# THE NATIONAL INCOME AND INDUSTRIAL STRUCTURE IN JAPAN

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## I. *Problem of "National Income Produced"*

1. The purpose of this paper is to investigate both statistically and analytically the "national income produced," mainly on the basis of statistical data available here. At the outset I would like to call the reader's attention to the specific meaning attached to the term "national income produced."

The essential feature in national income is, as shown by recent studies, not merely to know its aggregate total, but rather its constitution or circulation. National income involves three aspects, viz. production, distribution and expenditure. The production aspect is known as national income "produced"; it consists of net products in various branches of economic activity, after deducting all expenses for producers goods consumed from the gross value of the products. Distribution consists of personal revenue, such as wages, salaries, rent, interest, profit, etc. Lastly, the expenditure embodies various disbursements such as consumption, savings and taxes. These three aspects, with their own distinct meaning, are mutually interrelated with each other, and the problem of the circulation of national income arises from this mutual interrelationship of the three.

If our object were to be the estimation of national income as a total sum, it might be measured from any one of these three aspects whichever is confirmable without much difficulty. But if we wish to go deeper and grasp the constitution or circulation of national income, all these aspects must be ascertained separately and their interrelationship clarified.

In the opinion of the writer, however, there seems to exist some misunderstanding of this obvious principle, especially as the national income "produced" is often understood to be personal revenue classified only into various industrial branches, which implies a mere disguised definition of national income "distributed," not clearly distinguished from the proper meaning of national income "produced." The latter should indicate how the net product is derived from the gross product in the process of production. In Government *White Papers* in Great Britain and from the figures of the United States Deparment of Commerce, we find terms such as

"products" or "net products," which it seems to me are inadequate. What we have to know from the production aspect of national income is the structure of industry in national economy, and it is impossible to study the problem only by way of classifying personal revenue into various industrial branches.

2. As is well-known, discussions have taken place as to which method of estimation of national income is more superior, either the "material" method or the "personal" method. The material method is based on products statistics and the personal method on income statistics; in other words, the former is a method of confirming the aspect of production and the latter that of distribution. Many writers have concluded that an estimation might be attained equally well by one method or the other, whichever is preferred, considering only the relative difficulty of the work. Thus it has been concluded that each method has the defects of its qualities, so that the estimation might be satisfactorily accomplished by combining both methods, that is one method should be complementary to the other, as far as the former faces the difficulties. Those who support such a view might concentrate attention only on the total sum of national income, disregarding its constitution. If the total national income is the only subject of consideration, either method would do. But if the constitution or circulation of national income is the object, we should not consider each method as an alternative, for we must recognize the entirely distinct significance of production and distribution. These aspects of national income will be confirmed seperately.

The writer proposes to indicate how the national income "produced" should be ascertained, particularly on the basis of statistical data available. It must be admitted that statistics on national income in Japan are not too reliable, and every effort must be exerted in the future to promote the degree of reliability, which it is not my object to discuss here.[1] What I have in mind is, by the use of some statistical examples, to propound a method for ascertaining the national income "produced" in the proper meaning of the expression.

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[1] Colin Clark, in his work *The Conditions of Economic Progress* (London, 1940), quoting Dr. Hijikata's figures of 1925–1931, says that the estimates are in class II as to reliability, viz. within a statistical error of 10%. Reliable estimates of national income in Japan positively began with Dr. Hijikata's work *Constitution of the National Income* (Tokyo, 1933). Another reliable estimate of national income for the year 1930 was that by the Cabinet Statistics Bureau in the *Report of the Survey of National Income, 1930* published in 1934, to which Colin Clark does not refer. The estimate for the year 1935 was made by the same Bureau, whose statistical material was destroyed by fire during the war, after which the war-time and post-war estimates were undertaken by the Ministry of Finance and the Economic Stabilization Board. However, the reliability of these estimates is not so high owing to the great fluctuation in values and for other reasons. It seems to me that many points could be improved in the existing estimates of national income in Japan for the past 30 years, which I hope to discuss on another occasion.

## II. *"Gross" Products and "Net" Products in Various Industries*

1. In the aspect of production in the national income, the issue is the distinction between "gross" products and "net" products. These terms require special explanation, I think, and the prevailing definitions differ from those I am about to assume. In the statistics of the United States Department of Commerce, the "national income" involves compensation to the employee, corporate profit, net interest and rental income; the amount of "net products" is calculated by adding the indirect business tax to the national income and deducting subsidies from it; the amount of "gross products" is obtained by adding maintenance and depreciation to net products. I have no objection to such definitions, but the procedure is based on the premise of taking the national income merely as personal revenue unrelated to products statistics.

In my opinion, "gross" products mean all sales of goods and services, and "net" products must be calculated by deducting the expenses of producers goods consumed (not only maintenance and depreciation) from gross products. Marshall's definition of national income in his *Principles of Economics* should be adopted here. Thus we obtain the following formula:

*Gross Products — Producers Goods Consumed = Net Products*

The above distinction between gross products and net products contains an important clue for the comprehension of the industrial structure, which I think is the central problem of national income "produced." In order to estimate net products, it is necessary to know beforehand the gross value of the products and the expenses of producers' goods consumed or "user cost" in the Keynesian term. Permit me to give some statistical illustrations in Japan.

2. Example of the year 1930

The ratio between gross products and net products is given comparatively in full detail in the *Report of the Survey of National Income, 1930* published by the Government Bureau of Statistics in 1934, particulars of which are shown in the following Table 1.

The calculations in this table were based upon replies to a questionnaire submitted to about 10,000 farm households. By deducting all expenses for seeds, fertilizer, feed, farm instruments, etc. from the sales of products, we get the amount of net products and thus obtain the average rate of gross products to net products, which is applied to the whole of agriculture. Concerning domestic or small scale industry (with employees less than 5), about 2,500 housholds were investigated, and in factory industries (with employees more than 5), about 700 factories were the object of investiga-

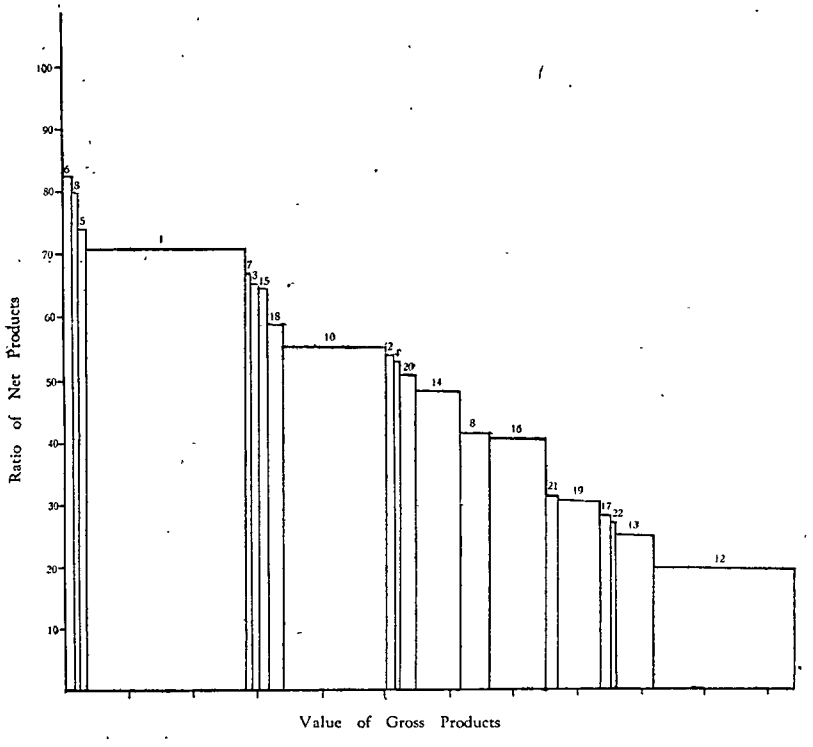
Table 1. Gross Products and Net Products in Various Industries in the Year 1930 (*in million yen*)

| Classification of Industries | | Gross Products | Net Products | Ratio of Net Products to Gross Products |
|---|---|---|---|---|
| I Agriculture & Forestry | (1) Agriculture : Housholds | 2527.7 | 1788.4 | 71% |
| | (2) Public-owned Agricultural Farms | 178.1 | 94.7 | 53% |
| II Aquatic | (3) Fishing | 275.5 | 179.8 | 65% |
| | (4) Hatcheries | 18.5 | 9.6 | 52% |
| III Mining | (5) Metals | 64.3 | 51.7 | 74% |
| | (6) Coal | 193.6 | 159.8 | 82% |
| | (7) Petroleum | 15.2 | 10.2 | 66% |
| | (8) Quarrying | 30.0 | 24.4 | 80% |
| | (9) Others | 4.1 | 3.2 | 78% |
| IV Manufacturing | (10) Domestic Industry | 1630.5 | 903.0 | 55% |
| | (11) Government Factories | 409.8 | 167.2 | 41% |
| | (12) Textile Industry | 2173.5 | 407.4 | 19% |
| | (13) Metallurgical | 550.5 | 137.6 | 24% |
| | (14) Machinery | 694.7 | 330.2 | 48% |
| | (15) Pottery Ceramics | 162.4 | 103.3 | 64% |
| | (16) Chemical Industry | 901.8 | 357.0 | 40% |
| | (17) Wood Working | 162.6 | 44.2 | 27% |
| | (18) Printing and Book-binding | 192.1 | 112.3 | 58% |
| | (19) Food & Drink | 728.9 | 215.5 | 30% |
| | (20) Electricity & Gas | 262.6 | 130.9 | 50% |
| | (21) Others | 193.8 | 60.1 | 31% |
| | (22) Salt-making | 27.5 | 7.2 | 26% |

tion. In these, the expenses for raw material, light and heat, motive power, machines, instruments, etc. are items of expenses which are to be deducted from the gross products in order to compute net products.

From Table 1, we know that the ratio of net products to gross products differs in various industries, which fact I intend to show by an area diagram. In Chart 1, abscissa means the amount of gross products of various industries and ordinate the ratio of net products to gross products, which

Chart 1. (The numbers show the classification of industries in the above table.)




is shown by percentage. The order of various industries is arranged according to the ratio value. It will be clear in this chart that area means the amount of net products, therefore, it can be claimed that this chart shows all at once gross products, net products and the ratio of the latter to the former, from which we can present the industrial structure of national economy from one standpoint.

So far I have dealt with "material" industries in four categories, not with "non-material" or "service" industries, such as commerce, transport and others. Theoretically speaking, the distinction between gross products and net products is also applicable to "service" industries as well as "material." In the estimates of the Government Bureau of Statistics, however, net products of service industries have been obtained chiefly by the personal

method.[2]

3. Gross Products and Net Products in Various Industries for the Period of 1920–1940

In the same manner as mentioned above, I should like to denote the gross products and net products of four industries from 1920 to 1940. The figures were computed by myself from existing statistical data. Leaving out details of the calculation, I propose to show here the figures for 1920, 1925, 1930, 1935 and 1940. The classification of industries is different from the above, manufacturing industries being classified into three categories; heavy industry (including metal, machines, chemical and pottery), light industry (textile, wood working, foods and beverages, printing, book-binding, etc.), and domestic or small scale industry.

Table 2. Gross Products and Net Products in Various Industries for the Period of 1920—1940*

*(in million yen at current prices)*

| | I Agriculture | | II Aquatic | | III Mining | | IV Manufacturing | |
|---|---|---|---|---|---|---|---|---|
| | Gross | Net | Gross | Net | Gross | Net | Gross | Net |
| 1920 | 4660 | 3215 | 546 | 273 | 567 | 459 | 7426 | 2656 |
| 1925 | 4820 | 3278 | 632 | 310 | 355 | 292 | 8823 | 3113 |
| 1930 | 2635 | 1739 | 489 | 245 | 308 | 249 | 7678 | 2859 |
| 1935 | 3355 | 2214 | 552 | 270 | 504 | 408 | 13267 | 4814 |
| 1940 | 7278 | 4731 | 1298 | 633 | 1198 | 970 | 29443 | 10375 |

[2] According to the survey by the Government Bureau of Statistics, the national income (or net products) is as follows:

| | | |
|---|---|---|
| Agriculture | 1,883 | *million yen* |
| Aquatic Industry | 190 | |
| Mining | 250 | |
| Manufacturing | 3,483 | |
| *Sub-total* | 5,806 | |
| Commerce | 2,706 | |
| Transport | 841 | |
| Public Services, Professional & Domestic Services | 1,347 | |
| *Sub-total* | 4,894 | |
| Balance of International Payments | —64 | |
| *Grand-total* | 10,636 | |

According to this table, the total "net" products of material industries amount to 5,806 million yen and that of service industries to 4,894 million yen. The Table 1 previously given shows the figures of "gross" products of material industries. For the service industries, such figures are not shown, but if we make use of some statistical data, it is not impossible to draw a distinction between gross receipts and net income in service industries.

| | IV (1) Heavy Industry | | IV (2) Light Industry | | IV (3) Domestic Industry | | Total Sum | |
|---|---|---|---|---|---|---|---|---|
| | Gross | Net | Gross | Net | Gross | Net | Gross | Net |
| 1920 | 2167 | 867 | 3810 | 991 | 1450 | 798 | 13200 | 6603 |
| 1925 | 1878 | 751 | 5045 | 1317 | 1900 | 1045 | 14630 | 6992 |
| 1930 | 2260 | 904 | 3677 | 992 | 1750 | 963 | 11119 | 5092 |
| 1935 | 5442 | 2068 | 5375 | 1398 | 2450 | 1348 | 17678 | 7706 |
| 1940 | 17758 | 6748 | 9335 | 2334 | 2350 | 1293 | 39216 | 16709 |

* In calculating the gross products, the data was obtained from statistical reports of the Ministry of Agriculture and Forestry, and the Ministry of Commerce and Industry. No data is available for domestic industry, so a good deal of guess work was resorted to, details of which I will omit. All figures given are provisional, as some alterations will be necessary.

Table 3. Gross Products and Net Products in Various Industries for the Period 1920—1940

*(in million yen at 1930 prices)*

| | I Agriculture | | | II Aquatic | | | III Mining | | | IV Manufacturing | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gross | Net | Ratio | Gross | Net | Ratio | Gross | Net | Ratio | Gross | Net | Ratio |
| 1920 | 2453 | 1692 | 69% | 287 | 144 | 50% | 298 | 242 | 81% | 3909 | 1398 | 36% |
| 1925 | 3213 | 2186 | 68 | 421 | 207 | 49 | 237 | 194 | 82 | 5867 | 2075 | 35 |
| 1930 | 2635 | 1739 | 66 | 489 | 245 | 50 | 308 | 249 | 81 | 7689 | 2859 | 37 |
| 1935 | 3290 | 2269 | 66 | 542 | 265 | 49 | 494 | 400 | 81 | 13000 | 4720 | 36 |
| 1940 | 4281 | 2783 | 65 | 764 | 372 | 48 | 705 | 571 | 81 | 17320 | 6103 | 35 |

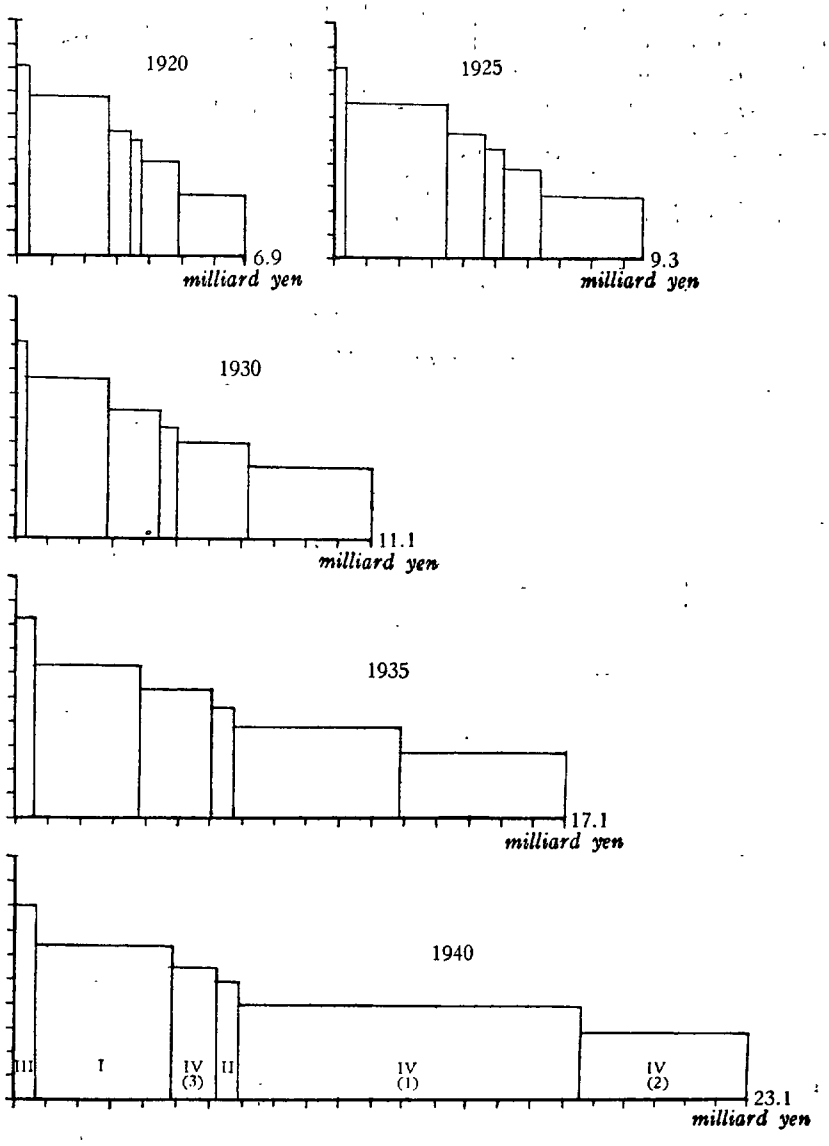
| | IV (1) Heavy Industry | | | IV (2) Light Industry | | | IV (3) Domestic Industry | | | Total Sum | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gross | Net | Ratio | Gross | Net | Ratio | Gross | Net | Ratio | Gross | Net | Ratio |
| 1920 | 1141 | 456 | 40% | 2005 | 522 | 26% | 763 | 420 | 55% | 6947 | 3474 | 50% |
| 1925 | 1251 | 501 | 40 | 3363 | 878 | 27 | 1267 | 697 | 55 | 9753 | 4661 | 48 |
| 1930 | 2260 | 904 | 40 | 3677 | 992 | 27 | 1750 | 981 | 55 | 11119 | 5092 | 46 |
| 1935 | 5335 | 2027 | 38 | 5270 | 1371 | 26 | 2402 | 1323 | 55 | 17333 | 7555 | 44 |
| 1940 | 10446 | 3970 | 38 | 5491 | 1373 | 25 | 1382 | 761 | 55 | 23069 | 9829 | 43 |

By these tables, I wish to indicate some tendencies in the industrial structure of Japan in the pre-war 20 years. As the amount of each item in the Table 2 is shown at current prices in each year, no hasty conclusions should be drawn. It is preferable for our purpose to eliminate price fluctuations with the price index number, and here I adopt the wholesale price index number of the Bank of Japan, taking the year 1920 as the

base. The Table 3 is thus obtained, showing at the same time the ratio of net products to gross products in each industry.

According to the ratio value of net products to gross products, the

Chart 2.



order of industries is arranged as mining, agriculture, domestic industry, aquatics, heavy and light industries. This order is subject to change, of course, according to the method of classification of industries. For example, the aquatic industry in our sense includes fishery processed goods and salt. Limited only to fisheries and culture, the rate of net products in aquatics would be over 60%, or higher than domestic industry.

For ascertaining the change of industrial structure from the last table, I will endeavor to explain by diagrams similar to the one previously mentioned. A glance at the five diagrams in Chart 2 will reveal the scale of industrial expansion in Japan from 1920 to 1940 and the change in the composition of various industries. Repeating my previous note, the abscissa in each diagram indicates the gross products and the ordinate the ratio of net products to gross products. From the value of the net products, we can tabulate all industries including mining, agriculture, domestic, aquatic, heavy and light industries. The area of each diagram represents net products; the larger the area, the greater the amount of net products; the longer the length on the abscissa, the greater the amount of gross products, from which we can recognize how the Japanese industrial structure changed during 20 years.

The above tables again show only the figures for "material" industries, and not of "service" industries. Net income of goods and services as a whole amounted to 10,636 million yen in 1930 and 14,532 million yen in 1935 according to the report of the Government Bureau of Statistics. Consequently, the net products of material industries in 1930 and 1935 shown in the tables are respectively a half of the whole national income.

4. Post-war Conditions

The estimates of post-war national income were prepared by the Economic Stabilization Board, though the data showing the ratios of net products to gross products is meagre. From statistical data of the Economic Rehabilitation Committee of the Economic Stabilization Board, the net products in various industries in 1948, compared with those in the pre-war period, are shown in the following Table 4. Though the figures are approximate, they are adequate in outlining the post-war conditions in Japan. Indeed, fair progress has been achieved with the restoration, but some industries, such as textile and ceramics, are far behind pre-war level. The ratios of net products to gross products in various industries given by the same Committee are shown in the left of the following table. They are generally higher than those in the pre-war years, except mining, although data is lacking to examine the facts fully.

Table 4. Net Products and Their Ratios in Various Industries in 1948 Compared with Those in 1930–34

| | Net products (*in million yen at 1930–34 prices*) | | Ratio of Net Products to Gross Products (%) | |
|---|---|---|---|---|
| | 1930–34 | 1948 | 1930–34 | 1948 |
| Agriculture & Forestry | 2040 | 1852 | 78 | 81 |
| Aquatic | 185 | 184 | — | — |
| Mining | 259 | 212 | 79 | 70 |
| Manufacturing | 3235 | 2678 | 33 | 41 |
| Textile | 735 | 315 | 23 | 39 |
| Metal | 276 | 283 | 31 | 39 |
| Machines | 529 | 466 | 55 | 54 |
| Pottery & Ceramics | 152 | 90 | 34 | 41 |
| Chemical | 430 | 439 | 48 | 51 |
| Food & Drink | 422 | 323 | 40 | 44 |
| Others | 691 | 762 | 37 | 45 |
| Gas & Electricity | 177 | 375 | 50 | 58 |

* The Ministry of Finance was chiefly responsible for preparing the estimates of national income in wartime; the Economic Stabilization Board has formulated estimates since the end of hostilities. The National Income Division of the Economic Stabilization Board was established in 1948, and up to the present has issued a monthly bulletin (unpublished). The Economic Rehabilitation Committee in the E. S. B. issued a revised Rehabilitation Plan in May 1949, in which the estimates of national income were dealt with in detail. The figures employed in the above table are based on these data.

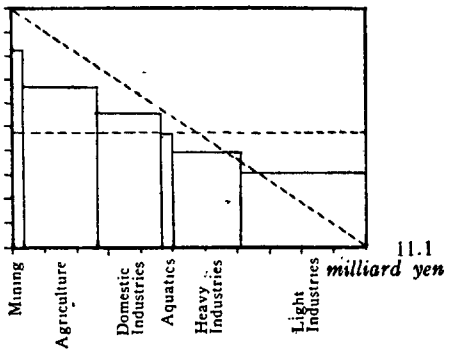
## III. *Change of Gross Products and Net Products in the Whole Industrial Sphere*

1. So far we have investigated the different proportions of net products to gross products in various industries and endeavored to show the results in a diagram, the industries being arranged in accordance with the value of their ratios, namely, as shown, mining, agriculture, domestic industry, aquatic, heavy and light industries. Some changes in this order appeared in the post-war conditions.

My area diagram resembles the so-called "Hayek's triangle"; that is, the nearer to the production of raw materials the industry is, the higher the rate of net products, and the nearer to the production of finished goods the industry is, the lower the rate of net products. In other words, a high rate of net products means that the consumption of producers goods is small, and *vice versa*, to illustrate which a diagonal is drawn from the height on abscissa (100% rate of net products) to the end point of the base

on ordinate (the total sum of gross products) in our diagram, the area between the axes and the diagonal showing "Hayek's triangle." It is clear, however, that even in mining and agriculture producers goods are more or less consumed, and so the rates of net products in such industries do not amount to 100%. Likewise, there is no industry in which the rate of net products is zero. Thus the actual order of industries extends out of the triangle. The real classification of industries does not represent the successive stages of production. If producers goods were to be consumed at the same rate in all industries, there would be a horizontal line showing the same rate of net products, but this is not the case under actual conditions. The rates in the real classification of industries lie, as shown in Chart 3 (example of 1930) between the diagonal and the horizontal line.

Chart 3.




2. Turning attention next to the change in the entire industrial sphere, apart from the difference among various industries, we find in general that the rate of net products decreased gradually from 1920 to 1940, which means that the producers goods consumed increased as a whole. The following Table 5 extracted from the last column of the Table 3, except the figures for 1946 and 1948, shows the gross products, the net products and the relative rate between them for the whole industry.

Table 5. Gross Products and Net Products in all Industries for the Period 1920—43

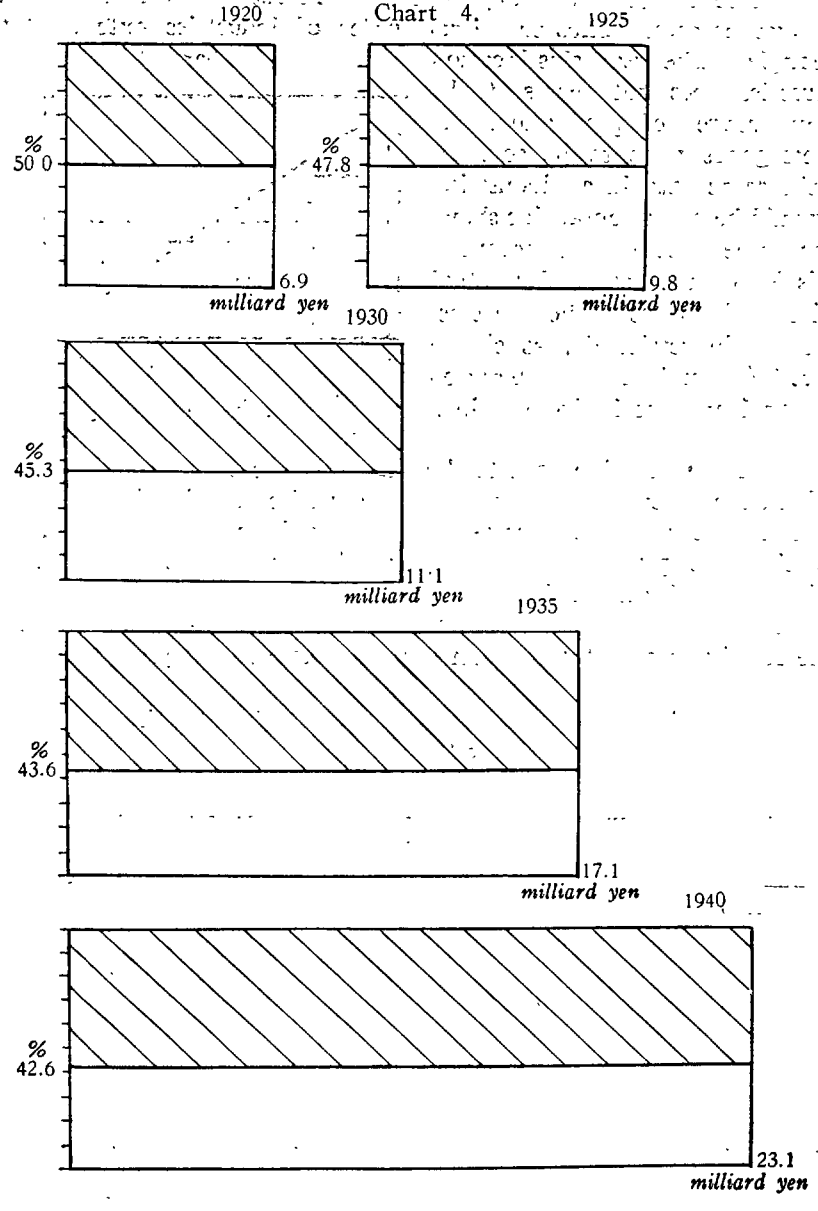
*(in million yen)*

| | Gross Products | Net Products | Ratio of Net to Gross |
|---|---|---|---|
| 1920 | 6947 | 3474 | 50.0% |
| 1925 | 9753 | 4661 | 47.8% |
| 1930 | 11119 | 5092 | 45.8% |
| 1935 | 17333 | 7555 | 43.6% |
| 1940 | 23069 | 9829 | 32.6% |
| 1946 | 5390 | 3140 | 58.1% |
| 1948 | 8760 | 4920 | 56.2% |

From this Table 5 we learn that the rate of net products decreased very clearly from 1920 to 1940. The figures for 1946 and 1948 are rough esti-

mates, but it may be concluded that the rate of net products is increasing in the post-war period, which means that producers goods consumed are decreasing. These facts are easily expressed by a chart. In the following Chart 4, the shaded part shows the amount of producers goods consumed,

Chart 4.



and the white part the amount of net products. The gross products increased greatly form 1920 to 1940, corresponding to which the average line dividing the area into two parts is falling gradually. After the war, an inverse tendency is perceived.

Theoretically, it would not be correct to conclude that a decreasing rate of net products is always accompanied by an increasing gross value of products, and *vice versa*. But, as far as our statistical data is concerned, such a conclusion holds true, from the fact that the decreasing or increasing rate of net products represents respectively the more or less capitalistic production in the whole of industry. After the war, the total value of gross products in Japan declined greatly. Compared with those of 1930, the gross products of 1946, directly after the war, were below 50% and net products about 60%, after which recovery was rapid, the gross products in 1948 being about 80% and net products over 90%. To evaluate adequately these percentages, however, we must consider that the population has increased by about 20% as compared with 1930.

Here I would like to call attention to the Marx's theory of reproduction. The Marxian scheme of "extended reproduction" means an increasing of the whole industry, but does not refer to the changing rate of net products, as expressed in the above chart. Even in the case of a constant rate of net products, the whole industry will be able to extend, as shown in Marx's case; that is, in his formula, the rate of net products is invariable after the second year. But our statistical investigations in Japan, as shown in the above chart, represent another type of extended reproduction accompanied by a decreasing or increasing rate of net products.

3. To ascertain the tempo of the change in industrial structure, we investigated the increasing rates of gross products, net products and producers goods consumed, and secured the following figures.

Table 6. Increasing Rate of Gross Products and Net Products in the Years 1920—40

(1920=100)

| | Gross Products | Net Products | Producers Goods Consumed |
|---|---|---|---|
| 1920 | 100 | 100 | 100 |
| 1925 | 140 | 137 | 147 |
| 1930 | 160 | 147 | 174 |
| 1935 | 248 | 213 | 304 |
| 1940 | 332 | 281 | 381 |
| Average rate of compound interest for twenty years. | (6.2) | (5.3) | (6.9) |

From this Table 6, we know that gross products have increased by 6.2%, net products by 5.3% and producers goods by 6.9% every year for the period considered. If these percentages were all the same (for example 6%), there would be no change in the rate of net products (50% in our case). But, in the table, the tempo of gross products (6.2%) lies between that of net products (5.3%) and that of producers goods consumed (6.9%), which means a decreasing rate of net products to gross products.

By the "rate of growth" we mean the increasing ratio of producers good consumed to net products. Expressing net products by $E$, producers goods consumed by $U$ and the increasing rate of $U$ by $\lambda$, the "rate of growth" is symbolically $\frac{U\lambda}{E}$. $U$ and $E$ in 1920 are nearly the same amounts, 100, by the figures mentioned above. Thus the "rate of growth" $\frac{U\lambda}{E}$ in 1920 was $\frac{100\times 0.08}{100}=0.08$, that is, $U$ increases by 8% to income in 1920. In 1925, $U$ is 147 and $E$ is 137, so the "rate of growth" was $\frac{147\times 0.08}{137}$ $=0.033$. The rate of change every five years will be as follows.

Table 7. Calculation of "Rate of Growth"

(1920=100)

| | Net Products | Producers Goods Consumed | | Rate of Growth |
|---|---|---|---|---|
| 1920 | 100 | 100 | increase of 147% ( 8.0% a year) | 0.08 |
| 1925 | 137 | 147 | increase of 118% ( 3.1% a year) | 0.033 |
| 1930 | 147 | 174 | increase of 175% (11.9% a year) | 0.141 |
| 1935 | 213 | 304 | increase of 125% ( 4.6% a year) | 0.065 |
| 1940 | 332 | 381 | | |

We see that in the period considered here the "rate of growth" was moving between 14.1% and 3.3%.

The "rate of growth" refers to the problem of saving or "gesellschaftliche Sparquote" in Hans Peter's term.[3] At present however, our consideration is limited only to four industries, disregarding national income as a whole. Further, we are only dealing with the producers goods "consumed," not those "produced." Admittedly our scope of consideration is narrow for dealing with savings in general.

4. Here some remarks are necessary about post-war conditions in Japan. Judging from the figures of 1946 and 1948 given above, the "rate of growth"

[3] See Hans Peter, *Grundproblem der Nationalökonomie*, II (Stuttgart, 1934). Furthermore, we should consider the distribution of national income between labor and property, and consequently introduce such a concept as Hans Peter's "Sparquote des Besitzeinkommen."

became about 25%, which seems to be comparatively large, and must not be regarded as a proper "rate of growth." Today in Japan the tempo of economic reconstruction depends partly upon the aid received from foreign countries. It is most important for us to ascertain the proper rate of growth which depends on the rate of capital accumulation in our national economy. Our present standard of living is extremely lower than that of the pre-war period, therefore, it is perhaps very difficult for us to-day to bear an average rate of growth of 8% or 10% so much as shown from 1920 to 1940. The lower this rate is, the slower the tempo of restoration. Inversely, in order to accelerate the tempo of reconstruction, we should make this rate advance. We know that net products about doubled in twenty years from 1920 to 1940 with an average rate of growth of 8% or 10%. But many differences exist today in technical and social conditions and without doubt the tempo of recovery cannot be explained only from the rate of growth in the past.

## IV. *Conclusion*

1. Surely there are many other problems requiring consideration which I do not dare to deal with here. However, as a supplement, I intend to show the net products per worker in various industries in Japan.

From the Table 8 it will be seen that there exist great differences in the net products per worker in four industries, but first of all I must elucidate some points regarding the figures. In activities centering around agriculture in Japan, many women are employed, and my figures include women, as I feel I cannot exclude them in calculating the productivity per worker as Colin Clark did. However, we must discount to some extent the productive power of women, it seems to me, and I think the average net product in agriculture and forestry per worker may be about fifteen percent higher than the figure mentioned. In the aquatic industry, the productivity must of necessity be more or less discounted, for many workers only engage in it as a subsidiary activity. The number of workers fully engaged in the aquatic industry, according to official statistics, is a little more than the number given in the Census Returns, while the number engaged in subsidiary activities is the same as that of the main workers. Assuming that the efficiency of subsidiary workers is one-third of that of the regular workers, the net products shown in the above table may be discounted by 30 or 40 percent. Perhaps the same problem arises in other industries, though it is very difficult to trace statistical data. The estimate of domestic industry is very approximate, so it would be appropriate to estimate it separately from that of factory industries.

Anyhow we can perceive in Table 8 that the productivity of agriculture

and forestry during the period 1920—1940 increased, while workers engaged in these industries decreased. From 1930—1940, the same tendency was seen in the aquatic industry, due possibly to diminishing returns, that is, if we assume the population somewhat increased; the productivity per employee decreased so much. Actually, the workers in agriculture during

Table 8. Net Products per Worker in Various Industries*

| | Agriculture | | | Aquatics | | |
|---|---|---|---|---|---|---|
| | Net Products (*in million yen*) | Number of Workers (*in thousand persons*) | N. P. per Worker (*in yen*) | Net Products (*in million yen*) | Number of Workers (*in thousand persons*) | N. P. per Worker (*in yen*) |
| 1920 | 1692 | 14287 | 118 | 123 | 537 | 229 |
| 1930 | 1739 | 14081 | 124 | 199 | 565 | 352 |
| 1940 | 2783 | 13802 | 202 | 210 | 543 | 387 |
| 1946 | 1630 | 16898 | 96 | 50 | 447 | 112 |

| | Mining | | | Manufacturing | | |
|---|---|---|---|---|---|---|
| | Net Products (*in million yen*) | Number of Workers (*in thousand persons*) | N. P. per Worker (*in yen*) | Net Products (*in million yen*) | Number of Workers (*in thousand persons*) | N. P. per Worker (*in yen*) |
| 1920 | 242 | 418 | 579 | 1398 | 4093 | 341 |
| 1930 | 249 | 270 | 902 | 2859 | 4508 | 634 |
| 1940 | 571 | 538 | 1061 | 6103 | 7152 | 853 |
| 1946 | 140 | 532 | 263 | 1320 | 5681 | 233 |

* In this table the number of workers in 1920, 1930 and 1935 is based on Census Returns; that for 1946 is an estimate by the Population Research Institute in the Ministry of Welfare, with corrections to adjust the industrial classification of workers to that of production. The conditions in the year 1930 have been treated in full detail by Mr. Tosuke Iguchi in his article "Industrial Constitution of Japan's Population and Changes," *Studies on Population Problem*, Vol. III (Tokyo, 1937), edited by Dr. Teijiro Ueda. However, the figures mentioned above are my own calculations.

1920—1940 decreased by more than 3%, while the net product per worker increased by more than 6%. Indeed, this cannot be fully attributed to the operation of diminishing returns, but it would not be incorrect to say that the number of workers in agriculture had already reached the condition of saturation. In 1946, the workers in agriculture numbered 17 million, an increase of about 20% compared with 1940. We cannot fail to see that this increase brought about a decrease in productivity, and consequently the suppression of the national income as a whole, and it is obvious that the only way to escape such a suppression is the promotion of export industries.

We must furthermore investigate the distribution of net income between labor and capital in various industries; data however is insufficient, and we must leave it to another occasion.

2. I have so far explained how a grasp can be had of the aspect of production in the national income, but I naturally do not deny the importance of an analysis of other features in the national income, viz. distribution and expenditure. The problem to be considered is the interrelationship of production, distribution and expenditure. In this paper, the main purpose has not been to treat the relationship in full detail; but, to prevent misconceptions, allow me to show briefly the formula of the circulation of the national income as a whole.

From the "national income produced" shown before we get the following formula:

$$\underset{\text{Consumed}}{\textit{Gross Products}-\textit{Producers Goods}}=\textit{Net Products} \quad \ldots\ldots\ldots\ldots(1)$$

On the other hand, the net products consist of the cost of factors in production and the gross profit for entrepreneurs, so we get another formula:

$$\textit{Cost of Factors of Production}+\textit{Gross Profit}=\textit{Net Products} \quad \ldots(2)$$

Even if the results of (1) and (2) are the same, they have obviously different components, which should be ascertained from different statistical data, quite unrelated.

Next, the distribution of the national income is defined as all kinds of personal revenue, which is divided into income from labor, income from property, net profit and transfer income; thus we get:

$$\textit{Income from Labor}+\textit{Income from Property}+\textit{Net Profit}+\textit{Transfer Income}=\textit{Personal Revenue} \quad \ldots\ldots\ldots\ldots(3)$$

In this expression, the income from labor and the income from property are derived from the cost of factors in production in (2), and the net profit is also extracted from the gross profit in (2) deducting savings and taxes disposed by the entrepreneur. The transfer income, however, appears in (3) for the first time and it has no relation to productive activities.

Lastly, a formula concerning the disbursement of personal revenue must be introduced as follows:

$$\textit{Consumption}+\textit{Saving}+\textit{Taxes}=\textit{Personal Revenue} \quad \ldots\ldots\ldots\ldots(4)$$

Here also, (4) and (3) are the same in result, but they possess their own distinct meaning, so we must ascertain their component parts from different statistical data respectively.

Thus we have four formulae (1) to (4), and the next step is to consider the interrelationship of these formulae, that is, the circulation of the national

income. In order to do so, however, some auxiliary formulae must be given, and I will show here only in a symbolic manner the equations system of the circulation.

The following several symbols are used:

$G$.....gross products
$U$.....producers goods consumed, or user cost
$F$.....cost of factors of production, or factor cost
$D$.....gross profit pre-disposal
$A$.....income from labor
$B$.....income from property
$X_1$.....taxes paid by producers
$S_1$.....savings by producers
$d$.....net profit distributed to individuals
$T$.....transfer income paid by government
$C$.....consumption expenditure
$X_2$.....taxes paid by consumers
$S_2$.....savings by consumers
$O$.....budget deficit of government
$Z$.....government expenditure
$K$.....goods produced but not consumed, or new investment.

Using these symbols, the circulation of the national income is formalized as follows:

$$G-U=\overbrace{F}^{A+B}+\overbrace{D}^{X_1+S_1+d} \quad \cdots\cdots(5)$$

$$A+B+d+T=C+X_2+S_2 \quad \cdots\cdots(6)$$

$$X_1+X_2+O=Z+T \quad \cdots\cdots(7)$$

$$S_1+S_2=O+K \quad \cdots\cdots(8)$$

It will be clear that these four formulae represent the so-called "social accountings"; that is, the active and passive sides of four accountings, i.e., of producers, consumers, government and banks, respectively conceived as a whole in the national economy. If we add further to these the accounts of foreign relations, we can visualize the whole system of the circulation of the national income. In these four formulae each item on the left side coincides with that on the right side, provided one more formula is supplemented:

$$U+C+Z+K=G \quad \cdots\cdots(8)$$

3. In this paper, the author has specially stressed the meaning of the left side in formula (5), which represents the production aspect of the national income in the proper sense of the term. In the sphere of economic theory, Keynes and Keynesians have attached much importance to the expenditure side of national income. Their idea is that the change in the

expenditure of income, *via* effective demand, has an influence on the number of employed persons, and it would appear that the problem of industrial structure is not taken into full and complete consideration by them, being more concerned, as I see it, with the way to actualize the potential or unused capacities. But many countries, including Japan, are facing the problem of improving productive power itself, and of reforming the industrial structure for that purpose. Apart from the current problems, a thorough analysis of the conditions of economic progress on a wider scope is indispensable regarding the general economic theory. What I have in mind is a grasp of the circulation of national income, and especially the aspect of production in the circulation from a statistical viewpoint, for the purpose of which I would like to propose the introduction of the formula (1) or (5) explicitly in national income statistics. I am aware that in the United States of America and other countries there is ample statistical data available, and I earnestly hope that a more systematic arrangement of the data in this respect may be made available on national income statistics for an international comparison.