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PREFECTURAL INCOME DIFFERENTIALS IN JAPAN

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This presents some additions and revisions of my paper "Regional Income Differentials in Recent Japan"¹⁾ published previously.

1.

We use the coefficient of variation for per capita income among prefectures as a mean to measure the regional income differential. If N_i is the population of the i th prefecture and Y_i is its total income, the coefficient of variation (V) will be as follows:

$$\begin{aligned} V &= \left\{ \sqrt{\sum \left(\frac{Y_i}{N_i} - \frac{\sum Y_i}{\sum N_i} \right)^2 \cdot \frac{N_i}{\sum N_i} / \frac{\sum Y_i}{\sum N_i}} \right\} \times 100 \\ &= \sqrt{\sum \left(\frac{Y_i}{N_i} \cdot \frac{N}{Y} \cdot 100 - 100 \right)^2 \cdot \frac{N_i}{N}} \end{aligned} \quad (1)$$

where $N = \sum N_i$ and $Y = \sum Y_i$. We take data as follows: Y_i is the total of income by distributive shares estimated in each prefecture, and N_i in 1955, 1960 and 1965 is the result of the National Population Census; in other years, N_i is the population estimate by the Bureau of Statistics, Office of the Prime Minister. $(Y_i \cdot N / N_i \cdot Y) \times 100$ in formula (1) is the percentage ratio of prefectural income per capita to the national average, that is, relative income; for its annual figures covering the whole period 1955–1965, see Supplementary Table I. The standard deviation calculated for relative income is nothing but the coefficient of variation for per capita income among prefectures. It is shown in column 1 of Table 1.

We will point out two features concerning the prefectural income differentials in this period. One is a correlation between the coefficient of variation and the percentage increase from the previous year of gross national product, as found by comparison with column 2²⁾. This correlation, however, seems to be unreliable after 1963. The tendency of expansion until 1961 and contraction from 1962 is another feature. If we specify these two relations in an equation for linear regression and estimate the

¹⁾ *Report of the Hokkaido Branch of the Japan Regional Science Association*, Vol. 2 (Sapporo, Dec. 1968), pp. 1–26.

²⁾ Data are from Economic Planning Agency, *Kaitei Kokumin-shotoku-tōkei, Showa 26~42 nendo* (Revised Report on National Income Statistics, 1951~1967), (Tokyo, 1969), pp. 60–61.

TABLE 1. COEFFICIENTS OF VARIATION FOR PER CAPITA INCOMES AMONG PREFECTURES, 1955-1965 (%)

Year	Coefficient of variation (1)	Per cent increase of GNP from previous year (2)
1955	29.09	10.1
1956	32.76	12.8
1957	33.12	13.9
1958	31.43	4.0
1959	32.72	12.2
1960	34.40	19.9
1961	36.21	23.4
1962	35.01	10.8
1963	34.46	15.4
1964	33.02	17.9
1965	31.22	10.2

parameters by the least squares method, we get the following result :

$$V = 33.521 + 0.1193 Y^* + 0.7503 t^*$$

$$(1.318) \quad (0.0666) \quad (0.1934)$$

$$\hat{R} = 0.8781 \quad \hat{S} = 0.951 (\%) \quad d = 1.58$$

Y^* = Per cent increase from the previous year of GNP at current prices

$$t^* \quad (1955 \sim 1961) = t - 1961$$

$$t^* \quad (1961 \sim 1965) = 1961 - t \quad t = \text{calendar year}$$

Here, t^* represents a time trend, which is made up so as to reach a peak in 1961. Figures shown in parentheses are standard errors of parameter estimates. R is a multiple correlation coefficient and S is a standard error of the equation; both of them are adjusted for the degrees of freedom. And d is the Durbin-Watson ratio of auto-correlation.

The period of eleven years might be too short to observe the behavior of income differentials. We have considered the possibility of extending over a longer period, that is, before 1955 and also after 1966. Unfortunately our available statistical data is limited to the period from 1955 to 1965. It was about 1955 that income accounting came to be adopted in all prefectures, while about the period after 1966 the method of estimation was revised in most prefectures and data is not comparable. It is, however, possible to estimate indirectly the prefectural distribution of income per capita by another means. This is to observe the percentage ratio of workers in the primary industries to total workers. Data about workers by industries is available

from the Population Census, retroactively to 1920. Then we can compute the standard deviation as per formula (2) and substitute it for the coefficient of variation of income per capita :

$$V' = \sqrt{\sum \left(\frac{Ai}{Li} - \frac{A}{L} \right)^2 \cdot \frac{Li}{L}} \quad (2)$$

where Ai is workers in the primary industries of the i th prefecture, Li is total workers of the i th prefecture, and $A = \sum Ai$, $L = \sum Li$.

Year	1920	1930	1940	1950	1955	1960	1965
V' (%)	17.47	19.57	21.45	18.17	18.46	17.76	14.40

From the above figures, it may be possible to tell the tendency of expansion of income differentials before World War II, and of contraction after the War. J. G. Williamson did attempt to lengthen considerably his time series of indices of regional inequality for Canada, Italy, and Brazil, by using the square of the differences between regional shares of agricultural employment in the labor force and that of the nation as a whole.³⁾ He based his procedure on the highly significant inverse correlation between these shares and regional income per capita.

To be sure, the percentage ratio of workers in the primary industries to total workers is closely correlated with the relative income per capita. For example in 1955, 1960 and 1965, the least squares fit of linear equations is as follows :

(1955)	$Yi = 149.686 - 1.2798 \frac{Ai}{Li}$ (3.851) (0.0784)	$\hat{R} = 0.9248$ $\hat{S} = 7.492$ (%)
(1960)	$Yi = 146.875 - 1.5265 \frac{Ai}{Li}$ (4.186) (0.0992)	$\hat{R} = 0.9163$ $\hat{S} = 9.153$ (%)
(1965)	$Yi = 132.784 - 1.4581 \frac{Ai}{Li}$ (3.890) (0.1126)	$\hat{R} = 0.8874$ $\hat{S} = 9.242$ (%)

where $Yi = Yi \cdot N / Ni \cdot Y$ (%). Here, we must point out that the coefficient of Ai/Li changes year by year. This means the distribution of relative income will change even if the distribution of Ai/Li is the same. Thus the above change of V' from 18.46 in 1955 to 17.76 in 1960 does not necessarily mean the contraction of prefectural income differential. Now, we try to adjust the value of V' by multiplying by the coefficient of Ai/Li .

Year	1955	1960	1965
V' adjusted	23.63	27.11	22.32

³⁾ Jeffrey G. Williamson, "Regional Inequality and the Process of National Development: A Description of the Patterns", *Economic Development and Cultural Change*, Vol. 13, No. 4, Part II (Chicago, July 1965), pp. 31-34.

Then, it may not be admitted to infer the prolonged tendency of the regional income differential from only the change of the value of V' as Williamson did. We know nothing about the relation between shares of primary industries in workers and relative income from 1920 to 1950. If the above mentioned coefficient of A_i/L_i has slightly changed or increased gradually for a long period, then we can guess that before World War II income differentials showed the tendency of expansion, and after the War the tendency has changed.

In regard to the period after 1966, prefectural income is being revised with the revision of national income statistics, and the final result has not yet appeared. Moreover, in some prefectures even provisional estimates of income is not published. If we calculate V of formula (1) from the available data about 1965~1967⁴⁾, the result is as follows:

Year	1965	1966*	1966**	1967
V	29.08	28.42	28.75	28.24

Because of insufficient data we cannot draw a definite conclusion, but the tendency of contraction is suggested.

2.

It can be said that the prefectural disparity of per capita income is caused by the disparity of net product per worker, that is, income productivity. In the case of the prefectural differential of income productivity, our available statistical data is limited still more.

Net product per worker in each prefecture is calculated by dividing the total number of workers into the net domestic product. The comparable figures of employed persons by prefecture can be obtained for only three years, namely, 1955, 1960 and 1965, through the National Population Census. But the movement from 1955 to 1960 and from 1960 to 1965 may quite well demonstrate the feature of those ten years when regional differential of per capita income expanded and then contracted. From Table 1, we know that the coefficient of variation moved from 29.1% in 1955 to 34.4% in 1960 and then to 31.2% in 1965. How did the variation of income productivity affect such movement?

⁴⁾ Data is from the Economic Research Institute of the Economic Planning Agency, *Kikan Kokumin-keizai-keisan (National Accounts Statistics Quarterly)*, No. 22 (Tokyo, Jan. 1970), p. 112.

We must notice that V in 1965 and 1966* is calculated from data of 38 prefectures (all except Miyagi, Gifu, Shiga, Hyogo, Wakayama, Tokushima, Kumamoto, Miyazaki), and in 1966** and 1967 from data of 42 prefectures (all except Miyagi, Shiga, Kyoto, Hyogo). Here, N and Y in formula (1) are the total of the 38 or 42 prefectures included.

Net domestic product for 1955 was not measured in Tochigi-ken and Osaka-fu. From the viewpoint of comparison, therefore, we must except both these prefectures when we calculate for 1960. Supplementary Table II represents the percentage ratio of net prefectural product per worker to the national average, that is, relative income productivity. The standard deviation of these ratios is shown in column 1 of Table 2.

Through the comparisons between 1955 and 1960, and furthermore 1960 and 1965, we can indirectly but surely know that the coefficient of variation of net product per worker has continued to fall. Therefore, it follows that the expansion of income differential from 1955 to 1960 occurred in spite of the contraction of productivity differential. The differences of income productivity among prefectures are the mixed results of the differences of per-worker product in the same industry and the differences of industrial composition among prefectures. In order to resolve each factor, some kind of standardization will be required.

The pure difference of productivity which is not affected by the differences of industrial composition will be found through the comparison of per-worker product weighted by the same industrial composition. Take, for example, Hokkaido. Per-worker products by industries in Hokkaido are put together weighted by the national percentage distribution of industrial workers, and this will be compared with national per-worker product of all industries, or national per-worker products by industries are put together weighted by the percentage distribution of industrial workers of Hokkaido, and this will be compared with the per-worker product of all industries of Hokkaido. It may be necessary to average these because both of them cannot always show the same result.

Here we denote net product of the j th industrial sector in a certain prefecture or the nation by $P'j$ or Pj , and similarly workers by $L'j$ or Lj . The relative productivity without the effect of the difference of industrial composition will be calculated by the formula below, similar to Fisher's formula for price index numbers:

$$\sqrt{\frac{\sum \left(\frac{P'j}{L'j} \cdot \frac{Lj}{\sum Lj} \right)}{\sum \left(\frac{Pj}{Lj} \cdot \frac{Lj}{\sum Lj} \right)}} \cdot \frac{\sum \left(\frac{P'j}{L'j} \cdot \frac{L'j}{\sum L'j} \right)}{\sum \left(\frac{Pj}{Lj} \cdot \frac{L'j}{\sum L'j} \right)} \quad (\text{A})$$

In the same way, the disparity of income productivity which depends only on the difference of industrial composition can be found by the adoption of different weights to the same per-worker product by industry; here it will also be necessary to cross these two ratios. That is to say:

$$\sqrt{\frac{\sum \left(\frac{P_j}{L_j} \cdot \frac{L'_j}{\sum L'_j} \right)}{\sum \left(\frac{P_j}{L_j} \cdot \frac{L_j}{\sum L_j} \right)}} \cdot \frac{\sum \left(\frac{P'_j}{L'_j} \cdot \frac{L'_j}{\sum L'_j} \right)}{\sum \left(\frac{P'_j}{L'_j} \cdot \frac{L_j}{\sum L_j} \right)} \quad (B)$$

Analyzing the interstate income differential of the United States, Frank A. Hanna calculated an average income per worker, named 'the rate-constant earning', in order to reflect differences in state occupational compositions without the distorting effects of varying compensation rates for similar work.⁵⁾ This will be equivalent to the above $\sum (P_j \cdot L'_j / L_j \cdot \sum L'_j)$, with the difference between occupations and industries. In his comment on Hanna's paper, Edward F. Denison mentioned that the difference of income due to differences in occupational composition can be measured not only by the national weight but also by the state weight, and advocated another measure.⁶⁾ This will be shown as follows, using our symbols:

$$\frac{1}{2} \left[\left\{ \sum \left(\frac{P_j}{L_j} \cdot \frac{L'_j}{\sum L'_j} \right) - \sum \left(\frac{P_j}{L_j} \cdot \frac{L_j}{\sum L_j} \right) \right\} + \left\{ \sum \left(\frac{P'_j}{L'_j} \cdot \frac{L'_j}{\sum L'_j} \right) - \sum \left(\frac{P'_j}{L'_j} \cdot \frac{L_j}{\sum L_j} \right) \right\} \right]$$

Denison's intension is to divide the difference between state and national average income—expressed by our symbols, $\sum (P'_j \cdot L'_j / L'_j \cdot \sum L'_j) - \sum (P_j \cdot L_j / L_j \cdot \sum L_j)$ —into one part due to the difference of occupational composition and another due to the difference of compensation rates, and moreover to prove that the latter is much larger than the former. Our intension is consideration of relative productivity and the yearly comparison, so the geometric mean of ratios with crossing weight as mentioned above should be required; it is impossible to compare yearly with the arithmetic mean of differences.

The standard deviation of relative income productivity calculated by formula (A) is shown in column 2 of Table 2. The weight used here is, needless to say, the employed persons by prefecture. On the other hand,

⁵⁾ Frank A. Hanna, "Analysis of Interstate Income Differentials: Theory and Practice", in the Conference on Research in Income and Wealth, *Regional Income*, Studies in Income and Wealth, Vol. 21 (New York, 1957), p. 121.

Besides, he suggested the calculation of 'the composition-constant earning' as one to reflect differences in earning rates without the distorting effects of variations in occupational composition, but it was not used in practice.

⁶⁾ Comment by Edward F. Denison on Hanna's Paper, *ibid.*, pp. 164-166. This corresponds to our formula (B). To correspond to our formula (A), the calculation below was adopted.

$$\frac{1}{2} \left[\left\{ \sum \left(\frac{P'_j}{L'_j} \cdot \frac{L_j}{\sum L_j} \right) - \sum \left(\frac{P_j}{L_j} \cdot \frac{L_j}{\sum L_j} \right) \right\} + \left\{ \sum \left(\frac{P'_j}{L'_j} \cdot \frac{L'_j}{\sum L'_j} \right) - \sum \left(\frac{P_j}{L_j} \cdot \frac{L'_j}{\sum L'_j} \right) \right\} \right]$$

But he got an approximation of $(P'_j \cdot L_j / L'_j \cdot \sum L_j)$ by $\frac{\sum P_j}{\sum L'_j} \times \frac{\sum P'_j}{\sum L'_j} + \sum \left(\frac{P_j}{L_j} \cdot \frac{L'_j}{\sum L'_j} \right)$.

one by formula (B) is shown in column 3, Table 2.⁷⁾ It is evident in our case that the differential of per-worker product without the effect of the difference of industrial composition is always smaller than that depending only on the difference of industrial composition. From 1955 to 1960, the former contracted and the latter expanded; from 1960 to 1965, the former was almost unchanged while the latter contracted. This means that the movement of productivity differential depending on the difference of industrial composition corresponds to that of prefectural income differential.

TABLE 2. COEFFICIENTS OF VARIATION OF PREFECTURAL PRODUCTIVITY, CENSUS YEARS (%)

Year	Net product per worker (1)	Productivity adjusted	
		A (2)	B (3)
1955*	30.03	13.42	16.37
1960*	27.53	12.48	17.36
1960	28.32	12.69	17.74
1965	23.66	12.75	14.73

* Excluding Tochigi-ken and Osaka-fu

There are two relations to bridge the gap between income differential and productivity differential. One is the relation between prefectural income by distributive shares and net domestic product, and the other is the relation between population and employed persons. By definition, prefectural income should be credited to the people who live in the prefecture and net domestic product is income produced within the prefecture, and the relation between these two should represent the degree of in-and-outflow of income. But it seems inaccurate to measure the degree of in-and-outflow of income only by the relation, considering the possible statistical discrepancy. Moreover, examining the data, net domestic products in 1955 are nothing but the distributive shares rearranged by industry for four prefectures, and data is unavailable for two prefectures as mentioned above.

Then we will regard the ratio of average income per worker classified by the usual place of residence to average net product per worker classified

⁷⁾ In all prefectures except only one, net domestic product by industry is estimated by 11 sectors—i) agriculture, ii) forestry, iii) fisheries, iv) mining, v) construction, vi) manufacturing, vii) wholesale and retail trade, viii) finance, insurance and real estate, ix) transportation, communication and other public utilities, x) service, xi) government. The only exception is Ibaraki-ken, and there 'services' and 'government' are shown in one lot.

We did share the net product of services and government in Ibaraki-ken by the assumption that per-worker income of the government sector in Ibaraki is equal to that of the same sector of the other prefectures.

by the place of work as an indicator of in-and-outflow of income. For 1955, as prefectural income has been used as net domestic product in four prefectures, we can adopt the same way of substitution for the two prefectures which have no data. The resulting coefficient of variation weighted by employed persons at the place of work is shown in column 1 of Table 3. Clearly the differential of the indicator of income flow continues to expand, though for 1955 it may be underestimated a little by the convenient method described above.

TABLE 3. COEFFICIENTS OF VARIATION FOR OTHER FACTORS (%)

Year	Inflow and outflow of income	Workers ratio
	(1)	(2)
1955	6.31	6.27
1960	10.21	5.71
1965	12.45	5.46

We call the ratio of employed persons in the total population 'workers ratio' briefly. If the denominator of the workers ratio is *de jure* population, the numerator should be employed persons at the usual place of residence. We will calculate the coefficient of variation for this ratio, too. Here prefectural population is used as the weight and the result is seen in column 2 of Table 3. Prefectural differential of workers ratio is not itself very large, but obviously it has a trend to contraction.

It may be said, in short, that the expansion of prefectural income differential from 1955 to 1960 is due to the expansion of the differences of industrial composition among prefectures and, above all, the inflow and outflow of income.

3.

Returning now to Table 1, we will more closely observe the yearly changes in the coefficient of variation for per capita incomes among prefectures. Increments of the coefficient of variation may be divided into three parts: one due to changes of relative income, another due to shifting percentage distribution of population and a third based on the interrelationship of the two. If $yi^* = (100 Yi \cdot N / Ni \cdot Y - 100)^2$ and $ni = Ni / N$ in formula (1), we obtain:

$$V^2 = \sum yi^* \cdot ni$$

$$\Delta V^2 = \sum \Delta yi^* \cdot ni + \sum \Delta ni \cdot yi^* + \sum \Delta yi^* \cdot \Delta ni \quad (3)$$

The third item on the right side can be neglected because it is so small. Columns 2 and 3 of Table 4 show the first and second items.

TABLE 4. EFFECTS OF RELATIVE INCOME AND POPULATION WEIGHTS ON INCREMENTS OF COEFFICIENT OF VARIATION, 1955-1965

Year	ΔV^2 (1)	$\Sigma \Delta y^* \cdot n$ (2)	$\Sigma \Delta n \cdot y^*$ (3)
1955-56	227	210.7	13.8
1956-57	23	6.5	18.9
1957-58	-109	-123.0	15.8
1958-59	83	67.0	14.3
1959-60	113	95.8	16.3
1960-61	128	112.0	14.6
1961-62	- 86	- 97.5	13.0
1962-63	- 38	- 47.4	9.8
1963-64	- 97	-101.7	5.7
1964-65	-116	-119.0	4.2

Except for the change from 1956 to 1957, the expansion and reduction of income differentials for the past ten years has chiefly depended on the variation of relative income. While the recent movement of population weights has always expanded income differential, since 1960 the effects of expansion has continually decreased. This, however, does not necessarily mean that the effect of internal migration is small; because the effect has been contained in the change of relative income, only a portion occurs through the changes of population weights.

As is well known, the migration has been taking place from lower income prefectures to higher income prefectures.⁸⁾ Now, let us take four prefectures which have different levels of income: A is much higher, B is a little higher, C is a little lower and D is much lower than the average level. The movement of population from C to A will raise the coefficient of variation, and the movement from D to B will lower the coefficient or reduce its rise. However, if the migration from C to A brings down the relative income level of A or the migration from D to B raises the relative income level of B, the above effect may be offset. For this reason, the complete effect of internal migration on prefectural income differential will be extremely complicated.

As regards only the change itself of population weights, not $\Sigma \Delta n_i \cdot y_i^*$ in formula (3), it has been getting larger and larger since 1955. As the total of changes of the population weights in zero, we must sum up the absolute values and divide by two:

⁸⁾ Cf. Minoru Tachi, "Regional Income Disparity and Internal Migration of Population in Japan", *Economic Development and Cultural Change*, Vol. 12, No. 2 (Jan. 1964), pp. 186-204.

$$\begin{aligned}\frac{1}{2} \sum | \Delta n | &= \frac{1}{2} \sum \left| \frac{N_t}{\sum N_t} - \frac{N_{t-1}}{\sum N_{t-1}} \right| \\ &= \frac{1}{2 \sum N_{t-1}} \sum \left| N_t \cdot \frac{\sum N_{t-1}}{\sum N_t} - N_{t-1} \right| \quad (4)\end{aligned}$$

The results of this calculation are shown in column 1 of Table 5. The numerator of above formula is merely an aggregate of the change of population in each prefecture adjusted by the rate of increase of national population. There have been few international migrants in recent Japan, so the rate of increase of the national population will be regarded as the rate of natural increase. The above formula, therefore, represents a rate concerning the estimated internal migration which adjusts the natural increase of population in each prefecture by the national average, so it may be called the rate of net migration.

From 1955 to 1965, this rate, which repeatedly rises and falls, is evidently rising after all. In order to get a more accurate observation about the level or movement of this rate, it is necessary to compare it with a standard, for example, the required rate of net migration. We can make many assumptions about the required rate. One is considered as follows: population of each prefecture should be changed for its prefectural income per capita to maintain the same value as the national average, when total income in each prefecture is a given. This is the way the number of such changes required to be equalized per capita income can be estimated: distribute the whole population proportionally by income component ratio by prefecture, and then subtract the actual population of each prefecture from it. Because the total of plus or minus values of the above disparity is

TABLE 5. RATE OF NET INTERNAL MIGRATION, 1955-1965 (%)

Year	Actual rate (1)	Required rate (2)	Realization ratio (3)
1955		10.9	
1956	0.51	12.9	4.6
1957	0.63	13.4	4.8
1958	0.58	12.6	4.4
1959	0.61	12.9	4.8
1960	0.73	13.8	5.7
1961	0.73	14.4	5.3
1962	0.78	14.2	5.4
1963	0.73	14.0	5.1
1964	0.72	13.5	5.1
1965	0.83	12.7	6.2

necessarily zero, the number of required migration should be obtained by dividing the total of these absolute values by two. Therefore, the rate of required migration will be found by summing absolute values of the differences between population weight and income component ratio by prefecture and dividing it by two. See Table 5, column 2.

It may be said that the ratio of actual rate of current year to required rate of former year represents how well the actual migration satisfies the required one. Of course, all migration does not always follow the required direction. But in general, population weight increases in such prefectures and neighborhoods where income component ratio is larger than population component ratio, and opposite cases are rare and exceptional. We may consider the above actual rate over the required one as a realization ratio without regard to migration in the opposite direction. This is shown in column 3 of Table 5.

As we can see from Table 5, the increasing tendency of net migration is admitted on this realization ratio. Here it must be noted that there are different features to the movement between before 1960 and after 1961, as shown by comparison of the realization ratio with the coefficient of variation for per capita incomes among prefecture (Table 1, column 1). Net migration after 1961 increases, with contraction of income differential. It is not too much to say that this is an expected result and normal phenomenon. From 1955 to 1960, on the other hand, net migration increases with expansion of income differential. In other words, the counterbalancing effect of migration was not enough to offset the rapid expansion during that period. Therefore, actual migration may still be insufficient from the viewpoint of that required.

4.

Though our conclusion cannot help being rather speculative because comparable data extending over a long period is unavailable, it seems that prefectural income differential in our country has the long-term tendency of contraction and is continuing to contract now. The expansion from 1955 to 1961 depends, likely, on the special condition that some shifts of structure could not correspond well to the rapid economic growth. The range of our available data is too narrow to distinguish temporary factors from basic ones. Therefore, we feel some hesitation in making more detailed conclusions, and will let the information we have found speak for itself.

SUPPLEMENTARY TABLE I. PREFECTURAL INCOME PER CAPITA, 1955-1965 (national average=100.00)

Prefecture	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
1 Hokkaido	99.14	89.36	94.60	96.36	93.80	88.51	84.87	81.92	84.85	81.29	82.97
2 Aomori-ken	72.57	72.06	69.36	72.10	70.60	65.95	63.15	66.27	66.48	66.68	69.90
3 Iwate-ken	70.11	68.32	66.66	65.97	66.28	63.89	62.77	65.61	66.69	67.55	70.52
4 Miyagi-ken	82.82	78.41	78.33	77.59	78.53	77.05	76.18	77.57	78.79	78.60	80.31
5 Akita-ken	77.69	74.43	72.72	71.19	69.17	67.31	66.03	67.00	66.77	70.65	72.39
6 Yamagata-ken	77.64	74.32	74.24	76.07	74.71	74.19	72.73	72.59	72.18	72.74	74.65
7 Fukushima-ken	77.20	73.89	71.02	73.73	74.80	71.41	68.42	67.89	67.80	67.14	70.65
8 Niigata-ken	86.86	83.92	85.12	83.07	82.13	79.73	77.11	80.28	79.56	81.19	80.76
9 Ibaraki-ken	72.20	68.50	68.86	71.46	72.41	71.13	71.45	72.49	70.14	69.30	68.91
10 Tochigi-ken	85.23	81.79	77.16	79.12	78.93	81.99	80.92	81.49	80.85	81.38	83.15
11 Gumma-ken	80.42	73.80	72.61	76.80	75.83	74.78	75.71	78.80	79.77	82.85	82.87
12 Saitama-ken	93.63	91.56	91.81	91.65	91.79	90.40	91.13	92.36	92.76	95.03	94.40
13 Chiba-ken	84.39	81.20	79.82	79.06	82.31	82.23	87.32	88.30	90.63	92.22	93.35
14 Tokyo-to	172.91	117.83	174.65	170.73	175.22	175.70	181.25	177.20	173.84	169.27	166.16
15 Kanagawa-ken	121.36	123.54	127.73	128.77	127.63	131.41	137.40	137.84	137.71	137.79	129.79
16 Yamanashi-ken	74.77	75.04	74.10	75.13	76.91	81.94	80.38	77.80	78.92	80.16	82.66
17 Nagano-ken	85.85	83.45	79.26	80.13	81.27	80.23	81.09	82.20	83.05	84.37	85.59
18 Shizuoka-ken	93.50	92.59	94.54	96.82	98.87	99.06	98.20	95.96	95.77	94.63	93.20
19 Toyama-ken	98.27	92.14	94.26	91.80	93.25	95.65	99.53	94.67	94.03	90.59	91.69
20 Ishikawa-ken	91.51	89.42	85.92	95.97	96.48	95.53	90.34	91.35	89.69	88.84	88.65
21 Gifu-ken	90.35	91.90	89.90	88.04	89.22	91.20	90.06	88.48	88.83	88.28	87.12
22 Aichi-ken	116.35	122.00	126.62	116.49	121.49	129.84	123.95	120.27	119.63	116.24	112.45
23 Mie-ken	84.42	85.96	85.47	78.56	76.65	83.03	85.41	87.26	87.58	85.93	83.63
24 Fukui-ken	92.40	85.95	83.93	84.56	84.50	82.19	80.78	81.56	81.17	82.67	81.60
25 Shiga-ken	88.31	87.09	84.83	88.78	90.75	88.56	84.99	84.34	84.35	85.94	82.18
26 Kyoto-fu	106.44	107.23	105.11	104.37	104.88	105.41	104.19	106.29	106.55	105.22	102.76
27 Osaka-fu	141.01	152.31	149.13	147.14	146.72	150.50	148.17	147.19	149.10	147.60	146.65
28 Hyogo-ken	118.02	125.02	130.26	124.68	113.68	108.29	106.88	106.91	102.76	104.43	103.91
29 Nara-ken	92.35	88.39	88.38	96.01	92.09	86.46	88.13	87.39	86.34	88.79	85.49
30 Wakayama-ken	97.12	91.61	86.03	83.29	85.64	81.42	78.71	80.65	82.76	84.82	85.29

SUPPLEMENTARY TABLE I. (Continued)

31 Tottori-ken	80.56	75.13	73.41	72.86	72.06	70.58	66.35	67.34	64.95	65.29	66.37
32 Shimane-ken	77.82	73.63	76.22	76.74	75.09	72.36	71.30	69.26	65.81	67.17	69.35
33 Okayama-ken	88.93	85.04	81.79	81.56	81.50	81.63	83.72	85.60	83.44	85.35	83.17
34 Hiroshima-ken	85.91	86.81	88.54	89.54	87.31	86.19	84.67	84.39	82.70	86.19	86.26
35 Yamaguchi-ken	89.85	86.21	86.35	88.28	85.70	88.44	81.88	82.39	80.29	81.92	81.61
36 Tokushima-ken	74.62	73.06	71.09	74.18	75.15	74.98	73.47	72.42	71.78	74.08	74.68
37 Kagawa-ken	95.92	94.28	90.23	90.68	87.25	89.41	89.23	87.89	88.44	90.58	91.53
38 Ehime-ken	85.82	82.42	79.36	77.74	76.84	76.75	77.32	75.19	74.69	75.51	76.68
39 Kochi-ken	76.63	75.49	71.64	74.38	75.03	74.08	73.68	72.52	71.90	73.02	74.56
40 Fukuoka-ken	99.83	101.44	103.82	104.56	99.29	94.98	92.45	89.24	86.66	86.40	88.77
41 Saga-ken	80.86	72.53	71.08	74.05	70.55	73.94	67.53	68.72	66.06	68.07	71.22
42 Nagasaki-ken	79.81	79.72	76.64	77.23	74.02	65.02	64.45	64.95	63.72	66.44	70.72
43 Kumamoto-ken	77.68	74.48	65.72	67.60	64.85	62.63	63.41	66.65	69.34	70.16	71.98
44 Oita-ken	74.46	69.67	71.68	76.76	72.18	67.70	63.95	66.00	65.67	67.86	70.29
45 Miyazaki-ken	64.96	69.07	62.02	63.36	65.53	64.86	60.27	62.20	66.95	65.35	68.86
46 Kagoshima-ken	57.78	56.06	56.67	58.94	56.70	53.63	53.73	54.38	55.22	54.40	57.48

Notes Data on prefectural income and population is from the National Income Division of the Economic Research Institute, Economic Planning Agency, *Kenmin-shotoku-tokei, Showa 30-40 nen (Prefectural Income Statistics, 1955-1965)*, (Tokyo, 1968), pp. 56-57 and pp. 274-275.

Eight prefectures (Chiba-ken, Toyama-ken, Gifu-ken, Shiga-ken, Shimane-ken, Tokushima-ken, Kagawa-ken, Kochi-ken) have adopted estimation by fiscal year and the rest by calendar year. As adjustments of them are liable to be arbitrary, we have used them without adjustment.

For Tochigi-ken in 1955, only personal income has been estimated. Here we have attempted to guess its prefectural income through the ratio of the total amount of income by distributive shares to the total amount of personal income. This ratio shows a tendency of a little rise from 1956 to 1965, but it can be allowed to apply the ratio in 1956 to 1955.

The national total of prefectural incomes is larger than national income in all the years from 1955 to 1965. Here we found national per capita income from the total of prefectural incomes, as we intend to hold a calculative consistency between average and standard deviation.

SUPPLEMENTARY TABLE II. NET PREFECTURAL PRODUCT PER WORKER, 1955, 1960, 1965 (national average=100.00)

Prefecture	1955	1960	1965	Prefecture	1955	1960	1965
1 Hokkaido	108.88	100.27	93.54	26 Kyoto-fu	110.57	105.87	99.74
2 Aomori-ken	72.75	69.36	75.54	27 Osaka-fu	—	145.16	138.95
3 Iwate-ken	68.26	69.25	74.79	28 Hyogo-ken	135.19	118.23	114.10
4 Miyagi-ken	88.66	84.36	87.58	29 Nara-ken	98.45	91.42	94.61
5 Akita-ken	80.92	75.00	77.23	30 Wakayama-ken	95.23	87.34	97.69
6 Yamagata-ken	75.09	73.52	75.59	31 Tottori-ken	79.10	68.38	66.37
7 Fukushima-ken	82.45	76.72	75.45	32 Shimane-ken	71.67	67.87	67.95
8 Niigata-ken	80.23	75.51	80.39	33 Okayama-ken	85.68	81.78	88.55
9 Ibaraki-ken	70.32	69.01	71.65	34 Hiroshima-ken	86.26	91.53	93.14
10 Tochigi-ken	—	80.77	83.43	35 Yamaguchi-ken	107.52	107.43	103.80
11 Gumma-ken	78.56	74.12	82.48	36 Tokushima-ken	77.16	78.78	78.18
12 Saitama-ken	83.12	89.49	100.32	37 Kagawa-ken	94.48	86.54	89.03
13 Chiba-ken	77.72	75.68	99.81	38 Ehime-ken	93.21	90.72	89.23
14 Tokyo-to	170.00	140.24	124.35	39 Kochi-ken	73.90	72.04	75.44
15 Kanagawa-ken	143.80	167.29	162.33	40 Fukuoka-ken	119.32	110.64	100.94
16 Yamanashi-ken	74.23	77.79	82.80	41 Saga-ken	84.49	80.30	83.42
17 Nagano-ken	69.58	73.20	75.90	42 Nagasaki-ken	87.07	76.19	78.93
18 Shizuoka-ken	101.31	101.98	96.92	43 Kumamoto-ken	82.97	71.85	82.20
19 Toyama-ken	91.54	89.39	84.60	44 Oita-ken	76.34	72.34	74.89
20 Ishikawa-ken	86.72	89.51	83.54	45 Miyazaki-ken	74.92	71.15	81.43
21 Gifu-ken	85.44	84.45	78.52	46 Kagoshima-ken	58.90	54.63	61.00
22 Aichi-ken	112.76	119.06	104.60				
23 Mie-ken	95.23	90.58	91.06				
24 Fukui-ken	82.33	74.95	74.13				
25 Shiga-ken	87.10	85.02	78.21				

Notes Data on net domestic product is from *Prefectural Income Statistics, 1955-1965*, pp. 74-75, 102-103 and 132-133. Data on workers is from the Bureau of Statistics, Office of the Prime Minister, *The National Population Census Report, 1955 ed.* Vol. 4 Part 2, *1960 ed.* Vol. 3 Part 2 and *1965 ed.* Vol. 3 Part 3.

The National Population Census of Japan has adopted two classifications of employed persons, that is, one by place of work and the other by usual place of residence. Workers that correspond to domestic product by prefecture are in the former.

About the adoption of fiscal year estimation in eight prefectures and the differences between national total of net prefectural product and net national product, the same as was mentioned in notes for the previous table is also true here.