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# The Turning Point in the Japanese Economy

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This paper attempts to discover at what point in her long process of economic development Japan ceased to have available "unlimited supplies of labor". This point has been labeled in some economic development models - the "turning point". This is a controversial issue: W. A. Lewis, who originally set forth the concept and the theory of the turning point, suggested that Japan would reach the turning point sometime in the 1950's [9, p. 29]. J.C.H. Fei and G. Ranis, developing a more refined version of Lewis' theory, applied it to the Japanese economy and concluded that the turning point was already reached by the end of World War I [2, p. 263]. They were criticized by D.W. Jorgenson, however, who claimed that unlimited supplies of labor defined in the Lewis sense were not found in even the pre-World War I period [6, pp. 74-75]. On the other hand, among Japanese economists, K. Ohkawa in particular [20, p. 484], the view that the turning point occured since the end of World War II seems to be dominant. In support of such a view the recent unprecedented changes in labor market; the absolute decrease in the number of agricultural laborers, the decrease in the wage differentials between manufacture and agriculture and between the large and small scale factories in manufacture, and so forth, are usually cited. However, no systematic attempt to conclusively date the Japanese turning point has been made. This is the reason why this paper is proposed. In Section I of this paper, by theoretically examining the concept, I will stylize some features of the economic transition about the turning point. This is an indispensable procedure in finding the turning point in the real process of economic development. This stylization will be contrasted with available empirical evidence in Section II.

The last part of this paper (Section III) will be devoted to summarizing the discussions in Section II. Some critical comments will also be made on the statistical findings by Fei, Ranis and Jorgenson.

## I. CONCEPT AND FEATURES OF THE TURNING POINT

### (1) What is the turning point?

The turning point is defined as the point of time in the process of economic development,[1] which demarcates the boundaries of the stages of unlimited and limited supplies of labor. What do we mean by unlimited and limited supplies of labor?[2] To answer this we set forth a model which includes two sectors, the capitalist sector and the subsistence sector. In the former sector, capitalists, using the available capital stock and labor force, carry out the production process so as to maximize their invidivual profit rates. Equilibrium is attained, following the familiar marginal productivity theory, in that situation where the wage rate is equal to the marginal productivity of labor. On the other hand the subsistence sector is characterized with the classical wage theory; the wage rate here is institutionally determined at some subsistence level.[3] This in turn means that entrepreneurs in the capitalist sector can employ the labor force at the 'constant' wage rate. (The residual labor force is absorbed in the subsistence sector.)[4] Assuming

[1] The turning point is defined theoretically as a point of time. In reality, however, it should be regarded as period of some years.

[2] This was fully discussed by Ohkawa and the present writer [21].

[3] It should be noted that we don't need at all the assumption of zero marginal productivity of labor. The marginal productivity can be positive, zero and negative. The only assumption needed is that it be lower than the subsistence level. In this sense the concept of unlimited supplies of labor is quite different from the concept of disguised unemployment as established by R. Nurkse.

[4] Throughout this paper the writer will not refer to unemployment. It is not a serious problem in a labor surplus economy, where the unemployment occuring in the capitalist sector in a depression is almost absorbed in the subsistence sector.

for simplicity that the whole labor force is originally supplied from subsistence sector, the supply function of labor force facing capitalist sector is given by the subsistence level.[1] Mathematically the elasticity of the labor supply with respect to the wage rate is infinite. This is the precise expression of unlimited supplies of labor condition. It is important to note that this manner of wage determination will last only so long as the marginal productivity of labor in the subsistence sector is lower than the subsistence level.[2]

On the other hand, in the case where the marginal productivity is equal to or higher than the subsistence level, the former determines the wage rate in the subsistence sector. In this case and under the assumption that all labor is supplied from subsistence sector, the marginal productivity of labor function in this sector forms the supply function of labor to capitalist sector. Labor supply, in our sense of course, is no longer unlimited. It is limited in the sense that capitalists can no longer employ any desired number of workers at a 'constant' wage rate. In a word, the elasticity of labor supply is now between zero and infinity.

In the above we assume that subsistence level is 'constant' over time. This level is historically and institutionally determined by the cost of living. Therefore, in the case where the standard of living increases according to some

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[1] The subsistence level may be defined as the minimum price of labor supply, in the sense that laborers don't want to work it their wages are less than this level. Lewis' notion of the subsistence level is not identical with the concept used by the classical economists: Population increase is possible in the former case, and it is impossible in the latter case, if actual wages are equal to the subsistence level. In this sense, a Lewis-type theory of economic development is closer to Marxian theories than to classical economics. (Lewisian theory as well as Marxian theory deny the population principle. This principle is one of the most fundamental assumptions in the classical economics.)

[2] To make the model more realistic, a differential between subsistence sector and capitalist sector wages may be assumed. This wage differential serves as the incentive continually drawing labor from the subsistence sector to the capitalist sector.

changes in institutional frameworks, the subsistence level may rise.[1] As long as we assume, however, that the subsistence level increases 'exogenously'; say, independently from the increase in productivity in the subsistence sector, the above theory stands unaltered.[2] The labor supply curves for the stages of unlimited and limited supplies will still have infinite and less than infinite elasticities respectively.

Next, we ask how can the economy move from the stage of unlimited supplies to the stage of limited supplies. The necessary condition for this is an increase in the marginal productivity of labor in the subsistence sector. The latter may be realized in two ways: The first way involves upward shifts in the marginal productivity curve, caused by an increase in inputs other than labor and/or the shifts in the production function (this may be called technological progeess). The second is through a decrease in the number of laborers in this sector. (We assume a decreasing return to each factor.) The decrease may be due to demographic factors and/or to the increase in the outflow of labor to the other sector. The latter is dependent upon the increase in the demand for labor in the capitalist sector. In any event, as soon as the marginal productivity exceeds the subsistence level; i.e., the turning point is passed, the wage rate in the subsistence sector begins to rise steadily. The value of the elasticity of labor supply will now decrease.[3]

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[1]The increasing subsistence level was admitted even by classical economists: Ricardo, whose theory makes use of the Malthusian population principle, claimed that the natural price of labor was dependent on "the quantity of food, necessaries and conveniences essential to him from habit" [28, p. 93]. The quantity of necessaries and conveniences increases in the course of cultural development. (Concerning this, the writer is obliged to Professor Ryozaburo Minami.)

[2]This point was strongly stressed by Ohkawa and the present writer [21, Sections I and II].

[3]See 10, Section III.

(2) How to find the turning point.

The above is a most simple and sketchy formulation of the Lewis-type theory of economic development with the turning point. In applying this to the real world, we should stylize the process of economic development around the turning point from certain aspects.

a) Changes in Real Marginal Productivity of the Subsistence Sector

The turning point cannot be realized without a steady increase (exceeding the increase in the subsistence level) in the marginal labor productivity of the subsistence sector ($MP_s$). Therefore we find it reasonable to expect that the real marginal productivity in this sector will be comparatively stagnant in the stage before the turning point with a big spurt occurring about the time of the turning point. That the path of real marginal productivity will have this slope, however, is not a strict implication of the theory of the turning point.

b) Changes in Real Wage Rate of the Subsistence Sector

The real wage rate in the subsistence sector ($W_s$) is expected to be quite stable before the turning point, after which time it may be expected to show a big spurt. In this respect recall that the subsistence level is not constant. One of the difficulties of trying to identify the stage of unlimited supplies of labor as a historical period, as opposed to a theoretical entity, is now apparent. When there is an increasing tendency in the real wage rate, we cannot ascertain straightforwardly whether that increase comes from a change in the marginal productivity of labor or from an increase in the subsistence level itself. Rather than ignor the wage data entirely, we will assume in examining what evidence we have at our disposal that while small increases in real wages ($W_s$) over time may be the result of changes in the level of subsistence,

persistent large changes quite likely mean that the stage of unlimited supplies has already ended.

c) Relationship between Real Wage Rate and Real Marginal Productivity of the Subsistence Sector.

In the stage prior to the turning point, the real wage rate has no relation with the real marginal productivity of labor in the subsistence sector. Therefore, in estimating the linear equation below,

$$W_s = a + b\ MP_s,$$

coefficient 'b' is expected to be zero. On the other hand, in the following stage, where $W_s$ is equal to $MP_s$, the equation above will show a good fit. Constant 'a' should be zero; coefficient 'b' should be unity.[1]

These are the strict tests of the subsistence wage theory and the marginal productivity theory. However, these tests might be too rigid for our purposes. In the first place, $W_s$ and $MP_s$ increase, as stated above, even in the stage of unlimited supplies of labor. Hence, in our time series data we might expect some correlation between them. Secondly, in the stage of limited supplies of labor wage increase may lag somewhat behind productivity increase. Even if they are not equal to each other ($a \neq 0$ and $b \neq 1$), marginal principle cannot be rejected, when there is a good correlation between them. Thirdly, there are the data problems. One problem is the difficulty in estimating $MP_s$. $MP_s$ is a product of the real average productivity ($AP_s$) by the output elasticity of labor in the subsistence sector. The former is rather easily obtained. But it is difficult to estimate the output elasticity. In some cases, therefore, one cannot help but assume a constant output elasticity over time (the assumption of the Cobb-Douglas production function). One other difficulty involves the measurement of $W_s$ and $MP_s$ in comparable flow units. This problem arises because

[1] This test was applied to Egyptian agriculture by B. Hansen [7].

of the lack of reliable data on working days, working hours and so forth. Taking into consideration all these problems it seems that to use a criteria which purported to make a very fine discrimination would be misleading. Hence, if we should find below that the correlation coefficient between $W_s$ and $MP_s$ is much higher in a later period than in an earlier period we will call the former period a stage of limited supplies of labor and the latter period a stage of unlimited supplies of labor (assuming of course, our other evidence is consistent with this determination).

d) Elasticity of Labor Supply to the Capitalist Sector

Our formulation of Lewis' theory indicates that the elasticity of labor supply to the capitalist sector ($\eta$) is infinite before the turning point and becomes smaller thereafter. The elasticity is defined as below:

$$\eta \equiv \frac{\frac{dL_c}{L_c}}{\frac{dW_c}{W_c}} ,$$

where $L_c$ and $W_c$ denote respectively the size of the labor force and the real wage rate in capitalist sector. Here recall the assumption that whole labor force is supplied from the subsistence sector. In reality, however, there is some labor in the capitalist sector supplied from its own resources. Under this condition, $\eta$ does not show the elasticity of labor supply from subsistenc sector to capitalist one. The true elasticity ($\eta'$) should take the form of

$$\eta' \equiv \frac{\frac{dL_c'}{Lc'}}{\frac{dW_c'}{W_c'}}$$

$L_c'$ is the number of laborers, originally supplied from subsistence sector to capitalist one, and $dL_c'$ is the net outflow of labor force from subsistence

sector, call $dL_c'$, M. $L_c'$ is the sum of M for the period from the beginning of the capitalist sector to the present time. $W_c'$ is the real supply price of subsistence sector labor relevant for the capitalist sector. Here let us assume supply price ($W_c'$) is equivalent to (or changes proportionately to) wages in subsistence sector ($W_s$).[1] Now $\eta'$ may be rewritten as follows;

$$\eta' = \frac{\frac{M}{L_c'}}{\frac{dW_s}{W_s}}$$

The average elasticity may be obtained by estimating the following equation;[2]

$$L_c' = A W_s^{\eta'}$$

or

$$\log L_c' = \log A + \eta' \log W_s,$$

where A is a constant term. Examining the changes in such estimates of $\eta'$, might enable one to locate the turning point. Here again, however, there is a problem; as mentioned above, a part of the increase in $W_s$ is caused by the increasing subsistence level. Therefore the safest way again may be to look for a big decline in $\eta'$. A big decline might mean that the economy is passing the turning point.

e) Changes in Employment Structure

In the item a), a big spurt in the marginal productivity of labor in subsistence sector was taken as one of the features of the turning point. The big

[1] See footnote 2, page 3.

[2] Strictly speaking, the estimate of $\eta'$ in this equation is not necessarily the elasticity of labor supply. That is, the equation cannot be always identified as the supply function. Under the assumption that the supply function is more stable than the demand function, however, the estimate for $\eta'$ can be regarded as a proxy for the elasticity of labor supply.

spurt comes from the shifts in the schedule of labor productivity, and/or the declines in the number of laborers in this sector. The latter results partly from a decline in the natural increase of population (the increase in potential labor supply) and/or from an increase in the net outflow of labor force from the subsistence to the capitalist sector. This latter change is caused by an increase in demand for labor in the capitalist sector. In any event, if we find a definite decreasing trend in the long term series of labor force in the subsistence sector, we might be able to say that the economy is passing the turning point at that time.

## II. STATISTICAL TESTS ON THE TURNING POINT

In this section we will attempt to find the turning point in the Japanese economic development. In Japan, as generally admitted, the subsistence sector composes almost the entire agricultural sector as well as most small scale enterprises in non-agricultural industries. Unfortunately statistics on the latter are quite poor. For this reason, we will take agriculture (or primary industry) as our substitute for the subsistence sector. Our tests will be attempted in the order and manner described in the previous section.

### (1) Changes in real marginal productivity in agriculture

In Table 1 and Figure 1, the figures for real labor productivities in agriculture, both average and marginal, are shown. (The method by which these figures were estimated is summarized in the footnote to the table.) It will be noticed that the marginal productivity moves in parallel with the average productivity for the prewar years (owing to our assumption of the constant output elasticity of labor), and somewhat faster than the latter for the postwar period. We should remark on two things here.

Table 1

Average and Marginal Productivity in Agriculture;

1934-1936 Prices

(Unit : Yen)

| Year | Average Productivity[a] | Marginal Productivity[b] |
|---|---|---|
| 1874 | 73 | 18 |
| 1880 | 86 | 21 |
| 1885 | 103 | 25 |
| 1890 | 112 | 27 |
| 1895 | 119 | 29 |
| 1900 | 123 | 30 |
| 1905 | 118 | 28 |
| 1910 | 140 | 34 |
| 1915 | 168 | 40 |
| 1920 | 179 | 43 |
| 1925 | 181 | 43 |
| 1930 | 191 | 46 |
| 1935 | 181 | 43 |
| 1940 | 196 | 47 |
| 1950 | 152 | 58 |
| 1955 | 202 | 93 |
| 1960 | 236 | 127 |
| 1963 | 256 | 162 |

[a]The ratio of gross value added in agriculture[1] deflated by agricultural price index (1934-36 = 1) to the size of agricultural labor force.

[b]Average productivity multiplied by the output elasticity of labor in agriculture.

[1] Net value added might be better for our purpose. But we use gross value added figures, considering the deficiencies in the estimation of depreciations.

Sources: Gross Value Added and Agricultural Price Index: Yamada's estimates [33, pp. ]. Labor Force: The writer's estimates [12, p. 278]. Output Elasticity of Labor, Prewar Period: A constant figure (.240), the unpunlished estimate by K. Ohkawa, is assumed for the entire period.[1] This is the weighted average of output elasticities in rice production (.234) and in barley, wheat and rye (.299). Weights used are values of rice, and barley, wheat and rye production. The former elasticity is the average of the figures for 1937-1939, and the latter, for 1940-1941. Gross-sectional data was used by Okhawa to fit the Cobb-Douglas production function from which the elasticity estimates were taken.[2]

Output Elasticity of Labor, Postwar Period: The following is an estimate of the output elasticities of labor by Y. Yuize [36, pp. 17-22]. He obtained these by using cross-sectional data to estimate Cobb-Douglas functions.

| | A | B |
|---|---|---|
| 1952 | .4118[3] | .5618 |
| 1958 | .5110 | .6972 |
| 1960 | .5396 | .6977 |
| 1962 | .6018 | .6478 |

[1] The assumption of constant output elasticity is simply the result of our having only one cross section estimate of the production function of prewar agriculture. As there was little change in the organization of agricultural production for the prewar years [26, p. 67], our assumption may, in part, be justified.

[2] The other inputs in this estimation are land and capital. The output elasticities of land and capital are respectively .562 and .183 for rice production. (They are the averages of the estimates for 1937-1939.) For barley, wheat and rye, they are respectively .335 and .389 (the averages of the estimates for 1940-1941). Therefore the so-called scale factors, or the sums of the output elasticities for labor, land and capital, are .979 and 1.023 respectively for rice production and barley, wheat and rye production.

[3] The original estimates by Yuize for this year is .6906 [35, p. 17]. In comparing this estimate with the estimates for other years in column A and the estimates in B, it seems that this estimate is not reasonable. Therefore, as a substitute for this, the figure .4118, being estimated by linking it with the

(footnote continued on page 12)

Figures in column A are the estimates, when the size of labor force is used as labor input. Figures in Column B, the estimates when labor hours are used.[1] In this paper estimates A are adopted, because our concept of average productivity is defined in terms of the size of the labor force. For the years 1953-1957 and 1959-1961, output elasticities are estimated by the method of linear interpolation. For the years 1950-1951 and 1963, they are obtained by extrapolation.[2]

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figures in Column B; that is,

$$.5110 \times \frac{.5618}{.6972} = .4118,$$

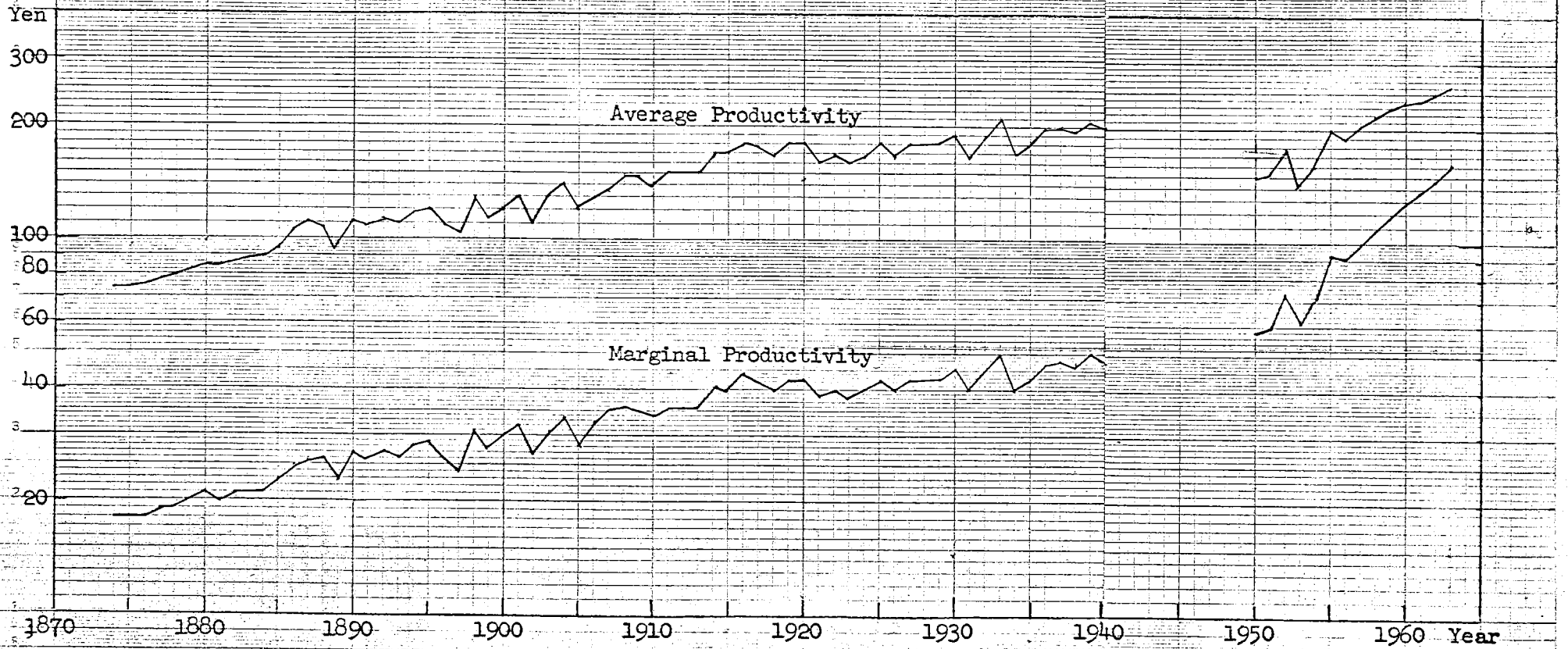
is used in this paper.

[1] The inputs are land and capital. The scale factors are the following:

| | A | B |
|---|---|---|
| 1952 | 1.0098 | 1.1498 |
| 1958 | 1.2626 | 1.2003 |
| 1960 | 1.0750 | 1.1973 |
| 1962 | 1.1697 | 1.2057. |

[2] The reader of this paper may be concerned about the increases in the output elasticity of labor between the prewar and the postwar periods as well as the continuous increases which have occurred in the postwar years. To my mind, these changes may be explained by the remarkable increase in capital intensity for the postwar years (see Table 2). We assume here that the elasticity of substitution should be less than one. (According to H. Kaneda's estimation of CES production function in the postwar agriculture, the elasticity of substitution is around 0.7-0.8 [8, Table 2].)

Figure 1 Average and Marginal Productivity in Agriculture; 1934-36 Prices



First, from our data it appears that after 1916 the growth rate of the marginal productivity of labor slowed down considerably. We calculate the annual compound rates of growth by fitting a function, $\log MP_s = a + b\ t$ to annual statistics. 1.9 percent and .75 percent are the rates respectively for the periods 1874-1916 and 1917-1940.

Table 2 gives the figures for capital-labor ratio and fertilizer input per capita in agriculture. The annual compound rates of growth of the former are .27 percent and .31 percent respectively for 1878-1882 and 1913-1917 and for 1913-1917 and 1938-1942. For the latter, they are calculated as .72 percent and .88 percent respectively for the two periods above. Growth rates in input ratios are rather higher in the years after 1913-1917. This means that the sharp kink in 1916 cannot be explained by changes in the input ratios. However, either of the following two factors might explain it. First, our series of agricultural output may be biased downward. This series was constructed relying mostly on the official statistics for agricultural output. According to J. Nakamura, these statistics are very much under-enumerated in the early years [17, Chapters 2-4]. If this is true, the contrast between the two periods is far less striking.[1] Second, and more important, food imports from Taiwan and Korea expanded in the 1920's. These food imports, which satisfied most of the increase in demand for agriculture products after 1920, were supposed to have had an unfavorable impact on Japanese

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[1] Nakamura has made new estimates of real agricultural output, depending on three alternative assumptions on paddy rice yields [17, Chapter 5]. According to estimates under the most moderate assumption, the annual compound rate of growth in output per capita is .59 percent for 1873-1877 and 1913-1917 [Output: 17, p. 114. Labor Force: See Table 1]. This is much lower than the growth rates in our series of average productivity for the two periods; 1874-1916 (1.9 percent) and 1917-1940 (.75 percent).

Table 2

Capital-Labor Ratio and Fertilizer Input Per Capita in Agriculture

(Unit : Yen)

| Year | Capital-Labor Ratio[a] | Fertilizer Input Per Capita[b] |
|---|---|---|
| 1878-1882 | 315 | 17.9 |
| 1883-1887 | 321 | 18.5 |
| 1888-1892 | 328 | 18.8 |
| 1893-1897 | 339 | 20.3 |
| 1898-1902 | 346 | 21.9 |
| 1903-1907 | 358 | 23.4 |
| 1908-1912 | 378 | 28.4 |
| 1913-1917 | 392 | 31.9 |
| 1918-1922 | 402 | 35.8 |
| 1923-1927 | 411 | 40.4 |
| 1928-1932 | 430 | 45.0 |
| 1933-1937 | 444 | 48.9 |
| 1938-1942 | 451 | 52.8 |
| 1948-1952 | 382 | 45.0 |
| 1953-1957 | 455 | 82.1 |
| 1958-1962 | 621 | 126.3 |

[a]Gross capital in 1934-1936 prices divided by the size of labor force.

[b]Fertilizer input in 1934-1936 prices divided by the size of labor force.

Sources: Gross Capital Stock: Umemura and Yamada's estimates [23, pp. 154-55]. Fertilizer Input: Hayami's estimates [33, p. 186]. Labor Force: See Table 1.

agriculture.[1] This factor has been stressed by K. Ohkawa and H. Rosovsky [25, Section VI] and B. Johnston [5, pp. 242-43].

Since the end of World War II we find another spurt in the rate of growth of the marginal productivity of agricultural labor. The annual compound rate of growth when calculated is 8.2 percent. This is about 4 and 11 times the growth rates respectively for the years before and after 1916. This spurt is the consequence, in part, of the unprecedented decrease in the number of agricultural laborers; as is stated later, this remarkable decrease began only in the 1950's. Another important factor has been the relative increase in non-labor inputs in agricultural production. Capital intensity and fertilizer input per capita as we see in Table 2 have shown remarkable increases in the postwar years; the annual compound rates of growth for them are respectively 2.1 percent and 4.5 percent for 1948-1952 and 1958-1962. Comparable prewar growth rates are 1/8 to 1/6 times as large. As far as the technological progress is concerned, the spurt may be found again in the postwar period. H. Ueno and S. Kinoshita's analysis shows that rates of technological progress in agriculture are .4 percent and 3.0 percent respectively for the pre- and postwar periods [31, p. 44].[2] The spurts in capital intensity, fertilizer input per capita, and technological progress for the postwar years may well explain the spurt in labor productivity. The spurt in the marginal productivity for the postwar years, especially after 1953, suggest that the turning point can be found in some span of postwar years.

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[1] The relation between retardation in agricultural productivity and food imports is, of course, not quite so simple: The former is a cause as well as a consequence of the latter.

[2] H. Kaneda calculated the rate of neutral technological progress in agricultural production for 1952-1960 by size of operation of farm households. The average is about 3 percent [8, Table 3]. This is very similar to the results of the Ueno and Kinoshita's estimation.

(2) Changes in real wage rate in agriculture

As a substitute for wages in subsistence sector, $W_s$, we use here wages for daily workers in agriculture. Takamatsu's estimates which we use are based on the Nōson Bukka Chingin Chōsa (Survey on Prices and Wages in Agriculture and Forestry) compiled by the Ministry of Agriculture and Forestry. This necessity creates some problems. What is the reliability of these statistics? For the postwar years there is a good relationship between the data we plan to use and data calculated from other official statistics.[1] No such supplementary data are available for the prewar period.[2] Hence, we must assume on the basis of our experience a modicum of reliability for our data and use them anyway. Another problem is the appropriateness of this data for the problem at hand. In Japan the majority of agricultural workers are unpaid family workers. Wage workers, with whom these data are concerned, are only a small proportion of this labor force. We feel we can use this data, however, as we are ready to make the

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[1]The following are the ratios of the wages per day for male daily agricultural workers to hourly wages for temporary agricultural workers, which are calculated from the Nōka Keizai Chōsa (Farm Household Economy Survey).

| | | | |
|---|---|---|---|
| 1952 | 20 | 1958 | 21 |
| 1953 | 19 | 1959 | 22 |
| 1954 | 21 | 1960 | 20 |
| 1955 | 21 | 1961 | 21 |
| 1956 | 20 | 1962 | 21 |
| 1957 | 22 | 1963 | |

Ratios are quite stable for the entire period. (The latter wage data was obtained by dividing annual wage payments by labor hours per year for temporary workers.)

[2]It is not impossible to estimate labor income in agriculture as a residual from total agricultural income and to check our wage data with it. As is stated in Section III, the estimation for labor income is confounded with many problems.

necessary assumption that the implicit wages which unpaid family workers receive are equal to or are invariably a constant proportion of the wages of daily workers. A further problem is that these data do not express the real price of labor supply, if the working days per year are not constant. (Maybe real price of labor supply should be measured in terms of annual wage earnings.) Unfortunately as we do not have figures on them covering the entire period. We must assume, again with great hesitation, that working days have been constant. In Table 4 the quinquennial figures for the wage rate for male workers deflated by two kinds of deflators, (consumer price index and agricultural price index), are shown. Figure 2 charts the annual figures for them. We use data for male workers only because 1) wage rates by sex are highly correlated with one another and 2) in the writer's opinion, the data is much better for male wages.

Let us examine first, the changes and the trend in the wage rate deflated by the consumer price index.[1] As far as the prewar years are concerned, the most striking change is a big wave for the years from 1917 to 1932. A spurt for 1917-1918 was caused by an increase in demand for labor, the result of the boom after World War I. The years from 1919 to 1932 on the other hand, were the longest period of depression of modern Japanese economic experience.

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[1] For a test of the subsistence wage theory, the consumer price index is a more appropriate deflator of the wage rate than the agricultural price index.

Table 3

Daily Wages in Agriculture;

1934-36 Prices

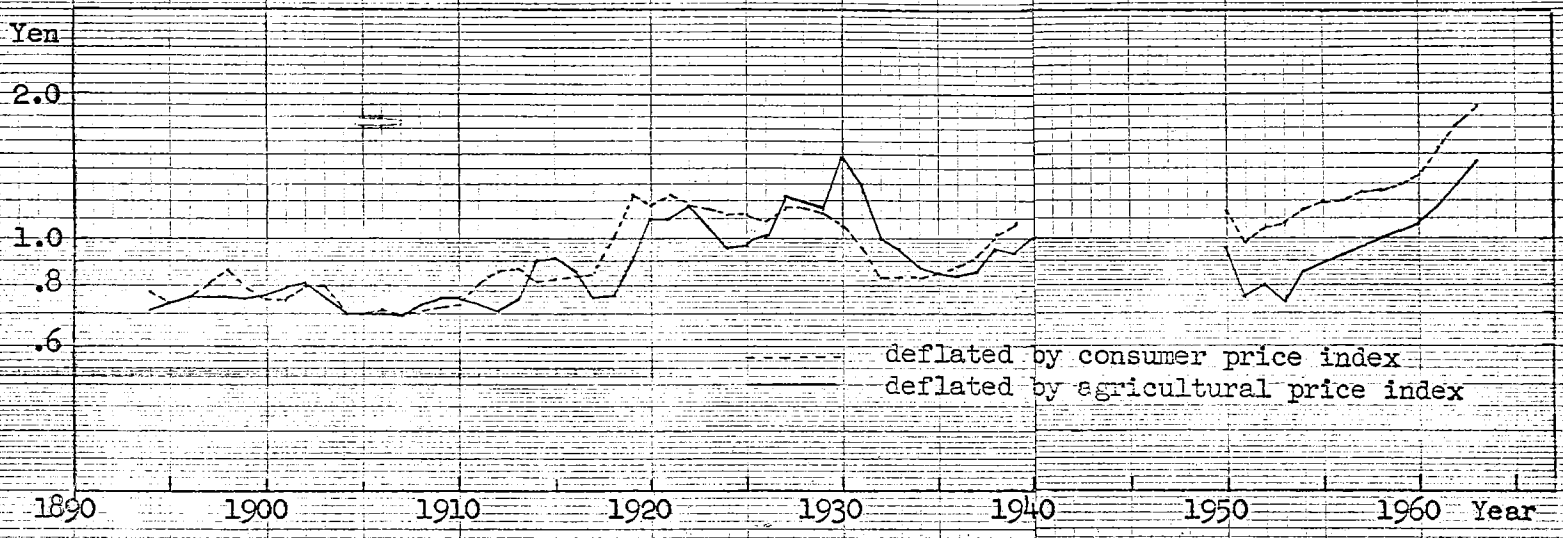
(Unit: Yen)

| Year | Daily Wages[a] Deflated by Consumer Price Index | Daily Wages[a] Deflated by Agricultural Price Index |
|---|---|---|
| 1895 | .74 | .74 |
| 1900 | .75 | .77 |
| 1905 | .69 | .70 |
| 1910 | .73 | .76 |
| 1915 | .83 | .91 |
| 1920 | 1.18 | 1.12 |
| 1925 | 1.11 | .97 |
| 1930 | 1.06 | 1.49 |
| 1935 | .86 | .85 |
| 1940 | . | 1.00 |
| 1950 | 1.13 | .97 |
| 1955 | 1.20 | .90 |
| 1960 | 1.34 | 1.07 |
| 1963 | 1.90 | 1.46 |

[a]For daily workers in agriculture. For male only.

Sources: Wage rate: Takamatsu's estimate [24, pp. ].
Consumer price index: Yamada's estimate [24, pp. ].
Agricultural price index: see Table 1.

Figure 2 Real Wage Rate in Agriculture; 1934-36 Prices




Source: Table 3.

Nonetheless, as a result of downward rigidity in nominal wages[1] combined with declining general prices the decrease in the real wage rate was not remarkable until 1930. Remarkable declines in real wages did occur in the years after 1930. (As a result of this big decline, the level of the real wage rate in 1932 is almost the same as the 1916 level.) If we exclude the depression years (1919-1932) as an exceptional period of Japanese economic development, we find a pretty constant trend in the real wage rate for the prewar years. By fitting a semi-log equation of the wage rate and time element, we obtain the average annual compound rates of growth of .52 percent. On the other hand, for the postwar years, the reader will see at a glance a steady and remarkable increase in the real wage rate especially after 1953. Calculating the annual compound rate of growth for the years from 1953 to 1963, it becomes 5.0 percent. (For 1951-1963, it is 4.2 percent.) This is about ten times the growth rate for the prewar period. More important, from the point of view of pre-postwar comparisons, the real wage rate for the postwar shows an increasing trend even in the depression years, 1961-1963. This is not the case for prewar years, where the real wage rate declined during depression years. The same observations may be made for the wage rate series which has been deflated by the agricultural price index. Again the increase is small for the prewar period and remarkable for the postwar period, especially after 1953.[2] Following our criteria outlined earlier, a big spurt in the

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[1] It seems to be very difficult to acknowledge the downward rigidity in nominal wages in the labor surplus economy. In the writer's opinion, however, the rigidity is not inconsistent with the hypothesis of unlimited supplies of labor.

[2] The annual compound rates of growth in the wage rate in agriculture deflated by agricultural price index are .54 percent and 5.7 percent respectively for 1894-1940 excluding 1919-1932, and for 1953-1963. (For 1951-1963 4.1 percent.)

real wage rate in agriculture since the end of World War II suggests that the turning point has been passed only in the postwar years.

In concluding this section, two problems remain to be answered. The first problem is the upward swing for 1917-1919. Does this mean the turning point was reached during these years? I doubt it. In the extraordinary two-three year boom after World War I, it is quite correct to say that labor supply became somewhat less than infinitely elastic. A situation approximating the phase of unlimited supplies returned with the subsequent depression period.

Recall here that the turning point is not a swing phenomenon, but a long term historical event in the process of economic development. Hence, we do not believe that we can consider the turning point as having been passed in the 1917-1919 period. On the other hand, we do believe that the recent sharp increase in wages does constitute evidences that the turning point was passed in the postwar period. The increase of the postwar years is undoubtedly a trend pheonomenon.[1]

---

[1] Here it may be of use to refer to the changes in wage differentials between agriculture and manufacture. For the prewar period, as was fully discussed by K. Taira [29, Section II], the ratio of manufacturing to agricultural wages increased and decreased respectively in the downward (1919-1932) and the upward swings (since 1933) of economic fluctuations. For the postwar however, it has continued to decrease even in the depression years since 1961, after a rather constant trend for 1951-1960. This is a new experience for Japan. (This point was called to the writer's attention by K. Ohkawa.) In connection with this, the changes in the wage differential among enterprises by scale are also suggestive. In the ratio of total cash wage earnings for the manufacturing factories with 5-29 workers to the wage bill of factories with 500 or more workers;

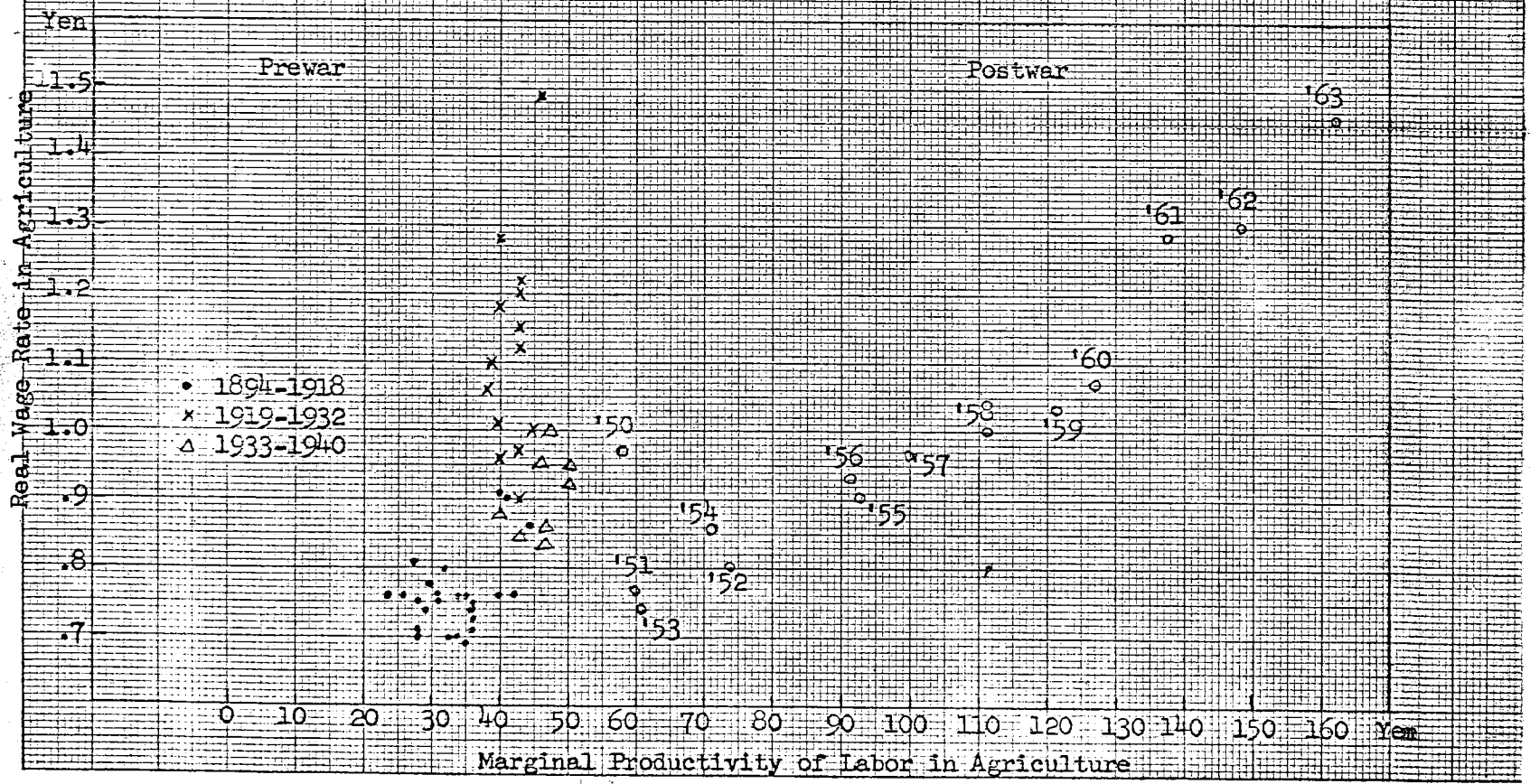
| | |
|---|---|
| 1958 | 43.6 |
| 1959 | 44.3 |
| 1960 | 46.3 |
| 1961 | 49.3 |
| 1962 | 57.0 |
| 1963 | 58.1, |

one can see a steady increasing trend for the entire period including depression years. (Data is from the Maigetsu Kinrō Tōkei, [Monthly Labor Statistics], [15, p. 328]). The continuous decrease in the wage differentials between two sectors as well as among enterprises by scale suggests that surplus labor in the subsistence sector has been disappearing. (Ohkawa expressed the same opinion [20, p. 484]).

(3) Relationship between Real Wage Rate and Real Marginal Productivity in Agriculture.

The big spurt in the real wage rate in agriculture since the end of the war corresponds to the increase in the marginal productivity of labor in this sector. This correspondence suggests the applicability of the marginal productivity theory to postwar Japanese agriculture. Let us examine the relationship in more detail. For this purpose the wage rate deflated by the agricultural price index is a better index than the wage rate deflated by the consumer price index. The relationship between the real wage rate and the marginal productivity of labor is plotted in Figure 3. For the prewar years no good relation exists. Regressing linearly the real wage rate on the marginal productivity, a coefficient of determination adjusted by degree of freedom, $\bar{r}^2$, is calculated as .32.

Figure 3 Relation between Real Wage Rate and Marginal Productivity in Agriculture




Sources: Tables 1 and 3.

Excluding depression years, 1919-1932, $\bar{r}^2$ becomes .53. Does this correlation mean that Japanese agriculture was already capitalized even for the prewar period? Let us examine the correlation for the postwar period. The estimate of $\bar{r}^2$ is .94 for the period 1951-1963.[1] This is extremely high compared with the estimate for the prewar years. This difference in the degree of correlation suggests, following the discussions in the previous section, that the turning point was passed in the postwar years.

---

[1]The year 1950 was omitted in this estimation, because the point for this year is far away from the regression line for the succeeding years.

Appendix to (3)

The subsistence level not being constant over time is one problem with a test such as the above which utilizes time series. If we use cross-sectional data we may free ourselves to some extent from this problem. Cross-sectional data is available from the Nōka Keizai Chōsa (Farm Household Economic Survey) for the postwar period: Following the method adopted by H. Kaneda [8, p. 165], the daily wages for temporary workers are obtained as the annual wage payments divided by the working hours per year multiplied by eight, the assumed figure for working hours per day. The average productivity of labor is calculated by dividing gross value added per year by total labor input per year in terms of adult-man-day equivalent in agricultural production. These statistics are calculated for ten agricultural regions[1] and for six scales of operation of farm household;[2] under .3, .3- .5, .5-1.0, 1.0-1.5, 1.5-2.0 and over 2.0 chō, for every other year since 1952. Therefore we have 10 x 6 = 60 (10 x 5 = 50, for 1952-1956) samples for each year. Dividing these samples into two groups; A, the farms of under 1.0 chō and B, the farms of over 1.0 chō, and regressing the wage rate for temporary workers, under the assumption that it is equivalent to that for permanent workers, on the average productivity of labor, we obtain the coefficients of deter-

[1]The Nōka Keizai Chōsa gives the statistics by eleven agricultural districts. Of them, the northern-most Hokkaido, characterized by the relatively large farms and substantially different agricultural enterprises in comparison with other districts [8, footnote 7], is excluded in our analysis.

[2]For the years 1952-1956, the data is tabulated by five scales of operation; under .5, .5-1.0, 1.0-1.5, 1.5-2.0 and over 2.0 chō.

[3]One chō is 2.45 acres.

mination adjusted by the degree of freedom as follows:[1]

| | A | B |
|---|---|---|
| 1952 | .179* | .251** |
| 1954 | .054 | .232** |
| 1956 | .164* | .421** |
| 1958 | .405** | .611** |
| 1960 | .310** | .689** |
| 1962 | .170* | .593** |

Note firstly, that all coefficients are statistically significant at the 5 percent level with the exception of the figure for A in 1954. Secondly, coefficients are larger for B than for A in every year. Thirdly, there is an increasing trend in the figures for B. Fourthly, the trend in B seems to be influenced by economic fluctuations; for the boom years of 1952 and 1960, the coefficients of determination are at peaks and for the depression years of 1954 and 1962 they reach troughs. Now, if we assume that the output elasticity of labor is constant among regions and over scale for each year, we may deduce from these findings the following conclusions: The wage rate in postwar agriculture has been determined according to the level of marginal productivity. The relationship is, however, much clearer in the large scale farms than in the small scale ones, and has been becoming tighter gradually. In other words, the modernization of agriculture has begun in the large scale farms and is steadily progressing. Modernization, on the other hand, has been delayed on small farms. Next, the correspondence of the wage rate to marginal productivity is much closer in the boom-time than in depression periods. This implies that labor supply tends to become less elastic when the demand for labor increases rapidly and vice versa.

[1] One and two asterisks mean that the coefficients of determination are significant at the 5 percent and 1 percent significance levels respectively.

(4) Elasticity of Labor Supply from Primary to Non-Primary Industries

In this section we substitute primary and non-primary industries respectively for subsistence and capitalist sectors. That is, M, in the definition equation of $\eta'$ established in the previous section, is now the annual net outflow of labor force from primary industry; $L_c'$ is the non-primary labor force originally supplied from primary industry, and $W_s$ is the wage rate in agriculture deflated by consumer price index. Figures for M are given in Table 5. With the aid of these figures estimates for $L_c'$ are obtained. In Figure 4 log $L_c'$ is regressed on log $W_s$. One may easily find that the slope of this regression, elasticity of labor supply from primary to non-primary sector, is not constant over the entire period covering the pre- and postwar years: The prewar years may be divided into some sub-periods. The first sub-period is from 1894 to 1903, in which no significant relationship is found. For the second period, 1904-1918, the elasticity is calculated as .65. For the third period, 1919-1932, the elasticity is negative. Declining prices and the downward rigidity of nominal wage rate accounts for this. The fourth sub-period, 1933-1939, shows a positive elasticity. Strictly speaking this period should be divided in two, 1933-1936 and 1937-1939. The elasticity for the former period is .80. For the latter it is much smaller than this. For the post-war year a kink in this regression occurs in 1960. Elasticities are 1.2 and .32 respectively for 1951-1960 and for 1961-1963.[1] Excluding the periods 1919-1932 and 1937-1939 as the exceptional ones, the former is a depression and the latter is a war time period, the elasticity for 1961-1963 contrasts with the estimates, from .65 to 1.2, before 1960.[2] This kink may reflect the structural changes in the economy or the modernization of agriculture both of which began in the post-war years and have been in progress up to the present day.

---

[1] See footnote 1, page 23.

[2] The estimates for $L_c'$ are not free from big biases, especially for the postwar period. The estimates of $L_c'(t)$ (or $L_c'(0)$ and $M(T)$) are not reliable enough. (See Figure 4 and p.22, ftnt.1 ). But even if we estimate it under the alternative assumptions, I am sure that the conclusion here will not be much changes.

Figure 4 Relation between the Number of Non-Primary Laborers Originally Supplied from Primary Industry and Real Wage Rate in Agriculture

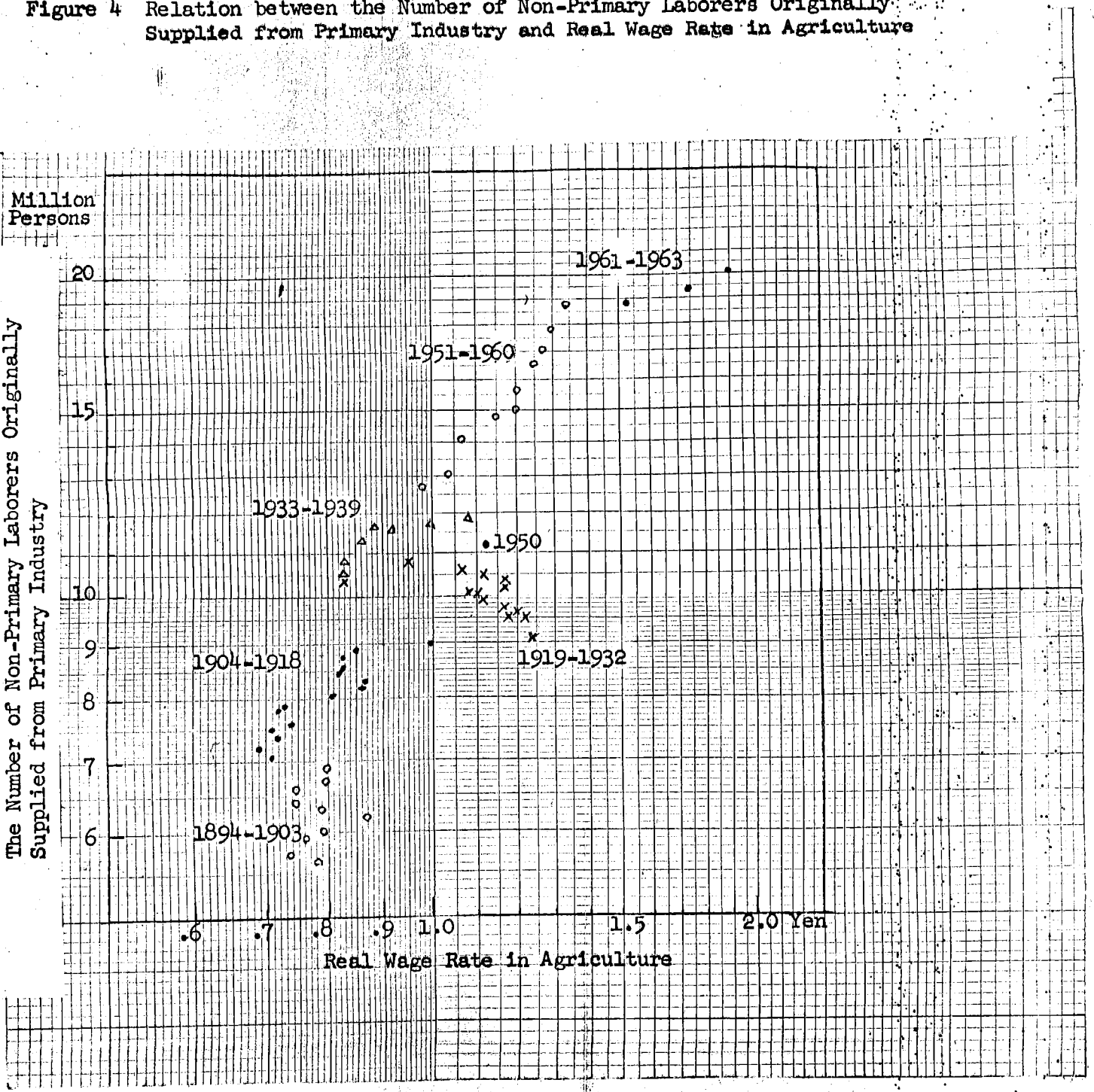


Figure 4
(continued)

Sources: Real Wage Rate in Agriculture: Table 5.

Non-primary Laborers Originally Supplied from Primary Industry: Obtained by substituting $L_c'(t)$ and M(t) for 1879-1940 and 1949-1964 into the equation below:

$$L_c'(t) = L_c'(0) + \sum_{t=1}^{t} M(t).$$

Annual net outflow of primary labor force, M(t), is taken from Table 6. Lc'(0) is the figure for 1878 and for 1948 respectively. The former is assumed to be equal to total non-primary labor force; i.e., we assume non-primary laborers in this point of time were all supplied from the primary sector. The latter figure is assumed as 69 percent of the non-primary labor force in this year. The ratio is that of non-primary laborers originally supplied from primary sector to total laborers in 1940. Considering the great changes in employment structure since the end of the war (1945), the estimation of $L_c'(0)$ for 1948 is the weakest point in our estimation of $L_c'(t)$.

(5) Changes in Employment

Again we use number of laborers in primary industry as a proxy for the subsistence sector labor force. The numbers shown in Table 4 indicate this labor force was strikingly stable for the prewar years. Annual compound rates of growth are -.04 percent and -.05 percent respectively for the periods 1880-1910 and 1910-1940. Its remarkable decrease began during the postwar years: The rates of growth are -.6 percent and -1.1 percent respectively for 1950-1955 and 1955-1960 if we rely on the Population Census figures. Making use of a different series available from the labor force survey on an annual basis since 1948, it seems the decline in the primary industry labor force first began in 1951.[1] The main reason is an increase in the shifts of labor force from primary to non-primary industries. According to the writer's estimates in Table 5, the net outflow of primary labor force in the postwar period is more than four times as large as in the prewar years; the net outflow volumes are on the average 150 and 670 thousands, respectively, for the pre- and postwar periods.[2] This difference in the net outflow between the pre- and postwar periods is largely explained by the difference in the degree of economic activity in the non-primary industries.[3] For

[1]The labor force in primary industry expanded by a large amount just after the end of the war because of a great outflowing of population back to rural areas. These workers began returning to the urban areas in large numbers, thus accounting for the initial decline beginning in around1911 in the subsistence sector labor force.

[2]Our estimates for net outflow of agricultural labor force seem to be biased upward for the postwar years. The net outflow of farm household population, estimated by the writer, shows a much smaller difference between the pre- and postwar periods; the net outflow volumes are 360 and 800 thousands, and the net outflow rates are 1.1 percent and 2.0 percent respectively for the pre- and postwar periods [14, p. ]. The reason for the over-estimation of net outflow of agricultural laborers for the postwar period comes from our assumption that the natural rate of increase of labor force is the same for all sectors. Perhaps for the postwar period, it should be much lower in agriculture than in other sectors.

[3]The relation between the population migration away from agriculture and the economic activity was fully analyzed by the writer [14].

TABLE 4

Labor Force in Primary Industry

(Unit: Thousands Persons)

| Year | Population Census and Estimates | Year | Labor Force Survey[a] |
|---|---|---|---|
| 1880 | 15,103 | 1948 | 16,950 |
| 1890 | 14,798 | 1950 | 18,055 |
| 1900 | 14,800 | 1952 | 16,890 |
| 1910 | 14,678 | 1954 | 16,190 |
| 1920 | 14,442 | 1956 | 16,150 |
| 1930 | 14,490 | 1958 | 15,200 |
| 1940 | 14,192 | 1960 | 13,910 |
| 1950 | 17,208 | 1962 | 13,690 |
| 1955 | 16,111 | 1964 | 12,510 |
| 1960 | 14,237 | | |

[a]For 1948-1956, fourteen or more years old. Since 1958, fifteen or more years old.

Sources: Population Census and Estimates, before 1920: Agriculture and forestry; the writer's estimates (see Table 1). Fishery; Hijikata's estimates [35, p. 152]. Hijikata estimated fishery laborers since 1872. But the estimates for 1920 is larger than the census figure for this year by 38 percent. Therefore, the writer has discounted all his pre-1920 estimates by 38 percent.

Population Census and Estimates, since 1920: Figures from Population Censuses [1, p. 53].

Labor Force Survey: [16, p. 23].

TABLE 5

Net Outflow of Primary Labor Force

| Period | Net Outflow[a] | |
|---|---|---|
| | Volume | Rate |
| | (thousands) | (percent) |
| 1881 - 1885 | 155 | 1.03 |
| 1886 - 1890 | 156 | 1.05 |
| 1891 - 1895 | 155 | 1.04 |
| 1896 - 1900 | 140 | .95 |
| 1901 - 1905 | 154 | 1.04 |
| 1906 - 1910 | 140 | .95 |
| 1911 - 1915 | 137 | .94 |
| 1916 - 1920 | 178 | 1.21 |
| 1921 - 1925 | 131 | .89 |
| 1926 - 1930 | 125 | .85 |
| 1931 - 1935 | 183 | 1.25 |
| 1936 - 1940 | 152 | 1.40 |
| 1951 - 1955 | 760 | 4.58 |
| 1956 - 1960 | 752 | 5.10 |
| 1961 - 1964 | 492 | 3.78 |

[a]Annual averages for quinquennial years.

Sources: Estimates by the writer. Net outflow of primary labor force, M, is the difference of the natural increase, N, from the actual increase, $\Delta L$, in primary industry.

$$M = N - \Delta L.$$

Now denoting the rate of natural increase in this sector as r; that is

$$r = \frac{N}{L},$$

we obtain the relation

$$M = r\,L - \Delta L,$$

$$= L\,(r - \frac{\Delta L}{L}).$$

Under the assumption that the rates of natural increase of labor force are equal among industries, r is equivalent to the rate of change of the total labor force. Substituting the figures for r, $\Delta L$ and L into the equation above, we can estimate the net outflow rate. Data used for the number of laborers is as follows: For the prewar period; the writer's estimates for primary labor force (see Table 4), and the Hijikata's estimates for non-primary industries [22a, p. 145]. For the postwar; the figures from the Labor Force Survey [16, p. 23].

example the annual compound rates of growth of real value added in this industry are about 2.1 percent and 4.6 percent respectively for the years 1910-1940 and 1950-1960.[1]

Business proprietors and family workers can be taken as an alternative proxy for the subsistence sector labor force. Series for these categories are presented in Table 6. Most business proprietors are, in fact, self-employed operators of farms or small scale enterprises and hence can be considered to belong to the subsistence sector. Family workers also are distributed mainly within the subsistence sector. According to the Population Census business proprietors increased and decreased respectively for 1920-1930 and 1930-1940. Through these periods, however, they were pretty constant. And for the post war they increased to some extent. Annual compound rates of growth are -.10 percent and .18 percent respectively for 1920-1940 and 1950-1960. With Labor Force Survey data we find a slightly increasing trend before 1957 and a decreasing trend thereafter. On the other hand, population Census data indicate the number of family workers increased somewhat for the prewar period, declining then for the postwar years. Rates of growth are .03 percent and -.66 percent respectively for 1920-1940 and 1950-1960. The Labor Force Survey series, however, does not show a decreasing until 1956.

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[1]For the postwar: National income by industry estimated by the Economic Planning Agency;1, pp. 44-45. Wholesale price index estimated by the Bank of Japan; 1, p. 77.

TABLE 6

Business Proprietors and Family Workers
(Unit: Thousands Persons)

| Year | Business Proprietors | Family Workers |
|---|---|---|
| | Population Census | |
| 1920 | 8,845 | 10,113 |
| 1930 | 9,584 | 10,247 |
| 1940 | 8,445 | 10,268 |
| 1950 | 9,297 | 12,248 |
| 1955 | 9,395 | 11,894 |
| 1960 | 9,688 | 10,509 |
| | Labor Force Survey[a] | |
| 1948 | 9,420 | 12,430 |
| 1950 | 10,110 | 12,970 |
| 1952 | 10,120 | 12,950 |
| 1954 | 10,140 | 13,540 |
| 1956 | 10,480 | 13,240 |
| 1958 | 10,310 | 12,410 |
| 1960 | 10,330 | 11,510 |
| 1962 | 9,810 | 10,940 |
| 1964 | 9,750 | 10,250 |

[a]See footnote of Table 4.

Sources: Population Census: Report on Population Census for each year.
Labor Force Survey: 16, pp. 22-23.

In any case it may be conclusively stated that the labor force in the subsistence sector began to decrease remarkably in the 1950's. This decrease, the result of a large increase in the demand for labor by the capitalist sector, is doubtlessly one of the major factors explaining the big spurt in the marginal productivity of the subsistence sector labor since the end of the war.[1]

---

[1] One may argue that the unprecedented decline in the birth rate since the end of the war might also have contributed to the decrease in surplus labor (e.g., 9, p. 29). The decline in the death rate since the war, however, has kept the rate of natural increase of population in the 1940s and 1950s as high as in the prewar period; the rate of natural increase is on the average 1.0 percent, 1.2 percent, 1.3 percent and .9 percent respectively for 1881-1910, 1911-1939, 1951-1955 and 1956-1960 [ 1, pp. 12-13]. As an index of labor supply to the whole economy, the production age population, the 15-29 year old population, is superior to total population. This group's annual rate of growth has been 1.1 percent, 1.5 percent, 2.1 percent and 1.9 percent respectively for 1880-1910, 1910-1940, 1950-1955, and 1955-1960 [22, p. 127 and 1, p. 16]. Note rate of largest increase are recorded for the postwar period! Clearly, structural changes in employment or the decline in surplus labor for the postwar years cannot be explained by the changes in total labor supply. The increasing demand for labor which has resulted from the unprecedented growth of the Japanese economy for these years is almost indubitably the proper explanation. In the near future, at which time the growth rate of production age population is expected to decrease, the demographic factor will first begin to have an important role in the modernization of the Japanese labor market.

## III CONCLUDING REMARKS

The statistical examinations in the previous section perhaps suggests that

1) Both the marginal productivity of labor and the real wage rate in the subsistence sector have shown big spurts since the end of World War II. Moreover the correlation between them is seen to be quite close for this period.

2) The big spurt in labor productivity since the end of the war seems to be the result of accelerated shifts in the production schedule and unprecedented declines in the number of laborers in the subsistence sector.

3) The decline in the labor force is on the whole due to accelerated shifts of labor out of the subsistence sector. This shift has been motivated by a big increase in the demand for labor in the capitalist sector.

4) The elasticity of labor supply from the subsistence sector to the capitalist sectors appears to rise sharply around 1960.

From these results the writer inclines towards the conclusion that the turning point, as rigorously defined in the first section, was passed sometime during the postwar years. We cannot offer, however, a definite date for the rurning point: One may observe it is around 1954, because the real wage rate and the marginal productivity in subsistence sector are thought to have begun to rise steadily in this year. Another may insist it is 1961, because the elasticity of labor supply kinks in 1960. Obviously neither date can be shown to be exclusively correct. In a sense this is quite natural, because the turning point, once put in historical perspective, is not a point of time; a certain day or a year, but rather should be defined as a span of some years.[1] All we can say therefore, is that the turning point did not occur in the prewar years.

How does our conclusion relate to other work on this question? Fei and

[1] See footnote 1, p.2.

Ranis assert that the turning point was reached around 1918. They support their conclusion, in part, with a real wage rate in manufacturing series worked out by Umemura. This series shows a sharp rise in real wages beginning in 1918 [2, pp. 263-64]. This sharp rise since 1918 is confirmed by the new estimates (by nine industry groups and by sexes) made by the writer [13]: The average wage for all manufacture and for both sexes deflated by consumer price index shows an upward trend from 1905 up 'til 1921. During this period, the upward trend accelerated as time passed on. The increase was conspicuous for a number of years after 1916. The real wage stopped rising rapidly in 1921. Slight increases were registered after that year. The postwar years however again show steady increases. In the writer's opinion, however, this data by itself is not sufficient to determine the date of the turning point. The data are averages of figures for male and female for many industries. Examine the three curves in Figure 5. These curves represent the ratios of average wage rates for both sexes and for all manufacturing industries calculated with variable weights to average wage calculated under three alternative weighting assumptions. For Curve (1), the male and female average wage rate figures are calculated with variable industry weights. These two series are then tied together using 1909 male-female weights. The resulting series is then used as the denominator in our ratio. For Curve (2), the series for the denominator is obtained by calculating a series of wages for each of the industry groups using variable sex weights and thence tying these nine series together using 1909 industry weights. The series for the denominator used for the third curve makes use of 1909 weights for both sex and industry groupings. Curves (1) and (2),

Figure 5 Ratios of Average Wages with Variable Weights to Those with Constant Weights in Manufacturing Industries

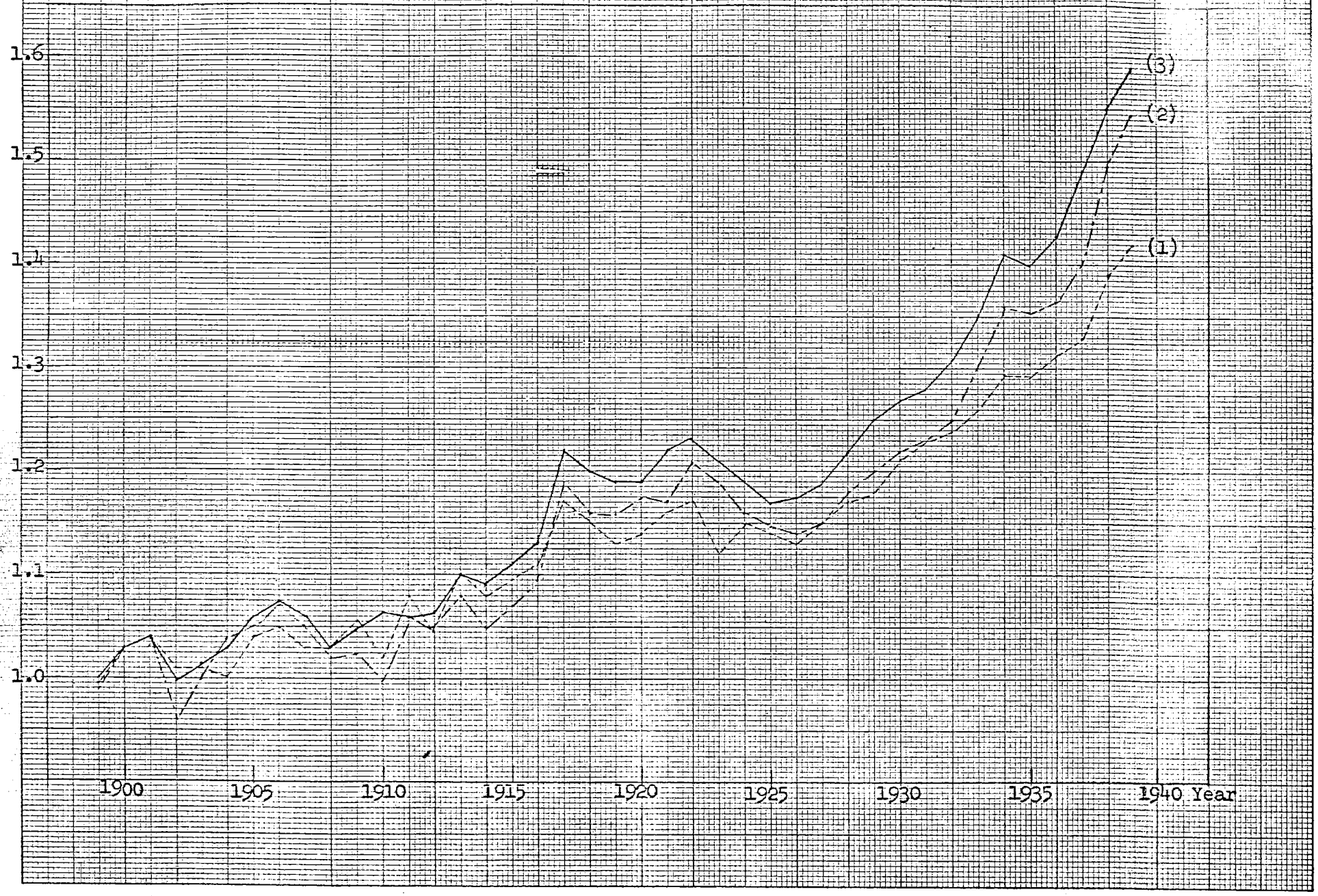

Figure 5

(continued)

[a]Denominators:

For (1), averages of male and female wages with the 1909's weight, for all manufacturing industries combined.

For (2), averages of wages of nine industry groups in manufacture with the 1909's weight, for both sexes combined.

For For (3), averages of wages of nine industry groups by sexes, with the 1909's weights.

[b]For the production workers in the factories with 30 or more production workers only.

Sources: Wages Rates: [13, Table VII].

Weights: The number of production workers in the factories with 30 or more workers taken from the Census of Manufacture in 1909.

therefore Curve (3), show upward trends during the decade of 1910s and the years since 1926. During these period average wages for both sexes and all industries remarkably increased. This means that the increase in average wages for both sexes and for all industries is partly the result of the structural changes of the labor force between sexes and among industry groups.

Here we should pay special attention to the changes in industrial structure. Categorically the manufacturing industry in Japan can be considered as composed of three groups:[1] The first group is small scale enterprise which may be classified as the subsistence sector. The second and the third groups belong to the capitalist sector by our definition. These two sub-sectors of the capitalist sector may be distinguished from one another, in part, by their respective relationships with the subsistence sector. The second group has a close relationship with this sector, in the sense that laborers move smoothly between them. As a result there is a tendency for wage rates to equalize between them. Capitalists in this sub-sector taking the institutionally determined wage rate as a given select the most profitable input ratios. On the other hand, the third group does not have this close relationship; labor does not move from subsistence sector to this sector, and the wage level is determined almost independently of the subsistence wage, which is so dominant in the other sectors. Technology, in this sector mainly borrowed from developed countries, is most modern and the level of productivity is very high. The first and the second enterprise group played an important role in the early stages of economic development in Japan. (The first group is not covered in our series

[1] This has been stressed by Ohkawa [20, p. 483].

of wages; the wages are for the factories with 30 or more workers.) The third group has grown since the end of World War I. Such changes in industrial structure may explain the upward trend in Curves (2) and (3), and at the same time show how dangerous it is to attempt to find the turning point by using the average wages for all manufacturing industries.[1]

Another proposition for Fei and Ranis' dating of the turning point is their finding that capital-labor ratio showed a decreasing trend before the end of World War I. Since then it has shown an increasing trend [2, pp. 129-131]. Some years ago E. P. Reubens made comprehensive comments on this aspect of Fei and Ranis' work [27].[2] (Also see the comments by T. Watanabe [34, footnote 6].) He gave alternative estimates for the capital stock which indicated that no capital shallowing occurred between 1888 and 1928 [27, p. 1056]. In replying to this comment, Fei and Ranis revised their original estimates of the capital stock. In this new series the turning point from capital shallowing to capital deepening appeared once again: This time, somewhat earlier, in the decade from 1893 to 1903, [3, p. 1064]. The method of estimation used by Fei and Ranis, however, is too simple; they obtained their capital stock data by

[1] Another problem in using the average wages for all manufacturing industries for this purpose comes from the more than proportional increase in skilled laborers: Their wages tend to increase faster than the subsistence wage. The concept of unlimited supplies of labor extends only to unskilled workers. The effect of changing composition of workers by age groups on the changes in average wages should also be considered. We do not have, however, sufficient data for wage rates by age groups covering long periods of the prewar. The data from the Rōdō Tōkei Jitchi Chōsa (Survey of Labor Statistics) is an exception. This data shows that the nominal wage rate did decrease for all age groups and for all industry groups for the depression periods, 1924-1927 and 1927-1930. During the former period, the average figure for all groups increased by 1.4 percent per year [18, pp. 296-297].

[2] Shallowing in capital intensity in the capitalist sector is not necessarily implication of the theory of unlimited supplies of labor. (In this respect Fei and Ranis and Reubens all agree [3, p. 1063, and 27, p. 1053]). For this reason we did not examine changes in capital intensity in non-agriculture when we attempted to find the turning point.

subtracting or adding as appropriate annual investment as, estimated by H. Rosovsky, from a benchmark capital stock figure obtained from the 1930 National Wealth Survey. Rosovsky's figures as a whole had first been deflated by them using Ohkawa's non-agricultural price index. On the other hand, the capital intensity in non-primary industry figures shown in Table 7 depends on new estimates of capital stock by S. Ishiwata. These are pretty comprehensive estimates covering many specific items of the capital stock. According to this series, no capital shallowing occurred in any period save the exception of 1883-1887 to 1888-1892. This data includes, however, tertiary industry, in which subsistence enterprises are dominant. We have no data for manufacturing industry alone.[1] As a substitute for this, however, horse-power per worker in this industry is calculated in the same table. This series shows an upward trend, not decreasing in any period. To my mind, therefore, capital intensity in capitalist sector as a whole has continued to increase throughout the process of economic development in Japan. Is this upward trend consistent with our hypothesis that the turning point has occurred only since the end of World War II? The answer is yes. Recall that the highly modernized manufacturing enterprises, used a technology borrowed from outside of the economy. Hence the Japanese capital-labor ratio was determined largely independently of its own relative factor prices. Moreover, the increase in the subsistence wage itself should have contributed to the increase in the capital-labor ratio.[2]

---

[1] S. Ishiwata also presented the provisional estimate for the capital stock of manufacturing industry, which was used by Watanabe [34, Table 1]. This estimate was obtained from his estimate for non-primary industries as a whole (used in Table 7). This procedure was, however, based on the very weak assumption. This is because in this paper we did not use the estimate for manufacturing industry.

[2] In addition to this, a continuously increasingly tight labor market for skilled workers may be in part responsible for the rising capital-labor ratio (see footnote 1, P. 28.)

Table 7

Capital-Labor Ratio in Non-Primary and Horse-Power per Worker in Manufacturing Industries

| | Capital Labor Ratio[a] (Non-Primary) | Horse-Power per Worker[b] (Manufacturing) |
|---|---|---|
| | Yen | $10^{-3}$ Horse Power |
| 1878-1882 | 575 | |
| 1883-1887 | 590 | |
| 1888-1892 | 572 | 10 |
| 1893-1897 | 634 | 20 |
| 1898-1902 | 720 | 20 |
| 1903-1907 | 786 | 36 |
| 1908-1912 | 949 | 77 |
| 1913-1917 | 1,148 | 136 |
| 1918-1922 | 1,462 | 284 |
| 1923-1927 | 1,681 | 459 |
| 1928-1932 | 1,937 | 588 |
| 1933-1937 | 2,124 | 801 |

[a]Gross capital stock in 1934-1936 prices divided by the size of labor force. Residential construction is excluded in capital stock.

[b]Horse-power of prime movers divided by the size of labor force.

Sources: Gross Capital Stock: 23, pp. 160 and 162.
Horse-power: 11, p. 223.
Labor Force for Non-Primary and Manufacturing Industries: 22a, p. 145.

Now we turn to the examination of Jorgenson's statistical findings. Jorgenson criticized the Fei and Ranis' hypothesis while asserting that the Japanese economy was in the limited supplies of labor stage even in the prewar years.[1] The most important support for this assertion is his finding that real labor income per capita in agriculture tended to increase from 1878-82 until 1913-17 [6, p. 65].[2] He estimated labor income by deducting rents for tenants from total agricultural income. Prior to Jorgenson's work, M. Umemura attempted the same estimation in a more precise way and for a longer period. According to his series of five-years moving average from 1885-1936, real labor income per capita increased from the beginning of his series until 1902. The upward trend begins once more in 1923 after tending towards constancy for the first two decades of this century [32, p. 85]. These kinds of estimations do have some problems associated with it. One is data: If it is true that there are some under-estimations in agricultural output in the early years, then real labor income per capita is somewhat under-estimated. Perhaps the increase before 1913-17 in Jorgenson's estimates and those before 1902 in Umemura's estimates may be explained partly by this reason. Another more basic problem is the estimation procedure: Agricultural income is composed of five components; rents, wages for wage earners, implicit wages for unpaid family workers, profits and interests. Under the assumptions,

$$\text{rents} = \text{rents for tenancy},$$

and

$$\text{profits} + \text{interest} = 0,$$

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[1] In support of this one might suggest the well-known violent competition for workers in cotton spinning industry in the late Meiji and early Taisho periods. This competition was, however, for trained workers and resulted from temporary regional disequilibria caused by lack of information [30, p. 74]. A.R. Tussing, who comprehensively studied the labor force and wages for this industry in Yamanashi Prefecture for these periods, concluded that the supply of labor to non-agriculture was elastic [30, p. 79].

(Footnote 2 is on page 41)

we can estimate labor income; that is, total of wages for wage earners and implicit wages, by deducting rents for tenancy from agricultural income. Dividing labor income by the number of laborers, labor income per capita is obtained. As Umemura stated in his correspondence to the writer, this method of estimation has some defects. Firstly implicit wages might lag behind the market wage rate. Secondly, rents for tenancy should be equal to the total of rents and interest. Thirdly, the profits might not necessarily be zero; depending on economic situations, they could be positive or negative. I am sure that the labor income per capita is a better index than the agricultural wage rate, which was used in our analysis, in the sense that it covers all agricultural workers including unpaid family workers. Considering that we have no reliable data for profits, interests and so forth, however, the latter approach seems to be superior.

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(Footnote 2 from the previous page)

[2]The real disposable income per worker in agriculture estimated by A.H. Gleason shows a steady increase since 1883-1887 up to 1933-1937. He obtained the disposable income figures by subtracting direct taxes on agriculture and gross agricultural investment from net income produced in agriculture [4, p. 414]. Note, however, in the first place that his figures are not a direct index for labor income as they contain incomes from rents and interests. Moreover, once again the agricultural outputs statistics on which Gleason bases his estimates may be downward biased.

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