

Research-data

B. No. 1.

On the Relation between Increase of
Productive Power and Growth of Population
by Districts in Japan, 1925-1935.

-- An "Index Number of Population Pressure"
by Prefectures.

by

Minoru Tachi

Institute of Population Problems, Welfare
Ministry, Tokyo, Japan.

I. Aim

Population problems in Japan today demand to increase the supporting power of the land to its highest extent. It is the chief aim of this study to analyse the relations between the increase of productive power and the growth of population by districts, before the war, and to present a fundamental material for the above problems.

II. Method

- (1) Areas under observation --- 47 prefectures on Oct. 1st, 1935.
- (2) Periods of observation --- Ten years, 1925-1935.
 - (A) The first period --- 1925-1930 (a period of business depression)
 - (B) The second period --- 1930-1935 (a period of increasing productivity)
- (3) "Index number of population pressure."

To measure the relation between the increase of productive power and the growth of population at every district, I tried to compute an "Index number of population pressure" as follows. First, I computed the index numbers of the prices of all products for every prefecture, and divided them by the index numbers of the whole sale prices of the country, and named these "index numbers of productivity" (a). Second, computing the index numbers of the growth of population of every prefecture (d), I divided them by index numbers of productivity, and named these "index numbers of population pressure" (p). $p = \frac{d}{a}$

According to the above definition, index numbers of population pressure of every prefecture show the intensity of population pressure for productivity, the coefficient of distribution assumed constant. The basis of all the index numbers are 1925.

- (4) Trends of the index numbers.
- By the least squares method, I fitted trend lines to the three index numbers, a, d, and p.

(5) To measure the statistical relations between some factors which take part to decide the geographical distribution of the index numbers of population pressure, I computed simple correlation coefficients among these factors, using the following formula to ungrouped data:

$$r = \frac{\frac{1}{n} E(xy - \overline{xy})}{\frac{1}{n} E(xx - \overline{xx})^{\frac{1}{2}} \cdot \frac{1}{n} E(yy - \overline{yy})^{\frac{1}{2}}}$$

III. Summary and Conclusion

Table 1 shows three index numbers obtained by the above methods and parameters of their trend lines. I computed some coefficients of simple correlations between some factors which affect the index number of population pressure, and showed their values as Table 2. The summary and conclusion of the observation according to Table 1 and 2 are as follows.

Table 1.

Table 1.

prefecture	Index Numbers						parameters of the trend line					
	pi		di		ai		pi		di		ai	
	1930	1935	1930	1935	1930	1935	n	k	m	k	m	k
Total	8287	6542	10833	11603	13072	17737	-346	10007	160	9977	774	9733
Hokkaido	8485	7181	11429	12500	13469	17406	-282	9967	250	10060	741	9922
Aomori	9172	7945	10833	11905	11811	14985	-205	10065	191	9958	499	9772
Iwate	9904	8453	10847	11695	10952	13836	-155	10225	170	10000	384	9677
Miyagi	10219	10355	10979	11888	10744	11480	036	10013	189	10012	148	10000
Akita	10044	8865	10625	11125	10578	12549	-113	10202	113	10022	255	9768
Yamagata	10965	10883	10545	10909	9599	10024	088	10177	091	10032	002	9863
Fukushima	9989	9425	10481	11058	10493	11733	-057	10092	106	9983	173	9875
Ibaragi	9323	7511	10563	10996	11330	14639	-249	10188	200	9853	464	9670
Tochigi	9537	6268	10473	11006	10981	17359	373	10468	101	9988	756	9067
Gunma	8460	9065	10565	11073	12488	12115	-093	9598	107	10012	222	10460
Saitama	11170	9342	10463	10954	9367	11726	-066	10500	095	9995	173	9502

Chiba	9135	7432	10471	11051	11463	14870	-257	10142	105	9962	487	9675
Tôkyô	7197	5570	12044	14183	16734	25461	-443	9805	418	9963	1546	9667
Kanagawa	6214	4027	11429	12990	18392	32255	-597	9732	299	9978	2226	9087
Nigata	8158	6589	10476	10616	12642	16416	-341	9955	082	10023	642	9877
Toyama	8478	5298	10398	10682	12264	20155	-470	10277	068	10020	1016	9060
Ishikawa	8629	6575	10056	10503	11654	15974	-342	10113	050	9937	597	9555
Fukui	7640	5609	10336	10201	13528	18186	-439	9945	020	10080	819	9802
Yamanashi	9597	10984	10444	10741	10883	9772	098	9793	074	10023	-022	10330
Nagano	10852	14197	10500	10500	9616	7300	420	9583	050	10083	-250	9152
Gifu	9323	8387	10370	10833	11123	12917	-161	10102	083	9985	292	9887
Shizuoka	9090	7337	10744	11628	11819	15849	-266	10133	163	10600	585	9412
Aichi	8360	6182	11002	12266	13246	19840	-382	10090	227	9955	984	9443
Mie	9298	7528	10361	10515	11143	13067	-247	10178	052	10033	397	9718
Shiga	7959	5846	10427	10732	13101	18358	-415	10012	073	10027	836	9640
Kyôto	8676	8203	10874	11909	12533	14518	-180	9860	191	9972	452	10490
Osaka	7504	6273	11571	14043	15420	22386	-375	9788	404	9850	1239	9742
Hyôgo	7214	5386	10928	12062	15149	22396	-461	9838	206	9967	1240	9650
Nara	9911	8142	10318	10701	10411	13112	-186	10280	070	9990	314	9613

Wakayama	8745	7180	10602	11024	12123	15353	-282	10387	102	10030	535	9815
Tottori	9202	9575	10370	10444	11269	10908	-042	9803	044	10050	091	10272
Shimane	8276	7446	10275	10367	12415	13922	-255	9852	037	10040	392	10153
Okayama	8724	6736	10341	10739	11853	15943	-326	10117	074	9990	594	9623
Hiroshima	7465	6476	10469	11146	14024	17210	-352	9743	115	9965	721	10138
Yamaguchi	7129	4818	10389	10889	14572	22601	-518	9907	089	9982	1260	9423
Tokushima	8102	7029	10359	10539	12785	14994	-297	9862	054	10030	499	10098
Kagawa	7536	6244	10396	10633	13796	17029	-376	9807	063	10028	703	10095
Ehime	9057	6920	10521	10729	11616	15504	-308	10200	073	10052	550	9623
Kôchi	9002	10111	10412	10412	11566	10258	011	9648	041	10068	030	10473
Fukuoka	8300	5124	10987	11974	13238	23367	-488	10247	197	10002	1337	8852
Saga	8286	7134	10107	10000	12197	14017	-287	9908	0	10037	402	10063
Nagasaki	7754	6867	10707	11237	13808	16363	-313	9772	124	10030	636	10210
Kumamoto	8212	9295	10460	10690	12738	11501	-070	9520	069	10038	150	10663
Oita	8881	7985	10136	10544	11413	13204	-201	9962	054	9957	320	10233

Miyazaki 9230 6823 11011 12022 11930 17620 -318 10273 202 10000 762 9373
 Kagoshima 8825 9023 10556 10802 11962 11971 -098 9773 080 10053 197 10325
 Okinawa 7777 6671 10342 10598 13299 15886 -333 9815 060 10013 589 10118

Table 2.

No	X	Y	r
1	mp	md	-0.46
2	mp	ma	-0.88
3	md	ma	-0.61
4	ma	f1	-0.68
5	ma	f2	-0.43
6	ma	f3	-0.81
7	ma	f4	-0.78
8	ma	f5	-0.54
9	md	f1	-0.64
10	md	f2	-0.52
11	md	f3	-0.52
12	md	f4	-0.70
13	md	f5	-0.74
14	mp	f1	-0.45
15	mp	f2	-0.27
16	mp	f3	-0.78
17	mp	f4	-0.82
18	mp	f5	-0.31
19	f5	f1	-0.77
20	f5	f2	-0.67
21	f5	f3	-0.61
22	f5	f4	-0.49

- mp --- "The rate of change" of the trend line of the population pressure index number.
md --- The same of the population growth index number.
ma --- The same of the productive power index number.
f₁ --- Rate of the agricultural population, 1930.
f₂ --- Rate of the industrial population, 1930.
f₃ --- Percentage of the prices of the industrial products to the prices of all products average, 1929-1931.
f₄ --- Prices of the industrial products per an industrial population, average, 1929-1931.
f₅ --- Population - Density, 1930.

(1) In spite of the rise of population index in the whole country 1925-1935, the index number of population pressure strongly declined.

It means that the population pressure in Japan was mitigated remarkably since 1925. The conspicuous increase of productive power, during this period, especially, in modern high grade industries caused such a decrease in population pressure.

(2) In the first period, 1925-1930, in spite of business depression, the productive power in Japan increased rapidly, and accordingly the population pressure markedly decreased. In the second period, 1930-1935, the population pressure declined more rapidly than the first, because of the more conspicuous rise of productive power and of the slight decrease of the growth rate of population which was the results of a little decrease of the natural increase rate and a little increase of emigrants from Japan to the continent.

(3) In the whole period, 1925-1935, regions where population pressure most rapidly declined, were such prefectures which included old large entities as Fukuoka, Hyôgo, Tôkyô, Aichi, Ôsaka, and such new industrial centers as Kanagawa, Yamaguchi, Toyama, Fukui, Saiga, and so on.

These regions greatly absorbed population and showed a high growth rate, but more conspicuously the productive power rose up.

(4) On the contrary, regions where population pressure most slowly declined, or such most rural districts under the poorest geographical conditions where it even rose up as Tôhoku, Tôsan, South Shikoku, South Kyûshû and San-in districts. The productive power of these districts rose most slowly, and in some districts like Yamanashi and Nagano productive power showed decrease. Prefectures which showed rising population pressure index were Nagano, Yamanashi, Yamagata, Miyagi and Kôchi, districts most typical of above mentioned characteristics.

(5) Between the first period, 1925-1930, and the second, 1930-1935, there were no basic changes in the geographical distribution of the trend of the population pressure index. It was the chief characteristics of the second period that these of the first period were more enlarged. In the first period, regions where the productive power decreased were three prefectures of Saitama, Yamagata, and Nagano, but in the second period, such regions were six prefectures, Nagano, Yamanashi, Kumamoto, Kôchi, Tottori and Gunma. Regions which showed a rapid increase of productive power showed almost no difference between the first period and the second but the rise of productive power in those regions was more rapid in the second period than the first.

I found a slight saturated tendency in the elder great city districts such as Tôkyô, Ôsaka, etc. And increase of the productive power was especially conspicuous in the young industrial districts.

Reflecting the distribution of the trend of productive power, geographical distribution of the trend of the population growth showed a more remarkable concentrating tendency in the second period than the first.

While the concentrating centers of population in the first period continued to absorb population more rapidly in the second, emigrating regions caused emigration in the second period.

Changes in the index number of population pressure correspond to those of productive power. Regions where the population pressure index rose in the first, were four prefectures --- Miyagi, Saitama, Yamagata and Nagano, while in the second, such regions increased to eight prefectures --- Nagano, Yamanashi, Kumamoto, Kôchi, Gunma, Tottori, Kagoshima and Miyagi.

Regions where the population pressure index slightly decreased correspond to those where the increase of the productive power was feeble.

As to regions where the decline of population pressure were notable, such relations remained.
(were quite the same.)

Thus, the contrast between the regions where the increase of productive power was most rapid and these where increase (was) slowest, became more apparent in the second period than the first. As a whole, the unbalance in the geographical distribution of the trend of productive power, population growth, and accordingly the population pressure increased in the second period rather than the first.

(6) A factor which determines the growth rate of population is the productive power, especially that of modern high grade industries. Accordingly, the increase of the productive power is followed by the aggregation of population. Consequently, regions where the index of population growth is high, show high index of productive power and low index of population pressure. And the regions of the higher index of population growth are of the lower index of population pressure. For in such regions, the increase of productive power is more conspicuous than the growth of population. And then, at determines population pressure is productive power, especially that of modern high grade industries.

(7) It is important that the industrialization or increase of productive power which determines population pressure should be very elastic, both from the point of time series or of geographical distribution.

(8) In view of the trends of the population pressure index, we must take notice to the following districts: Hokkaidô, Tôhoku, Tôsan, Sanin, South parts of Shikoku and Kyûshû.

Among these districts, in Hokkaidô and Tôhoku we can find some elastic increase of the productive power. This means that the future increase of the population-supporting capacity of these districts is hopeful. In the other districts (No.) above mentioned, we can find nothing of this kind.

Especially, Tôsan and south Shikoku show the most undesirable conditions. It is an important

question.

question, how we can increase the productive power of these districts and magnify the supporting capacity of population, may, at least mitigate the present population pressure.

(No.) The rest of the districts reveal no sign of this kind.