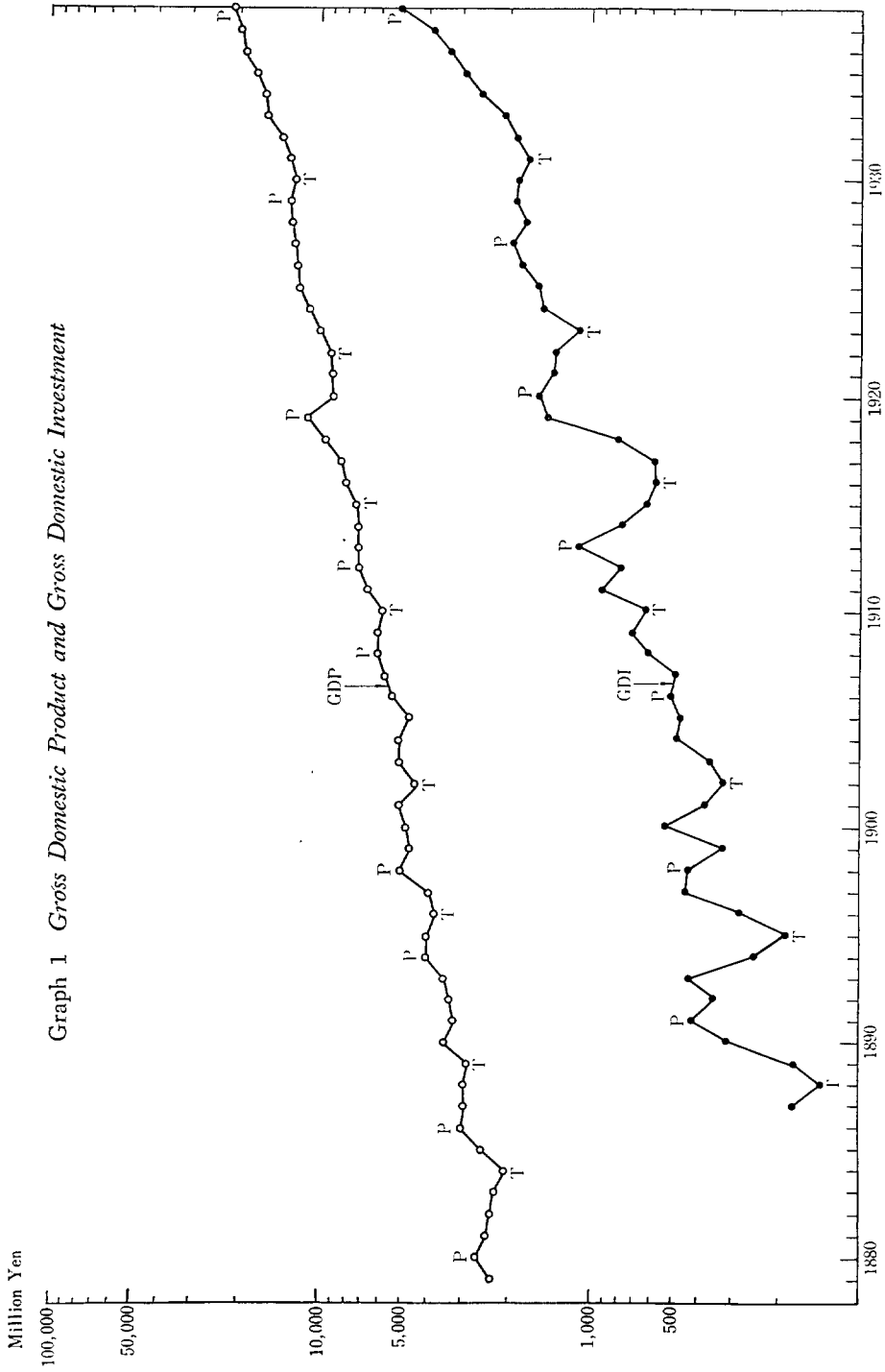
The Short Cycle

Graphs 1 through 4 are intended to demonstrate the short cycle in gross domestic product, gross domestic investment, the general deflator or prices, and imports and exports. By themselves, the annual series plotted in graphs 1 and 2 show the short cycles quite clearly—especially for investment, prices, and imports. In order to bring-out the fluctuations with even greater clarity, we devised graphs 3 and 4, the so-called price periodization. First, we identified the peaks and troughs in the general deflator, and then calculated the annual average rate of growth for each peak to trough and trough to peak movement. These were entered in graph 3. (For example, according to the graph, between 1893 and 1898, prices

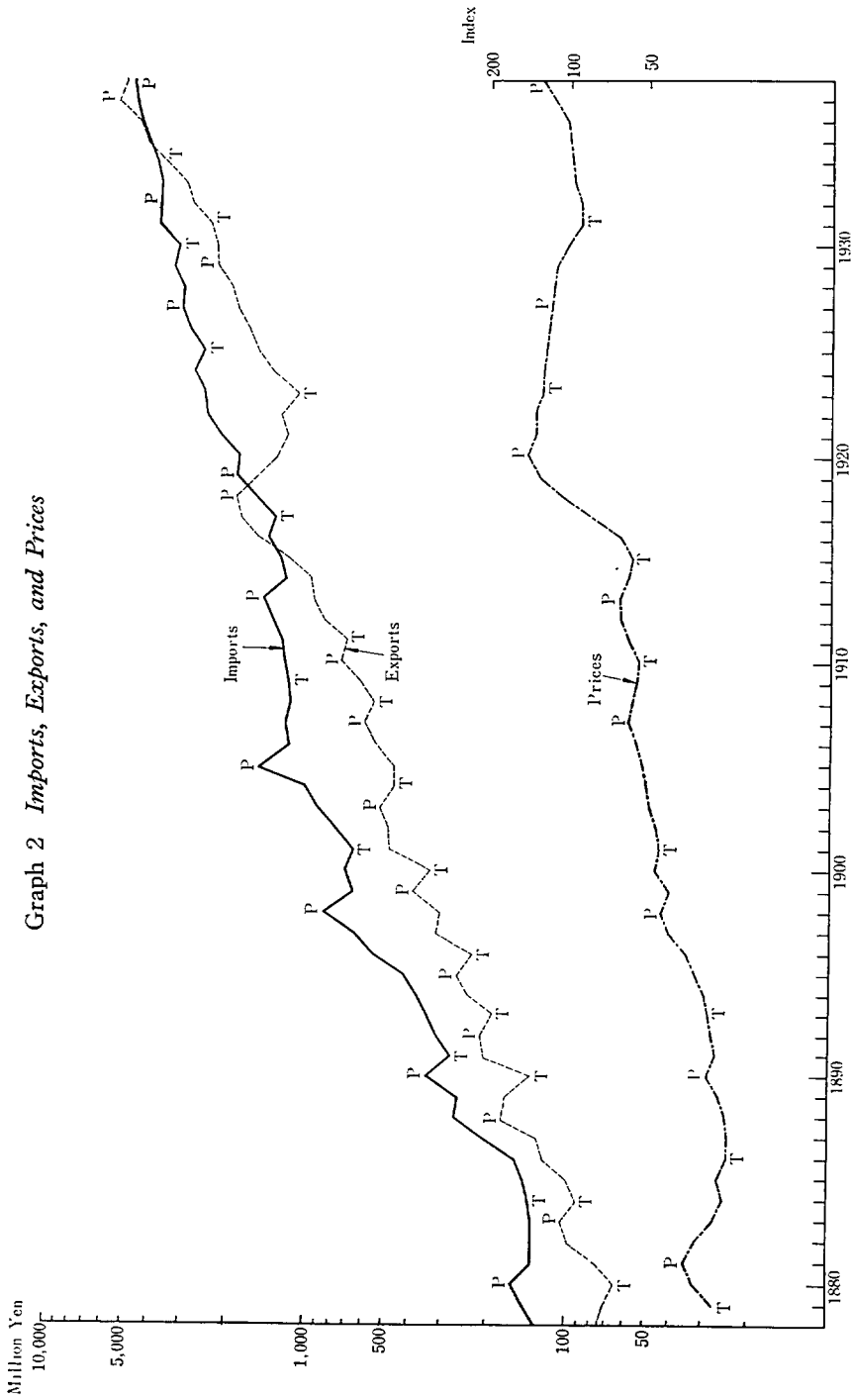
* There has been some earlier work on this subject. See, Tōyō Keizai Shimpō-sha, (Ed.), *Nihon no keiki hendō* (Business Cycles in Japan), Tokyo 1931, especially pp. 16—32; Aoyama Hideo (Ed.), *Nihon keizai to keiki hendō* (The Japanese Economy and Business Cycles), Tokyo, 1957, especially the contributions of Baba Masao; Shinohara Miyoei, “Growth and Long Swing in the Japanese Economy”, *Hitotsubashi Journal of Economics*, Vol. 1, No. 1, (October 1960). There is also some information in Willard L. Thorp and Wesley C. Mitchell, *Business Annals*, New York, 1926. Our own results are mainly based on the series contained in Ohkawa Kazushi and Others, *The Growth Rate of the Japanese Economy Since 1878*, Tokyo, 1957, Henry Rosovsky, *Capital Formation in Japan, 1868—1940*, New York, 1961, and recent work of the Rockefeller Project of Hitotsubashi University’s Institute of Economic Research of which Ohkawa is director of research.

¹ The findings below are restricted entirely to synthetic series. A fuller analysis must examine also the behavior of physical output series.

² A short cycle lasting seven years may seem like a contradiction in terms; usually this term is reserved for inventory cycles. However, information about inventory fluctuations is unavailable for prewar Japan, and the seven year cycle is the shortest one on record.

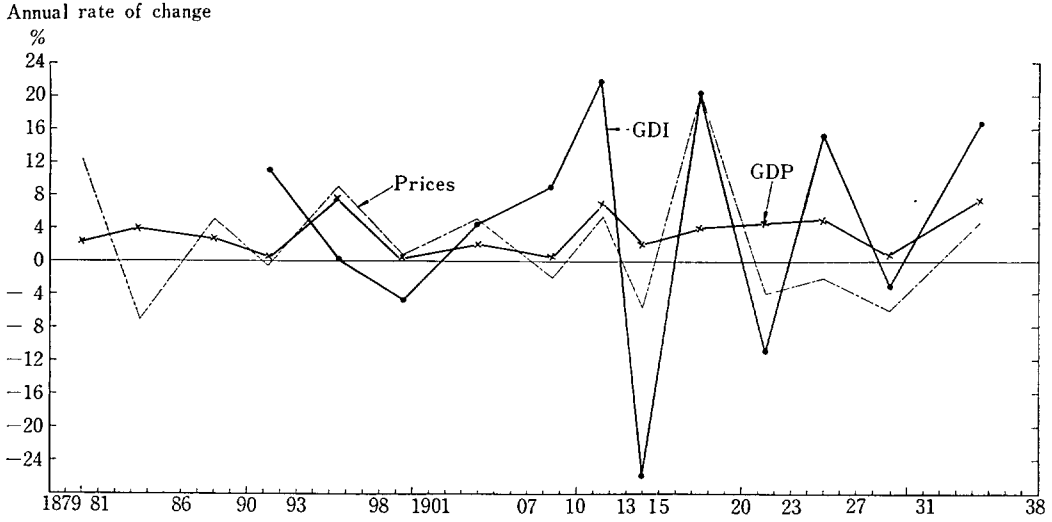


Source: Appendix Table 1.



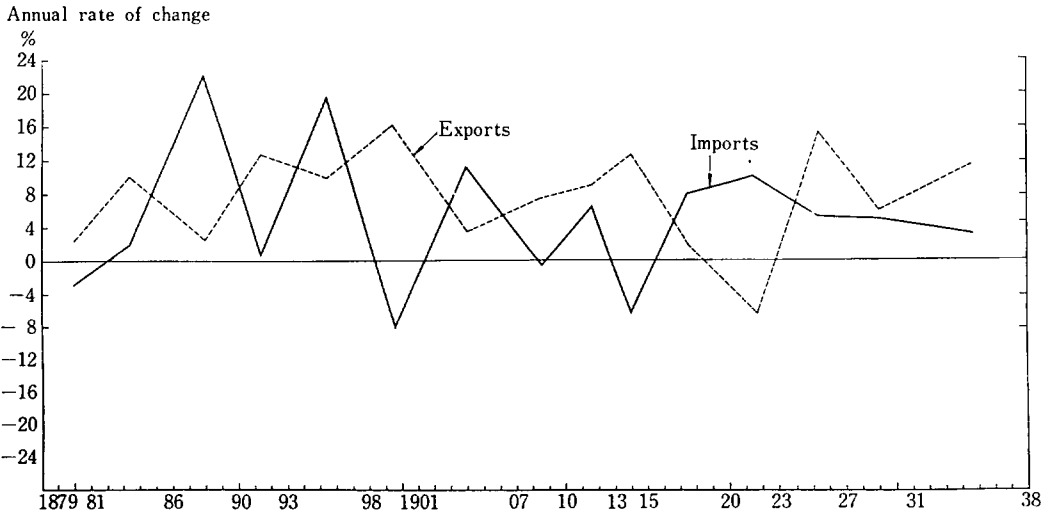
Source: Appendix Table 1.

Graph 3 *Price Periodization: Prices, Investment, and GDP*



Source: Computed from Graphs 1 and 2.

Graph 4 *Price Periodization: Exports and Imports*



Source: Computed from Graphs 1 and 2.

rose at the rate of 9.2 per cent per year. In the following period the rate of increase declined to 0.4 per cent per year.) Secondly, the GDP, investment, export, and import growth rates were computed during the upswings and downswings as indicated by prices, and also plotted in graphs 3 and 4.

These graphs show, in addition to the marked upswings and downswings of the growth rates, that the components—with the exception of exports—fluctuated in close association with each other. This is not due to the accident of a price periodization; an investment or output periodization would indicate more or less the same thing. The duration of these cycles and their concurrence is also brought out in table 1, where we indicate the peaks and troughs of the individual series.

The Price Cycle

We cannot, at this stage, offer a complete explanation of the cyclical movements in the prewar price level. Our suggestions below, which contain almost no institutional analysis, represent hypotheses which will have to be investigated more thoroughly in the future.

The empirical record indicates that the long-run development of the Japanese economy was accompanied by a moderate but sustained inflation. There were, in the roughly seventy years under consideration, some exceptions: the Matsukata Deflation brought a price decline lasting from 1881 to 1886; World War I caused hyper-inflation, and was followed by declining prices throughout most of the 1920's. However, in terms of the long-run, these exceptions were not frequent, and they can generally be explained in *ad hoc* terms.

Information supplied by the graphs tells us that the movements of the price level were cyclical. Usually, prices rose fairly moderately for three to five years, and this was generally followed by a period of price stability or slight decline lasting a somewhat shorter period of time. Within these general features, there emerge four significant characteristics.

1. The price declines do not cancel out the previous price rises, and this results in the rising trend of the price level.
2. The rate of growth of GDP tended to be higher during inflationary times; it tended to be lower or stagnant during periods of price stability or deflation.
3. There is a very close positive association between the price cycle and the investment cycle. In other words, the rate of increases in investment rise during periods of inflation, while they fall or remain stagnant during price stability or deflation.
4. Import movements are positively associated with price cycles, while export are inversely correlated.

We will now try to explain the pattern of Japanese inflation in relatively theoretical terms, but at the same time basing our assumptions on historical facts. It is convenient to begin with a model for a typical 3 to 5 year price cycle upswing, turning later to the downswing and the relations between the cycle and the trend.

The Typical Price Cycle Upswing

1. We may begin with an event which took place very often in post-Restoration economic history: a credit expansion to the "modern" sector. The latter term may require

Table 1 *Peaks, Troughs, and Duration of Short Cycles*

Peak	Trough	Expansion	Contraction	Full Cycle	
				Peak to Peak	Trough to Trough
PRICES					
	1879				
1881	1886	2	5		7
1890	1893	4	3	9	7
1898	1901	5	3	8	8
1907	1910	6	3	9	9
1913	1915	3	2	6	5
1920	1923	5	3	7	8
1927	1931	4	4	7	8
1938		7		11	
Average		4.5	3.3	8.1	7.4
GDP					
	1884				
1880	1884		4		
1886	1889	2	3	6	5
1894	1896	5	2	8	7
1898	1902	2	4	4	6
1908	1910	6	2	10	8
1912	1915	2	3	4	5
1919	1922	4	3	7	7
1929	1930	7	1	10	8
1938		8			
Average		4.5	2.8	7.0	6.7
INVESTMENT					
	1888				
1891	1895	3	4		7
1898	1902	3	4	7	7
1906	1910	4	4	8	8
1913	1916	3	3	7	6
1920	1923	4	3	7	7
1927	1931	4	4	7	8
1938		7		11	
Average		4.0	3.7	7.8	7.1

Peak	Trough	Expansion	Contraction	Full Cycle	
				Peak to Peak	Trough to Trough
IMPORTS					
1880	1884		4		
1890	1891	6	1	10	7
1898	1901	7	3	8	10
1905	1909	4	4	7	2
1913	1917	4	4	8	8
1919	1925	2	6	6	8
1927	1930	2	3	8	5
1932	1934	2	2	5	4
1938		4			
Average		3.9	3.4	7.4	6.3
EXPORTS					
	1880				
1883	1884	3	1		4
1888	1890	4	2	5	6
1892	1893	2	1	4	3
1895	1896	2	1	3	3
1899	1900	3	1	4	4
1903	1904	3	1	4	4
1907	1908	3	1	4	4
1910	1911	2	1	3	3
1913	1914	2	1	3	3
1918	1923	4	5	5	9
1929	1931	6	2	11	8
1937		6		8	
Average		3.3	1.5	5.0	4.8
Average (Before 1914)		3.0	1.1	3.2	3.8
AVERAGE DURATIONS					
Prices		4.5	3.3	8.1	7.4
GDP		4.5	2.8	7.0	6.7
Investment		4.0	3.7	7.8	7.1
Imports		3.9	3.4	7.4	6.3
Exports		3.3	1.5	5.0	4.8
(Exports before 1914)		3.0	1.1	3.2	3.8
Average of all series		4.0	3.0	7.1	6.5
Excluding exports		4.2	3.3	7.6	6.9

Source: Graphs 3 and 4.

some explanation, although we have used it elsewhere.³ By modern sector we mean that element within the economy which used largely Western techniques and organization of production, introduced to Japan in significant quantities only after the Meiji Restoration. A good example would be the mechanized cotton-spinning industry. Co-existing with the

³ See Henry Rosovsky and Kazushi Ohkawa, "The Indigenous Components in the Modern Japanese Economy" *Economic Development and Cultural Change*, Vol. IX, No. 3 (April 1961); in that article we used the term indigenous for what we now call traditional.

modern sector is the traditional sector, in our terms that sector which continued to use largely pre-Meiji techniques and organization. Agriculture and the production of many items in daily-use (*geta*, *miso*, etc.) are outstanding examples. When, as sometimes happened, an enterprise used modern techniques and traditional organization, we will call it "hybrid." A good example would be an electric motor used with family labor. To return now to the credit expansion, we know that it could have taken many forms: a government subsidy designed to start or expand some particular branch of industry (shipbuilding would be a typical case), public, semi-public, or private bank loans, or simple government currency expansion for military or other purposes.

2. As a result of the credit expansion, investment expenditures increased in the domestic market. Entrepreneurs who received the credit spent it on labor, materials, producers' durables, and perhaps land. The bulk of these expenditures were obviously made within the domestic market, although—as we shall see—there were important import leakages.

3. What was the result of these expenditures (which, if we had started in an equilibrium situation, would mean that *ex ante* investment was larger than *ex ante* savings)? In a relatively free market they must have caused a redistribution of the factors of production to the people with the credit. In Japan, this would mean that the labor force moves from the traditional to the modern sector, and that other factors—materials, machines, land, etc.—will be in greater demand.

4. In general, this redistribution would have taken place through price increases, with the holders of the credit bidding away resources from the rest of the economy. In Japan, however, throughout almost the entire period in question, there was one vital exception: real wages did not necessarily increase because the supply of labor available to the modern sector remained highly elastic. Within a certain range of increased modern investment, the resulting demand for labor could be satisfied by an exodus from the traditional economy without a sizeable increase in real wages. It is important, nevertheless, to stress the "certain range." An overly rapid expansion was capable of creating temporary labor shortages, and this happened at the time of World War I.

5. A slight digression is now needed. Throughout the prewar period, the traditional sector produced a large, though declining, share of Japan's consumers' goods. We know that the marginal productivity of labor in the traditional sector must have been, on a comparative basis, quite low. Cannot this combination of circumstances prevent price rises for consumers' goods? After all, losing relatively underemployed workers should allow production to remain at previous levels. While these forces could, to a constantly diminishing degree, mitigate the inflationary pressure on consumers' goods, they could certainly not prevent price rises entirely. The demand for these goods increased secularly due to a slow rise in the standard of living and a more rapid rise in population, and the elasticities of supply were simply not high enough to prevent price rises.

6. We have now demonstrated how inflationary pressure was created in the economy. At the same time, however, the output-effect of the newly created credit—i.e. the increased output which resulted from the investment financed by new credit—also enters the picture. How it was possible to raise output is best explained in terms of the modern—traditional dichotomy.

In the modern sector, there were three reasons why the new investments could increase the rate of growth of output. First, they frequently meant the introduction of new or

improved technology. Second, the availability of cheap labor at more or less constant wages made profitable operation of these new techniques much more likely. Third, rises in output did not even require the latest modern technology. Insofar as modern units were simply multiplied and replaced less productive traditional methods, the rate of output growth would rise. To give a concrete example, almost each time a hand-loom weaver was replaced by an automatic loom—even if the loom was not of the latest model—output would increase.

Strangely enough, the output-effect can also be observed in the traditional sector, and its explanation must be a bit more complicated. Let us first deal with it in the non-agricultural traditional sector which consisted largely of small proprietors. Here we can trace the effect quite directly to new investments and relations with the modern sector. The non-agricultural traditional sector often used the opportunities of inflation to convert itself into, what we have called, hybrids. Traditional organization such as family labor was preserved, while some modern technology was adopted. The opportunities presented by inflation are quite obvious. These industries were especially labor intensive: to some extent their selling prices must have risen while their labor costs could be kept relatively steady.

In agriculture the story is quite different and the effects usually much more indirect. The movements of primary output also show a good positive association with price movements, indicating a large output-effect. To a limited extent this output-effect was also related to investment, and especially investment in working capital aided by the liberal credit policies of the government. Working capital was mainly used for the purchase of materials—mainly fertilizers—and this was directly related to increased output.

There were, however, other more important reasons why agricultural output was positively correlated with price movements, and these are only indirectly linked to investment or credit creation. This has to do with the behavior of agricultural entrepreneurs, and especially the incentives of the owner-cultivators. In general, when the price level was rising, the price of rice and other agricultural commodities also rose. This served as an overall stimulus to increased production. It was an especially strong incentive for the landlords because they collected tenant rent in kind while paying the land tax in cash. The opportunities for profit during inflationary times were therefore very large.

Downswing of the Price Cycle and Relations to the Long-run

7. There is *a priori* proof that in Japanese inflations the output-effect was generally weaker than monetary or price effects. We can see this in the secular trend of the price increases. The price rises during the upswing of the cycle are attributable to short-run inelasticities of supply, somewhat mitigated by the output-effect. The short-run downswing, on the other hand, can be attributed to one of three causes or combination of causes: the output-effect, a balance of payments crisis, or (especially when the output-effect was weak and there existed the danger of run-away inflation) monetary policy. In fact, all three factors usually played a role in reducing the price level, and this makes precise analysis very difficult. Generally, we feel that balance of payments and monetary policy considerations have been more important than increases in output.

8. The balance of payments, and more especially the import requirements of modern industry, were especially strategic factors. We know that the traditional sector was capable of supplying labor and certain materials which modern industry needed in order to grow. Nevertheless, many of the goods required by modern industry, especially capital goods and

raw materials, had to be imported. Consequently, new investments brought about by credit creation meant that imports on behalf of the modern sector had to rise. There is no lack of statistical evidence in support of this point, and its implications are equally plain: the need for imports was a clear ceiling to output expansion given the fact that the ability to export was limited. In reality, the Japanese economy was capable of repeated accelerations of imports, but the absolute amounts and the duration of import spurts was anything but limitless.

These increased import flows placed a two-fold pressure on prices. They could lead to a balance of payments crisis which by itself exerted deflationary pressure. But imported goods also bolstered the output-effect by increasing the productive capacity of industry.

9. We have given reasons for a typical upswing and downswing, and given the initial assumption of new credit creation the ensuing price cycle can be explained in endogenous terms. There remains one major problem: why did Japan experience secular inflation in which each successive price trough was generally higher than its predecessor? Our inclination is to argue that after the price level had been stabilized or had undergone a slight decline, the process of credit creation started again. It started again before a deep deflation could develop, leading to secular inflation. Renewed credit creation cannot really be explained in endogenous terms within the cyclical mechanism. Rather it must be discussed in terms of the overall expansionist atmosphere which prevailed during the entire course of Japanese industrialization.

It is not easy to explain the commitment to expansion at the credit-creating (public and private) levels. With considerable hesitation, we suggest the following reasons. The need for an underdeveloped country to grow speedily has been frequently recognized. This was especially true in Japan where real or imagined threats to national sovereignty were great. Less well recognized, perhaps, are the uncertainties or weaknesses in Japan's historical development pattern. One must be impressed—sometimes even blinded—by the pace of growth and the success story which is told by Japanese economic history. But when one looks more closely, weak spots become more prominent, and it is clear that growth was only rarely "self-sustained", that dangers were ever-present, and that random events often effectuated a lucky rescue. We cannot, due to limitations of space, provide a description of the major weak spots as they arose. Among the most important were: the decline in the growth rate of agricultural output beginning in 1905—10, the permanent built-in international payments problems, and beginning in the 1920's, the rapidly growing productivity disparities between the modern and traditional sectors. The best example of a random event which proved fortunate for Japan was World War I, which created an unprecedented opportunity for export expansion. In addition, Japan was never a rich country, and her reserves—social and material—for sitting-out a period of stagnation were very small. If growth did not continue speedily, there was the real danger of slipping once more into backwardness, and at certain early stages the danger of disappearance as a nation. It seems to us highly probable that these issues were understood by economic and governmental leaders. And this could explain the expansionist atmosphere and the recurrence of credit creation when price levels began to decline and a prolonged recession was in view.

The Investment Cycle

Most of the major considerations pertaining to the short investment cycle have already been discussed in the section on prices. It seems to us that domestic capital formation was the major autonomous factor in long-run Japanese growth, and we have shown how new investment resulting from credit creation can generate the short cycles. Of course, credit creation was not the only force behind the surges of investment. Profit considerations, in the case of the private sector, varied from period to period, and some of the upswings (downswings) of investment are obviously tied to improved (worsened) market conditions, both domestic and international. For example, the investment boom of World War I must be considered primarily a result of the vastly enlarged foreign market. The upswing beginning in 1923 was due to a construction boom following the Great Earthquake of the same year, and this can be called an improvement in the domestic market. What brought about the downswings has already been covered (i.e. the output-effect, balance of payments crises, monetary policy *and* changes in the profitability of investment); the upswing we consider largely autonomous.

Recent research results make possible the comparison of the cyclical pattern of public and private investment. In his volume on *Capital Formation In Japan, 1868-1940*, Rosovsky noted that approximately half of gross domestic investment was initiated by the public sector.⁴ His estimates did not include a direct measurement of private investment in agriculture, and it is possible that if such a computation were available, the pre-World War I share of the public sector would decrease. For example, using the recent and highly preliminary agricultural investment estimates of M. Umemura and S. Yamada,⁵ the share of government investment before World War I would fall to between 40 and 45 per cent. In any event, the revision is of minor magnitude, and the unusually large share of government investment supports the view that we are dealing with an autonomous factor.

In year to year terms, private investment was definitely much more volatile than its public counterpart, but in some measure this may be due to poorer data for the private sector. Still, it is reasonable to suppose that short-term fluctuations were caused more by the private sector, while government investments acted as some sort of stabilizer. With very few exceptions, however, the cyclical pattern of public and private investments was the same—the difference between the two series was largely a question of volatility.

*The Long Swing*⁶

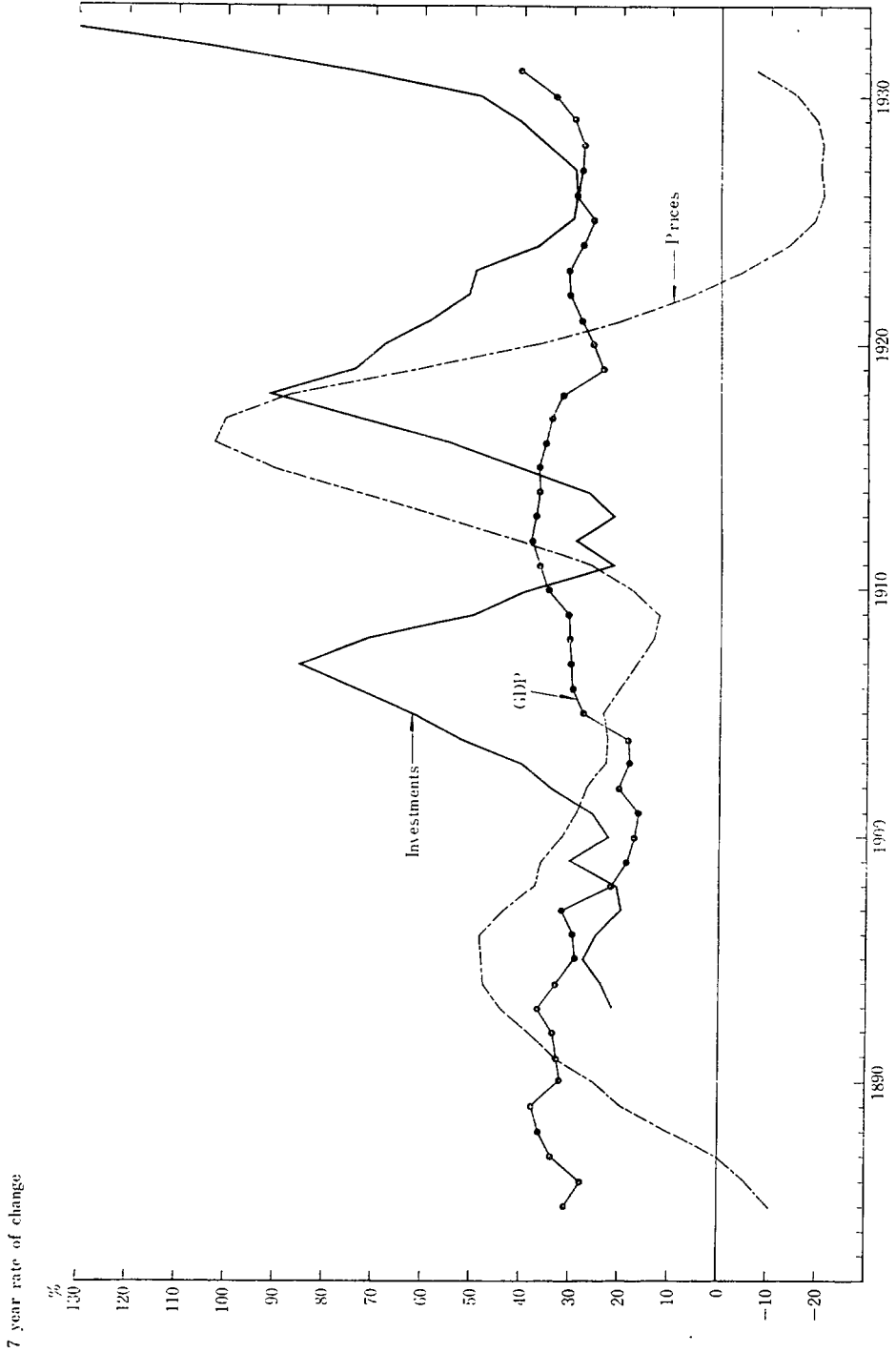
In addition to the seven year cycle, the pattern of Japanese economic growth also

⁴ Chapter ii.

⁵ "An Estimate of Fixed Capital in Agriculture" (Mimeographed), Rockefeller Project Working Paper, 1961.

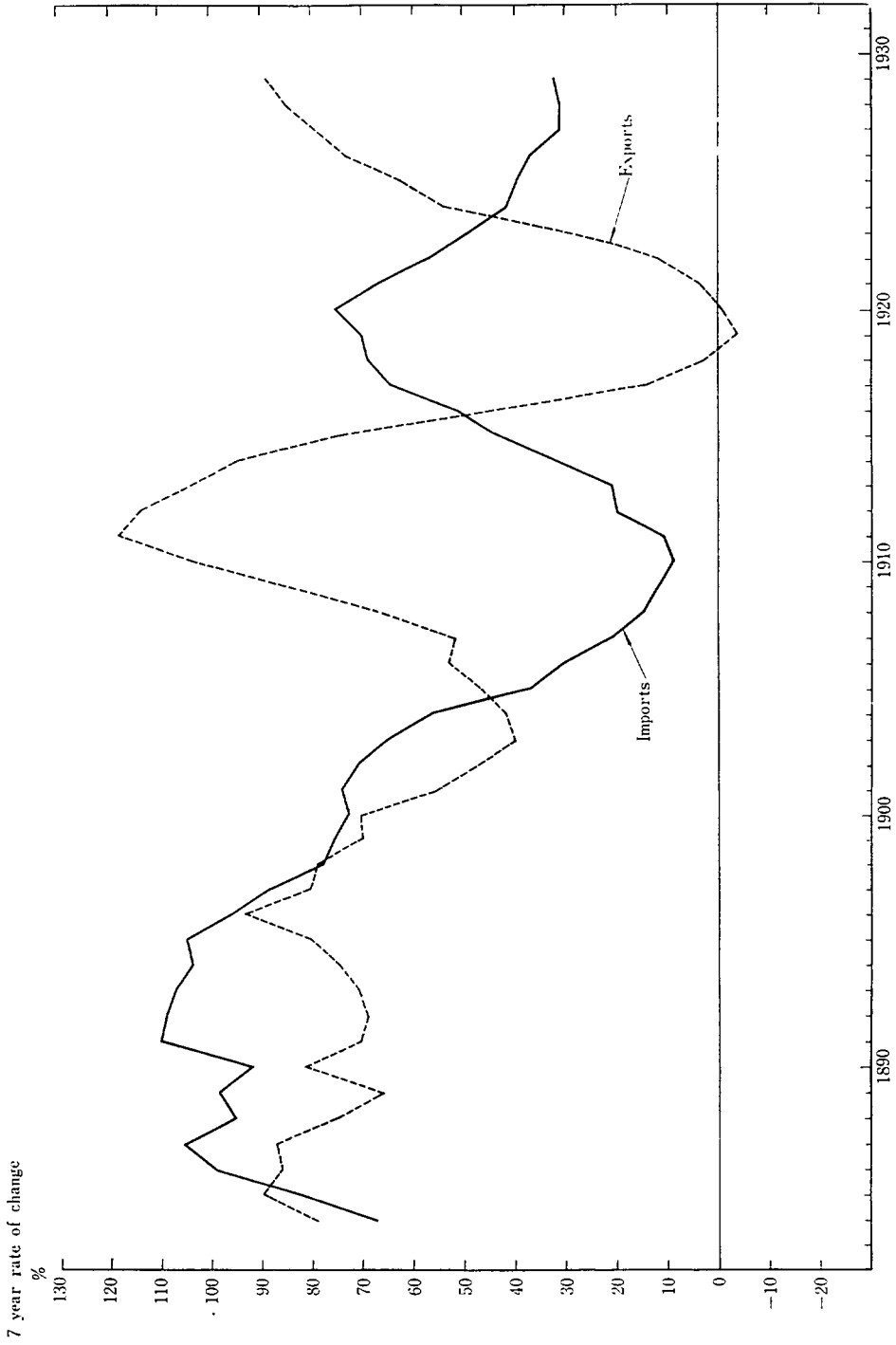
⁶ A recent article provides an interesting basis of comparison for the Japanese results. See Jeffrey G. Williamson, "The Long Swing: Comparisons and Interactions between British and American Balance of Payments," *Journal of Economic History*, Vol. XXII, No. 1 (March 1962).

Graph 5 Long Swings: GDP, Investment, Price



Source: Appendix Table I.

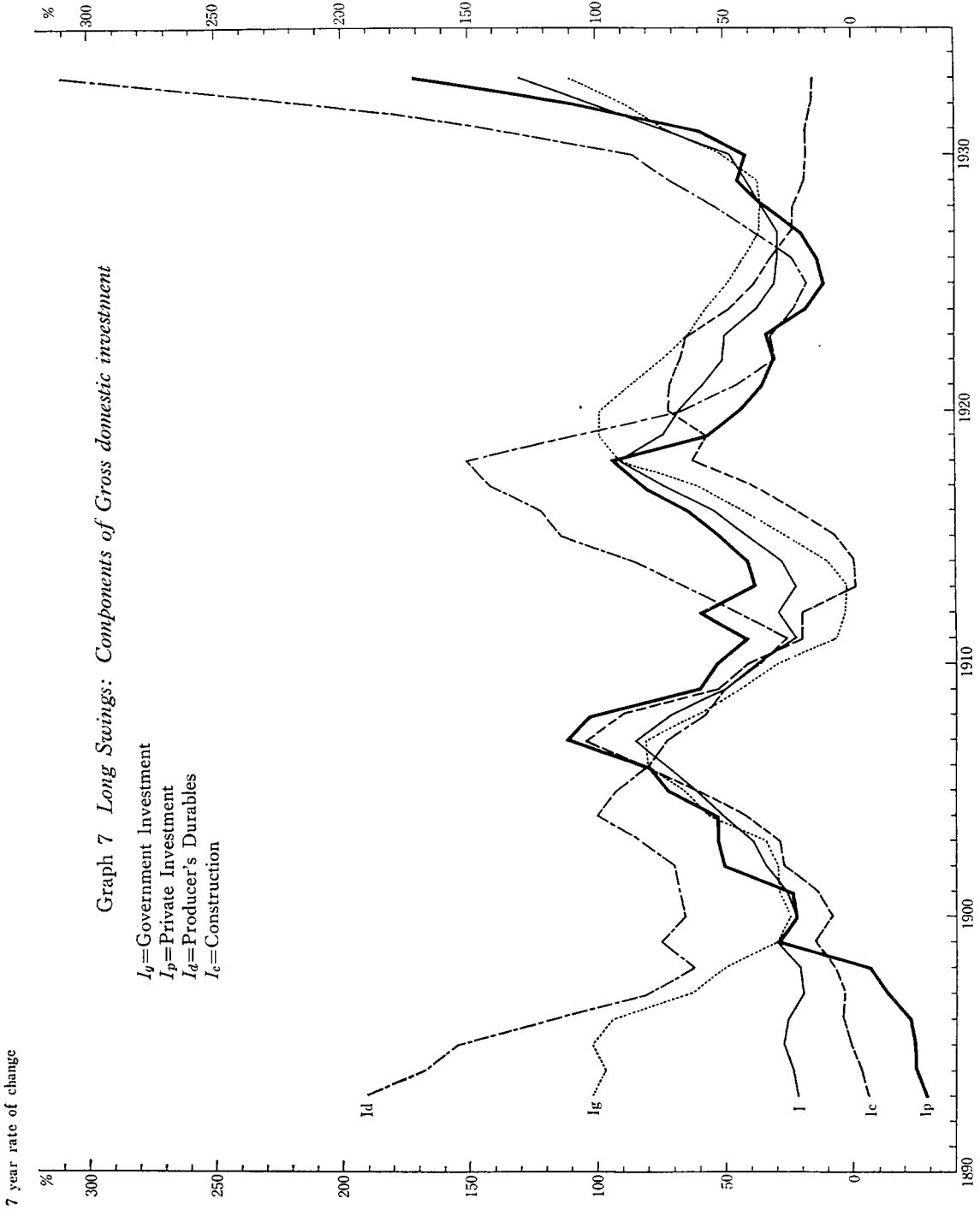
Graph 6 Long Swings: Exports and Imports



Source: Appendix Table 1.

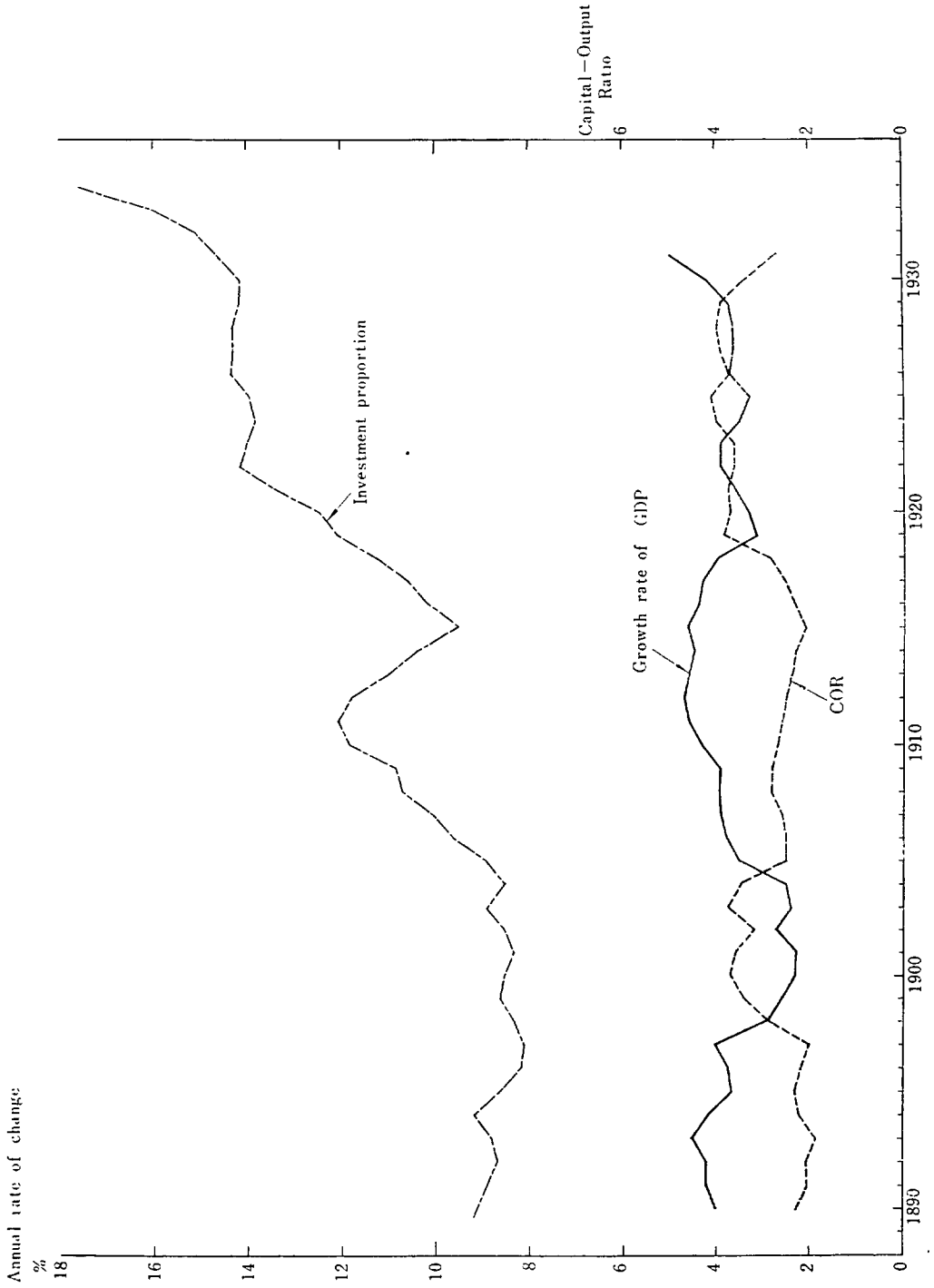
Graph 7 Long Swings: Components of Gross domestic investment

I_g = Government Investment
 I_p = Private Investment
 I_d = Producer's Durables
 I_c = Construction



Source: Rosovsky, *Capital Formation in Japan*, ch. V.

Graph 8 Long Swing of Capital-Output Ratio and the Investment Proportion



contained fluctuations of longer duration, which we shall tentatively call long swings. We cannot yet suggest an adequate explanation of these fluctuations, but a preliminary presentation of the measurements and of our ideas may be of some interest.

The long swings were identified by smoothing the annual series with a seven year moving average (in order to eliminate the short cycle), and then computing the growth rates in overlapping seven year intervals, the resultant being plotted on graphs 5 through 8. This smoothing procedure does not eliminate all irregularities in the series, but the remaining movements do appear sufficiently clearly to analyze longer fluctuations.

Let us now turn to the behavior of some of the individual components during long swings. This time we will concentrate first on the output (GDP) swing, and examine the behavior of the other series in relation to output.

1. GDP: a series with a very slight upward trend containing approximately two-and-a-half long swings.

2. Gross domestic investment: two-and-a-half long swings, of shorter duration and much wider amplitude than GDP.

3. Exports and imports:⁷ again, the long swing is easily identifiable in both series, although we note some important differences. First, both series develop a downward trend, but the trend of imports is somewhat steeper. Second, beginning sometime before World War I, the two series move in an inverse manner.

4. Prices: two long swings, although it is obvious that additional data for the 1930's and 1940's would result in a steep upswing after the trough in about 1929.⁸

5. Incremental capital-output ratio: a slight upward trend with two long swings fluctuating inversely to GDP.

Referring to the entries of table 2, in addition to the graphs, we can make a few more inferences.

6. According to the averages of the table, the long swing in GDP, imports, prices, and the capital-output ratio lasted between twenty and thirty years. The swings in exports and investment were shorter, averaging between thirteen and sixteen years.⁹

7. The amplitude of the swings, with the exception of GDP and the capital-output ratio, is very large, showing the long-run instability of important segments within the Japanese economy.

It is not easy to systematize the interrelationships between the various major components during the course of long swings. In our judgement, however, there are two rather distinct patterns, if output is used as a standard: one pattern prevailing before the end of the nineteenth century, and the other during the twentieth century. In the nineteenth century the data are very limited, especially before 1885, and therefore it cannot be stated definitely that an upswing of output took place before that time. Qualitative as opposed to quantitative

⁷ Our figures include invisibles; their inclusion or exclusion does not affect the series to a significant degree.

⁸ For purposes of convenience, the graphs, tables, and text refer to single years. When dealing with long swings, however, it should be remembered that each single year stands for a seven year average, and it should therefore be thought of as a rather broad range of time.

⁹ The export and investment swings appear on the average twice as long as the short cycle, and it might seem as if a fourteen year moving-average would eliminate these fluctuations. We did not find this to be the case: a fourteen year average for exports and investments does result in a smoother series, but the long swings remain.

Table 2 *Peaks, Troughs, and Duration of Long Swings*

Peak	Trough	Expansion	Contraction	Full Cycle	
				Peak to Peak	Trough to Trough
GDP					
1889	1901		12		
1912	1919	11	7	23	18
1931		12		19	
Average		11.5	9.5	21	18
INVESTMENT					
	1897				
1907	1913	10	6		16
1918	1926	5	8	11	13
1933		7		15	
Average		7.3	7	13	14.5
EXPORTS					
	1889				
1896	1903	7	7		14
1911	1920	8	9	15	17
1929		7		18	
Average		7.3	8	16.5	15.5
IMPORTS					
	1884	7			
1891	1910	11	21		26
1921	1930		9	30	20
Average		9	15	30	23
PRICES					
	1885				
1896	1909	11	13		24
1916	1926	7	10	20	25
Average		9	11.5	20	24.5
CAPITAL-OUTPUT RATIO					
	1893				
1903	1915	10	12		22
1925	1931	10	6	22	16
Average		10	9	22	19

Source: Graphs 5, 6, 7, 8.

evidence would suggest that there was an upswing.¹⁰ At any rate, before the turn of the century, no clear relationship is observable between output, prices, exports, and investment. A relatively close association does exist between output and imports. Furthermore, the rather sharp downswing of output starting around 1897 is reflected in the downward movements of prices, exports, and imports. Investment data, unfortunately are not available before 1893 (because we are using seven year averages), but the short series which does exist shows no close association between output and fixed investment during the nineteenth century.

When the second period begins, a fairly good positive correlation develops between output and exports. Imports now move inversely to exports, and therefore are in a negative association with output. The import movements are roughly parallel to the investment fluctuations, although their timing is quite different before approximately 1910. Price movements coincide quite well with output. Lastly, investment swings are not too clearly associated with the swings in output, because the investment swing is shorter. Thus, when GDP records a peak in 1912, investment reaches a trough. On the other hand, during the long upswing or downswing of output, investment is often in phase.

What are the economic implications of these observations? Once again we can offer only a few preliminary suggestions.

1. Why are the interrelationships so blurred during the nineteenth century? The data are naturally much less reliable for the earlier years, and this alone may be a sufficient explanation. We can, however, think of a more plausible reason. Before 1900, the Japanese economy was dominated by what we have called the traditional sector. Agriculture, using largely a pre-modern technology, and cottage industry were the most numerous and important elements of economic life. Increases in output of the traditional sector were less dependent on increases in capital, and also less sensitive to price movements.¹¹ This would be one reason for the looser association of the component series.

2. When we shift to the second period, the associations between the output swing and the other components seem to assume a definite pattern. Its essence is this: increases in foreign effective demand (exports) and domestic investment—these being the two major autonomous factors in the economy—fluctuated inversely. (A relationship which also pertained during the short cycle.) As a result, effective demand, on the whole, remained rather stable, and this must have been an important factor in maintaining the stability of the growth rate of output.

3. Also in the twentieth century, the relationship between investment and imports underlines certain aspects of the supply-production mechanism. An increase in investment meant that a whole range of goods had to be imported; a decreased rate of investment reduced the needs for imports. There is, on the other hand, no particular evidence to indicate that import swings are explainable by changes in the demand-consumption pattern of households.

4. Capital-stock series for Japan are still unobtainable in useful form, so that no details can be deduced about the movements of productive capacity. But it can be said that during the upswing of exports the utilization of productive capacity became relatively greater and

¹⁰ For example, see Yamaguchi Kazuo, *Nihon keizai-shi kōgi* (Lectures on Japanese Economic History), Tokyo, 1960, pp. 136 ff.

¹¹ See Ohkawa Kazushi and Henry Rosovsky, "The Role of Agriculture in Modern Japanese Economic Development", *Economic Development and Cultural Change*, Vol. IX, No. 1 (October 1960).

that this contributed to an acceleration of the growth rate of output. During the export downswing, increased investments led to enlarged capacity, to be used during the following export acceleration.¹²

All of the above stresses the central position of investment. Some further insights into the role of investment is possible by examining graph 7 and table 3.¹³ Both construction and durables show distinct long swings, although the long swing of durables is shorter. The overall movement of these series coincide quite well, except before the turn of the

Table 3 *Peaks, Troughs, and Duration of Long Swings for Investment Components*

Peak	Trough	Expansion	Contraction	Full Cycle	
				Peak to Peak	Trough to Trough
PRODUCERS' DURABLES					
1893	1900		7		
1904	1911	4	7	11	11
1918	1925	7	7	14	14
1933		8		15	
Average		6.3	7.0	13.3	12.5
CONSTRUCTION					
	1893				
1907	1914	14	7		21
1921	1933	7	12	14	19
Average		10.5	9.5	14	20
PRIVATE INVESTMENT					
	1893				
1907	1913	14	6		20
1918	1925	5	7	11	12
1933		8		15	
Average		9.0	6.5	13.0	16.0
GOVERNMENT INVESTMENT					
1893	1900		7		
1906	1913	6	7	13	13
1920	1928	7	8	14	15
1933		5		13	
Average		6.0	7.3	13.3	14.0

Source: Graph 7.

¹² To put these ideas into different words, when the domestic economy was in an inflationary situation with prices rising and increasing investments, the pressure for foreign markets was lessened, and the rate of export increases declined. During the downswing the reverse was true, and export growth accelerated.

¹³ The breakdown of investments by components is given in Rosovsky, *Capital Formation in Japan*, ch. vii, ff.

century and during the 1930's. In general, the pattern of gross domestic investment swings is dominated by construction during the first swing, but with the second swing—especially during and after the 1920's—the movements of durables determine the shape of total investment fluctuations. Durables fluctuate most widely, and are the leaders of most swings.

Public and private investment also move in close association, affecting the movements of total investment with nearly equal force. We know, of course, that the relative share of public and private investment remained very stable.

There remains a crucial question: we have stressed the autonomous nature of investment (and the complementary role of exports); but why does this lead to long swings of accelerated and decelerated growth rates of investment? The answer, at least in Japan, must consider both economics and politics. In the former instance, one can see the influences of a kind of Schumpeterian mechanism, namely the introduction of innovations or rapid changes in the industrial structure. Upturns in long swings are always associated with events of this kind. The first upswing coincides with the rapid expansion of agriculture and other traditional industries, and also with the initial introduction of a variety of Western industrial techniques. The second upswing is the period when modern industry—mainly textiles and other light industries—has its first independent surge of development. Modern industry does not yet become dominant at this point, but both in terms of output and employment its weight becomes significant. The third and final upswing illustrates well the political and economic factors, although political influences were always highly important. During this upswing, Japan experienced her first wave of heavy industrialization in connection with preparation for war. Heavy industrialization was “premature” at that time; the resulting enterprises operated rather inefficiently at high costs, but national aims took precedence over economic rationality.

Downswings of investment and output are more complicated. The one following World War I is no doubt related to the overexpansion of Japanese industry during the war and the international economic difficulties of the 1920's. This was a period of uncertainty and retrenchment. The downswing in the years preceding the Russo-Japanese War can also be attributed to a number of causes. At about that time, the growth rate of agriculture was beginning to decline, limiting somewhat the sources of investment funds available to both public and private sectors. Modern private industry was still too small to grow impressively on its own profits. Exports declined sharply, and there were larger than usual deficits in the balance of payments. Modern entrepreneurship was still in its infancy and technologically inexperienced. Gradually all these factors changed for the better: the government developed other sources of revenue and also engaged in some major industrial activities (e.g. the formation of the Yahata iron and steel complex in 1904), profits capable of re-investment slowly accumulated in private business, and technological expertise was acquired. Then, with the coming of World War I, foreign and domestic markets opened enormous opportunities for light industry to expand secularly.

We have as yet said only very little about the incremental capital-output ratio, and turn to this subject by way of conclusion. The ratio was derived from the annual series, smoothed by a seven year moving average, according to the following formulation: incremental capital-output ratio = proportion of investment to GDP/growth rate of output (all in real terms).¹⁴ As already indicated in the tables and graph 8, there were two long swings

¹⁴ See appendix table 2.

in the capital-output ratio: the first lasting from about 1894 to 1915, and the second from 1915 to 1931. The relationship between this ratio, the growth rate of output, and the investment proportion, can be conveniently summarized as follows:

Incremental Capital-Output Ratio	Growth Rate of Output	Investment Proportion
1. Upswing of first long swing	Down	Unchanged
2. Downswing of first long swing	Up	Up
3. Upswing of second long swing	Down	Up
4. Downswing of second long swing (beginning only)	Up	Up

This pattern suggests a number of tentative conclusions. To begin with, we may be able to say something about the long-term movements of investment efficiency. If we assume that the capital-output ratio represents an aggregate inverse indicator of investment efficiency in producing output, we can say that the output downswing implies decreasing returns in terms of the efficiency of investment, while the upswing implies increasing returns. This interpretation has considerable historical plausibility. The movements of the ratio tell us that decreasing returns reached a peak and investment efficiency a trough at about the time of the Russo-Japanese War. At that time, as we have seen, the traditional economy was beginning to lag, and the modern economy was still very small. The initial social overhead complex was just about completed, and its formation must have contributed considerably towards raising the capital-output ratio. The Russo-Japanese War itself, and especially the rapid and relatively independent development of modern industry led to a period of technological change in the following years. The investment proportion starts to rise, and investment experienced increasing returns. Somewhere in the second decade of the twentieth century, the capital-output ratio begins to climb gradually, until investment efficiency reaches a trough in the early 1920's. These were, of course, the wild years of World War I that brought not only business prosperity, but also overexpansion, and a cost structure that was high and way out of line internationally. Increasing returns appear again towards the middle 1920's, no doubt under the influence of rationalization which, in essence, meant an increase in capital intensity embodying technological innovations—another period of rapid change in the industrial structure.¹⁵

¹⁵ Two major reservations must be kept in mind. First, agricultural investment is excluded throughout, and this means that the capital-output ratio is understated especially for the earlier years. Our belief is that the long swings would not change if this omission were corrected. Second, military investment forms part of total investment; for certain purposes it would be desirable to exclude it.

Appendix Table 1 *Major Components (Annual Series) 1934—36 Prices*

(Unit: Million Yen)

Year	GDP	Gross Domestic Investment	Imports (including invisibles)	Export	General Deflator 1934—36=100
1878			131	75	
1879	2,318		146	71	27.4
1880	2,632		161	66	31.5
1881	2,435		138	75	34.7
1882	2,326		136	97	31.9
1883	2,190		137	103	27.4
1884	2,064		139	91	24.9
1885	2,487		144	97	26.1
1886	2,979		155	121	23.9
1887	2,860	178	210	125	24.2
1888	2,893	140	268	174	24.4
1889	2,792	174	262	171	26.0
1890	3,390	308	339	134	29.0
1891	3,223	422	276	206	27.3
1892	3,362	349	312	210	28.2
1893	3,455	426	343	191	28.6
1894	4,100	246	373	237	29.9
1895	3,969	188	417	261	32.6
1896	3,718	275	548	228	35.1
1897	3,853	444	644	317	40.9
1898	4,971	430	833	305	44.4
1899	4,626	319	648	386	40.9
1900	4,727	533	697	335	45.8
1901	5,018	374	646	476	44.9
1902	4,429	319	747	483	46.4
1903	5,023	363	901	521	48.8
1904	5,054	480	1,030	453	50.4
1905	4,616	463	1,516	458	52.1
1906	5,377	500	1,161	542	54.6
1907	5,703	484	1,212	589	59.3
1908	6,018	610	1,155	551	56.9
1909	5,977	704	1,158	623	55.7
1910	5,800	624	1,200	730	55.9
1911	6,624	907	1,217	701	59.6

Year	GDP	Gross Domestic Investment	Imports (including invisibles)	Exports	General Deflator 1934—36=100
1912	7,160	766	1,324	847	63.9
1913	7,096	1,133	1,456	949	65.4
1914	7,202	762	1,223	963	60.0
1915	7,333	616	1,269	1,203	58.2
1916	8,087	576	1,434	1,562	64.3
1917	8,342	579	1,335	1,783	81.9
1918	9,521	790	1,538	1,833	105.3
1919	11,312	1,480	1,878	1,508	131.6
1920	8,943	1,567	1,865	1,309	145.9
1921	9,056	1,373	2,192	1,227	134.0
1922	9,194	1,362	2,494	1,278	134.2
1923	10,167	1,114	2,493	1,074	128.2
1924	11,240	1,533	2,727	1,333	128.2
1925	12,147	1,567	2,555	1,585	124.5
1926	12,260	1,793	2,865	1,669	119.8
1927	12,353	1,973	3,088	1,875	118.3
1928	12,891	1,760	3,038	1,994	115.4
1929	13,149	1,924	3,196	2,214	112.7
1930	12,785	1,871	3,119	2,228	100.7
1931	12,927	1,728	3,737	2,371	91.3
1932	14,343	1,911	3,682	2,745	92.5
1933	15,823	2,117	3,589	2,954	97.1
1934	16,221	2,557	3,770	3,485	98.3
1935	17,578	2,928	4,072	3,982	99.6
1936	18,929	3,311	4,327	4,453	102.1
1937	20,001	3,860	4,557	5,417	113.3
1938	21,338	5,078	4,661	5,004	125.8

Sources: The series for GDP and the General Deflator are taken from Ohkawa Kazushi and Akasaka Keiko "Kobetsu suikei no sōgōka" (Survey of Individual National Income Components), Working Paper D 11 of the Rockefeller Project of the Institute of Economic Research, Hitotsubashi University, December 1961. Export and import series are listed in the same source, although we have chosen a slightly revised version of the figures to be published shortly by the Rockefeller Project. Investment series come from Henry Rosovsky, *Capital Formation in Japan, 1868—1940*, (New York: The Free Press, 1961). This book gives the series only in five-year moving totals and current yen; *Ibid.* Table V—1, pp. 109—111. We have used the annual data underlying these series, computed from the individual tables in chapters VII through XI, and these were deflated by the investment price index as given in Working Paper D 11.

Appendix Table 2 *Incremental Capital-Output Ratio (Seven Year Moving Averages)*

Year	Investment/GDP (%) (1)	Annual Growth Rate of GDP (%) (2)	Incremental Capital- Output Ratio (1)/(2)
1890	9.08	4.03	2.3
1891	8.90	4.16	2.1
1892	8.70	4.21	2.1
1893	8.77	4.53	1.9
1894	9.16	4.17	2.2
1895	8.60	3.70	2.3
1896	8.12	3.76	2.2
1897	8.13	4.02	2.0
1898	8.30	2.89	2.9
1899	8.60	2.55	3.4
1900	8.51	2.33	3.7
1901	8.34	2.31	3.6
1902	8.51	2.70	3.2
1903	8.85	2.41	3.7
1904	8.47	2.45	3.5
1905	8.89	3.52	2.5
1906	9.55	3.77	2.5
1907	10.03	3.85	2.6
1908	10.70	3.85	2.8
1909	10.76	3.88	2.8
1910	11.78	4.33	2.7
1911	12.01	4.55	2.6
1912	11.67	4.72	2.5
1913	10.92	4.59	2.4
1914	10.30	4.53	2.3
1915	9.54	4.56	2.1
1916	10.08	4.38	2.3
1917	10.49	4.26	2.5
1918	11.15	4.00	2.8
1919	11.99	3.12	3.8
1920	12.43	3.33	3.7
1921	13.28	3.61	3.7
1922	13.87	3.89	3.6
1923	14.12	3.88	3.6
1924	14.02	3.53	4.0
1925	13.83	3.34	4.1
1926	13.85	3.72	3.7
1927	14.30	3.64	3.9
1928	14.25	3.60	4.0
1929	14.28	3.70	3.9
1930	14.09	4.20	3.4
1931	14.13	4.97	2.8
1932	14.62		
1933	15.12		
1934	15.90		
1935	17.52		

Source: Computed from Appendix Table 1.