SOME OBSERVATION ON INCOME DISTRIBUTION IN KOREA

by Myon-Suk Lee

1. General Remarks on Income Distribution:

During the last summer (1959), the Economic Development Council, a consultative institution to the Minister of Reconstruction, has made the first attempt to investigate income distribution in the town and city areas in Korea, with sample survey technique.

The survey covers about 3,000 family units whose income brackets range from 100,000 hwan ($200 at the official rate 500 to 1) to 9,000,000 hwan ($18,000), and the results of the survey are rather productive with showing two main charcatreistics of the income distribution; that is, (1) 50% of family units have only 24% of total national income; (2) an equality of the income distribution has decreaed, even though an average income per family unit has increased from 1958.[1)]

1) * The results of the survey have been published with a title— *The Report of Sample Survey on Income Distribution in Korea.* E. D C. Pub. No. 55.
Please refer to the Data No. 1

These two characteristics can be illustrated as follows:

(1) Assuming the figures obtained from the survey basically reliable, the average income is 564,000 hwan in 1959 with increasing by 5% from 1958, and 74% of the total family units are under the average income level (the average income families and downward). So 1% of the total family units in the upper income brackets (over 20,000,000 hwan) share 8% of the national income, and they have made their incomes increased by 60% (from 83 million hwan to 124 million hwan) during the period. On the other hand, the family units below 400,000 hwan income amount to 51% of the total family units, share only 27% of the income; and their aggregate income has decreased from 416 million hwan to 408 million hwan.

(2) According to the income distribution (Table. 1) Gang-Won and Chung-Buk Provinces have the most equitable income distribution in Korea; 70% of the family units in these provinces share a half of the income respectively. And. we could rounghly say that more the provinces have farm areas, the more they have lower income family units.

In this connection, one can notice the pattern of income distribution in the City of Seoul is close to Chulla province; in other words 74% of family units shares a half of income in the respective area. Considering the huge amounts of national wealth concentrate around the City of Seoul, it may be safe to say that the City has the largest discrepancy in income distribution.

We can not figure out the possible changes of income distribution in various provinces and Seoul City during the last year due to a lack of necessary data of 1958. However, as the Data No. 1 shows, 75.2% of the family units at the national level share only a half income.

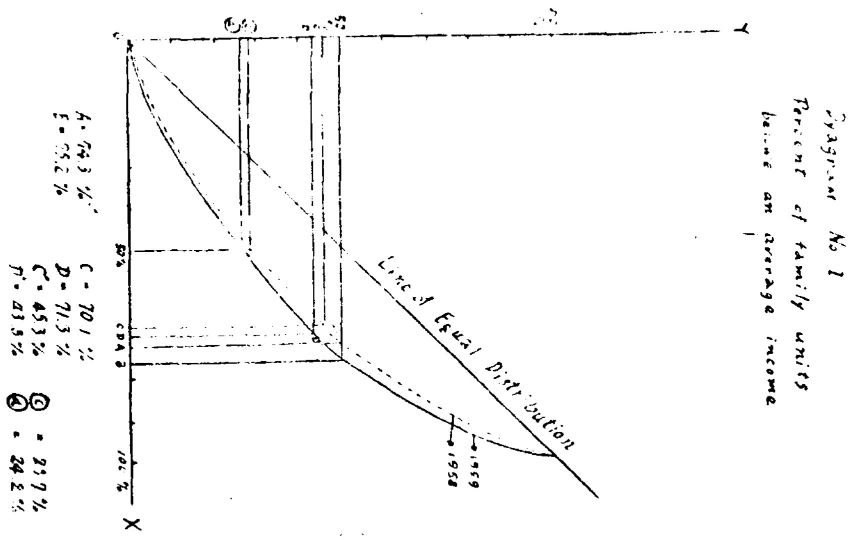
In the Data No. 2 we can see the Lorenze curve derived from these data. In the Dyagram No. 1, A and B indicate the percent of family units which share a half of the total incomes 1958 and 1959 respectively. This is, the point A shows 74.3% of family units sharing a half of the total in 1958 and the B tells 75.2% of family units in 1959 sharing a half of total income. The discrepancy between A and B is 1.1%, which means in 1958 shows much more equitable income distribution.

(Table 1). Percent of Family Units Sharing a Half of Total Income (1958)

Seoul City	73.5%
Province of Gungki	71.2%
〃 Gang Won	70.9%
〃 Choong Buk	70.4%
〃 Choong Nam	74.0%
〃 Chun Buk	73.7%
〃 Chun Nam	74.2%
〃 Kyung Buk	76.2%
〃 Kyung Nam	76.0%

The point C and D indicate the percents of family units which have under than the average income, respectively in 1958 and 1959. And, the average income of 1958 is 539,000 hwan, the point C indicates 70.1% while the average income of 1959 is 564,000 hwan, the point D 71.3%.

At the cross-points of the Lorenze curves and the two verticle lines from C and D, we can draw the two pararell lines which meet the Y axis at C" and D". Thus, the points C" and D" show that the family units, whose income are under the average, share 45.3% and 43.8% of the repective year's total incomes. Perhaps, it may be worth bringing our attention to that the points C" and D" are



necessarily located below the 50% points of the re'pective year's ncome, because in case of the absolute equality of income distribution the C" and D" can reach to the 50% points.

And, the point (c) and (d) indicate the percents of income shared by the a half of total family units in 1958 and 1959 respectively. In comparison of 1958 and 1959, the percents of total family units under the average income is larger in 1959 than 1958, but the percent of income shared by the family units in 1959 is less then that of 1958. In short, the less the income shared by a half of total family units is, the less proportion of income shared by the family units below an average income. The above conclusion can be expressed with the following mathematical terms:

$\frac{Tt+1}{Nt+1}$ .... The slop of the Lorenze curve of 1959.

$\frac{Tt}{Nt}$ .... The slop of the Lorenze curve of 1958.

Then $\frac{Tt+1}{Nt} < \frac{Tt}{Nt}$ .... (1)

($\because$ $Nt+_1 = N = 50\%$ and $Tt+_1 < Tt$)

Meanwhile, the proportion of the family units below the average income in 1959 is bigger than that of 1958, so $Nt+_1 < Nt$. Therefore, under the condition of (1), the percent of income shared by the family units should be $Tt+_1 < Tt$.

II. Pareto Coefficient of the Income Distribution:

From the Data No. 1—the Figures of Income Distribution—

we draw the Pareto coefficient— coefficient of equality in income distribution (Table 2 & 3) . Pareto expresses degree of income distribution in terms of a following equation:

$$\text{Log } N = \text{Log } A - \alpha \text{ Log } x \cdots\cdots\cdots\cdots (2)$$

In the equation, N represents number of income receivers or family units; x is income brackets, and A a constant number. And, he makes an assertion of a statistical law that the larger a absolute value of α (which is a trend coefficient of equality in income distribution) is, the more even the distribution of income.[2)]

However, in order to calculate an unknown constant number, we have to insert a certain numberical value, with an aid of logalism, to the following equation.

$$\varepsilon \text{ Long } N = n \text{ Log } A - \alpha \varepsilon \text{ Log } x \cdots\cdots\cdots\cdots (3)$$

(∵n is number of incoma brackets.)

With the logalism, we can calculate $\triangle$ Log N and $\triangle$ Log x.

Then, we may easily calculate

$$\varepsilon\triangle \text{ Log } N \div \varepsilon\triangle\text{Log } x = \alpha$$

Incidentally,

$$\triangle \text{ Log } N = \text{Log } Ni - \frac{\varepsilon\text{Log } N}{N}$$

$$\triangle \text{ Log } x = \frac{\varepsilon \text{ Log } x}{n} - \text{Log } xi$$

Now, from the above table 2, we can see in 1959

$$\varepsilon\triangle \text{ Log } x = -4,3855$$
$$\varepsilon\triangle \text{ Log } N = 7,4182$$

Therefore, $\alpha = -1.6928$; in other words, the equal coefficient of income distribution (henceforth, ID) is 1.7.

And, likewise we calculate the equal coefficient of ID in 1958 (—1.878) from the table 3

Thus, we see the coefficient of 1958 is larger than 1959, which means 1958 has more even ID. And, the discrepancy between the slops of ID in 1958 and 1959 in the above Lorenze curves also supports this feature.

2) There are two different interpretations in regard to a relation of Pareto's trend coefficient and degree of the discrepancy in ID. The writer takés the view of R. Benini on this matter; that is, α is proportional to equality of ID.

(Table 2.) Calculation of the Pareto Coefficient

— 4292 —
(1959)

(x)	(N)	log x	log N	$\triangle$ log x	$\triangle$ log N
10. thousand	2.691	4.000	3.4300	—1.8860	+1.1543

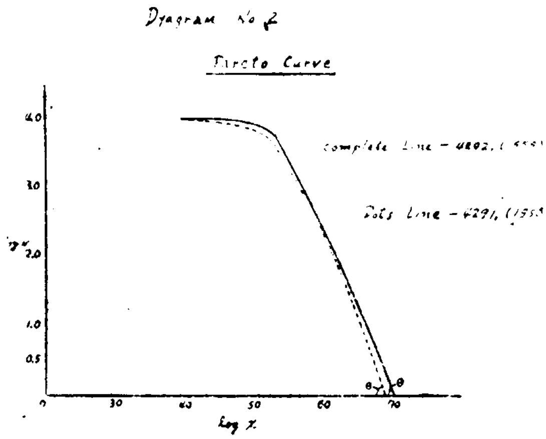
100.	"	2.555	5.000	3.4074	—0.8860	+1.1310
200.	"	2.295	5.3010	3.3608	—0.5850	+1.0851
300.	"	1.780	5.4771	3.2504	—0.4089	+0.9747
400.	"	1.310	5.6021	3.1173	—0.2839	+0.8416
500.	"	951	5.6990	2.9782	—0.1870	+0.7025
600.	"	686	5.7782	2.8363	—0.1078	+0.5606
700.	"	482	5.8451	2.6830	—0.0409	+0.4073
800.	"	371	5.9031	2.5694		+0.2937
900.	"	289	5.9542	2.4609		+0.1852
1.000.	"	228	6.000	2.3579		+0.0822
1.200.	"	228	6.000	2.3579		
1.400.	"	87	6.1461	1.9395		
1.600.	"	63	6.2041	1.7993		
1.800.	"	48	6.2553	1.6812		
2.000.	"	29	6.3010	1.4624		
2.500.	"	19	6.3979	1.2788		
3.000.	"	13	6.4771	1.1139		
4.000.	"	9	6.6021	0.9542		
5.000.	"	5	6.6990	0.6990		
	Average		5.8861	2.2758		
	Total		117.7216	45.5166	—4.3855	+7.4182

(Table 3.) Calculation of Pareto Coefficient

— 4291 —

(1958)

(x)		(N)	log x	log N	△log x	△log N
10.	thousand	2.691	4.000	3.4300	—1.8860	+1.2443
100.	"	2.532	5.000	3.4033	—0.8860	+1.2176
200.	"	2.271	5.3010	3.4033	—0.8860	+1.2176
300.	"	1.740	5.4771	3.2405	—0.4089	+1.0548
400.	"	1.268	5.6021	3.1032	—0.2839	+0.9175
500.	"	914	5.6990	2.9609	—0.1870	+0.7752
600.	"	648	5.7882	2.8116	—0.1078	+0.6259
700.	"	458	5.8451	2.6609	—0.0409	+0.4752
800.	"	352	5.9031	2.5465		+0.3608
900.	"	273	5.9542	2.4362		+0.2505
1.000.	"	214	6.000	2.3304		+0.1447
1.200.	"	124	6.0792	2.0934		
1.400.	"	76	6.1461	1.8808		
1.600.	"	51	6.2041	1.7076		
1.800.	"	35	6.2553	1.5441		
2.000.	"	23	6.3010	1.3617		
2.500.	"	11	6.3979	1.0414		
3.000.	"	8	6.4771	0.9031		
4.000.	"	4	6.6021	0.6021		
5.000.	"	2	6.6990	0.3010		
	Average		5.8861	2.1857		
	Total		117.7216	43.7149	—4.3855	+8.2368



of ID in 1958 and 1959 in the above Lorenze curves also supports this feature.

Drawing this feature in the Pareto curve (Dyagram No. 2), we ee᷉a complete line tan $\theta = |\alpha| = 1.7$ in 1959, and the dotted line an $\theta = |\alpha| = 1.8$ in 1958.[3] The bigger tan θ, which is closee to 90 degrees, the more even ID.

t If we express this statement in terms of equation, then

$$-\alpha = \frac{d\log N}{d\,Log\,X} = \frac{dN}{dX} = \frac{X}{N}$$

(This equation can be derived from the above equation (2) by differentation.)

The equation indicate that, when the rate of increasing mumber of income receivers is bigger than the rate of income increased, ID will become more even.[4]

In other words, as the income receivers of obtaining the marginal income (dN ÷ dx) increase, or the lower income receivers increase more rapidly than the higher income receivers, than ID will become more even.

3) The Pareto's coefficients of major countries are:

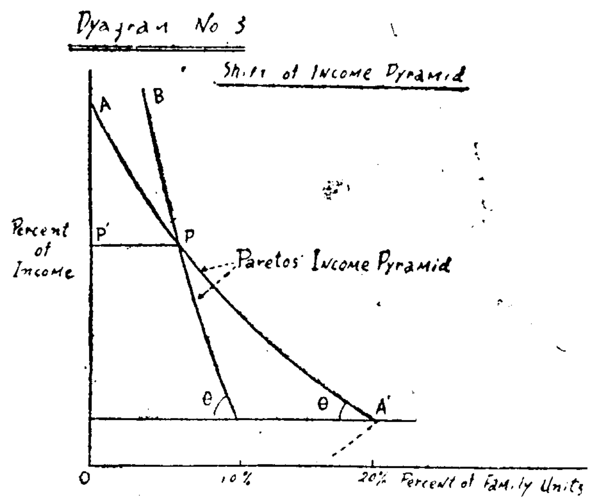
U. S. A.	1914 - 1953	1.62
U. K.	1932	1.68
Germany	1934	1.96
France	1934	1.82
Austraria	1934	2.25
Finland	1934	2.65
Japan	1946	2.02
Holland	1931	1.76

4) National income of 1959 has increased by 5% from 1958, yet the family units below an average income in 1959 has increase by 1.1% (1,919 family units in 1959 and 1,887 family units in 1958)

However, it should be pointed out that more even distribution of income does not necessary correspond to general upward movement in ID as a result of economic growth. In other words, there can be more even distribution of income with a less average income under a condition of decreased national income. In this regard, most classical economists assume the constant economic growth.[5]

The following Pareto's Dyagram shows a relation between an aggregate income and family units.

In the dyagram the lower income family units decrease from the point A' to B'. In other words the original income bracket line A A' shifts to B B' and tan $\theta = |\alpha|$ is getting bigger which means the ID become more even.



5) A. Smith, Wealth of Nations, Cannan ed. vol. I. P. 80. And, D. Ricardo; J. S. Mill; A. Marshall, and A. C. Pigou have led to the same conclusion in this regard.

Now, in the above Lorenze curves, let us calculate the sizes of the areas between Equal Distribution Line and the actual distribution lines, since the size of the areas are an indicator of degree of discrepancy in income distribution. The size of the areas:

$$\lambda = \int_0^1 (y-z)dz = \int_0^1 ydz - \frac{1}{2}$$

(∵ λ ························· Total size of the area

z ························· Horizental axis ······ percent of family units

y ························· Verticale axis ······ percent of

.... aggregate income)

and $\lambda = \frac{1}{2(\alpha-1)}$ here α is Pareto's coefficient.

Thus, λ of $1958 = \frac{1}{2(2\times1.8-1)} = \frac{1}{5.2}$

λ of $1959 = \frac{1}{2(2\times1.7-1)} = \frac{1}{4.8}$ ....

In comparison of two years,

λ of 1958 $<\lambda$ of 1959, that is $\frac{1}{4.8} - \frac{1}{5.2} = \frac{0.4}{2.5}$.

This indicates in 1959 discrepancy of ID has increased.

(Incidentally, the area of xy $=1$, and $0<\lambda<\frac{1}{2}$)

III. Degree of Inequality in Income Distribution and Economic Welfare.

What sort of conclusion or significance can we draw from the above said trend of income distribution in Korea?

What is a proper degree of equality in income distribution from the viewpoint of general economic welfare or economic growth?

Of course, there could be various arguments on the above questions, because the above questions involve so many factors; and no one can assert an absolute equaritarian with resonable justification. Meanwhile, it is a generally accepted that there should be a certain degree of inequality in ID for economic incentive and necessary saving for capital formation. However, there must be also a certain limit to this inequality. Furthermore, the recent economic theory rejects Say's law on supply and demand; and warns over-saving with declining propensity to consume. And, in the advanced countries, the governments take positive measures, for achieving a fair distribution of income through progressive taxation and social security scheme.

In this article, we mainly concern with theoretical aspects of economic welfare, mainly through A. C. Pigou's interpretation of economic welfare. In other words, prof. Pigou regards economic welfare in terms of economic utility, which can be measurable.[6)]

6) A. C. Pigou, The Economic of Welfare, 1920.

This view bases on the law of dimmnishing returns. In other words, as amounts of income rise beyond a certain limit, the marginal welfere obtaining from the additional income is getting decreased. Thus, from a certain amount of income an individual receives, there can appear some discrepancy in relation of an additional income and welfeare or economic utility derived from it. Same thing can be said to a nation or society as whole, as D. Bernoulli's hypothesis"

Income has to increase proportionally among various income groups in order to have even increase of economic welfare from the income indicates."7) Thus, the relationship between Welfare (w) and income

(x) can be expressed as $dw = \frac{dx}{x}$ so, $w = \text{Log}x + c$.

Then, adding an arithmetical average income (xa) of total income to this equation, calculate total economic welfare of the income $Nw = n \text{ Log } xa + nc$ (∴ n is number of income receivers) with a following equation;
However, welfare of individual income receiver is $w' = \text{Log } x + c$ rather than $w = \text{Log}x + c$

Thus, taking account of the discrepancy between w and w' which can be expressed in geometrical term, total amounts of economic

welfare can be, $\varepsilon w = \text{Log } x + nc = n \text{ Log } xg + nc$
And, the discrepancy between εw and Nw is;

$$\frac{Nw}{\varepsilon w} = \frac{n\text{Log}xa + c}{n\text{Log}xg + c} = \frac{\text{Log}xa}{\text{Log}xg} = d$$

7) H. Dalton, Some Aspects of the Inequality of Income in Modern Communities, 2nd ed., London, 1925.

Now, the arithmetic average income of 1958, is 539,000 (xa) and the geometric average income 437,000 hwan (xg), so d=1,017 in 1958, and in 1959 we can get

$$\begin{aligned} xa &= 564{,}000 \text{ hwan} \\ xg &= 447{,}000 \text{ hwan} \\ d' &= 1{,}018 \end{aligned}$$

In comparison of d and d', we can easily notice that the increasing average income doesn't accompany with increased amount of economic welfare from 1958.8)

8) In order to have equal increase of income in various income brackets, there should be either even additional income or even ratè of additional increase in the various brackets. For instance,

If rate of additional increase $= \theta$, then,

$$Xa \rightarrow Xa\,(1+\theta) \qquad Xg \rightarrow Xg\,(1+\theta)$$

Thus, $\frac{\text{Logxa}}{\text{Logxg}} > \frac{\text{Log}\theta + \text{Logxa}}{\text{Log} + \text{Logxg}}$ ………………This

equation shows a discrepancy between increased income and economic welfare from it, which is decreased.

Data No. 1

Figures of Income Distribution

Unit : Thousand Hwan

Classification	Family Units (1959)	(1958)	%		The Aggregate Family Units		%
Income Bracket	4292	4291	4292	4291	4292	4291	4292
0 — 100	136	159	5.1	5.9	136	159	5.1
100 — 200	260	261	9.7	9.7	396	420	14.7
200 — 300	515	261	19.1	19.7	911	951	33.9
300 — 400	470	472	17.5	17.5	1,381	1,423	51.3
400 — 500	359	354	13.3	13.2	1.740	1.777	64.7
500 — 600	265	257	9.8	9.6	2.005	2.034	74.5
600 — 700	204	199	7.6	7.4	2.209	2.233	82.1
700 — 800	111	106	4.1	3.9	2.320	2.339	86.2
800 — 900	82	79	3.0	2.9	2.402	2.418	89.3
900 — 1,000	61	59	2.3	2.2	2.463	2.477	91.5
1,000 — 1,200	91	90	3.4	3.3	2.554	2.567	94.9
1,200 — 1,400	50	48	1.9	1.8	2.604	2.615	96.8
1,400 — 1,600	24	25	0.9	0.9	2.628	2.640	97.7
1,600 — 1,800	15	16	0.6	0.6	2.643	2.656	98.2
1,800 — 2,000	19	12	0.7	0.4	2.662	2.668	98.9
2,000 — 2,500	10	12	0.4	0.4	2.672	2.680	99.3
2,500 — 3,000	6	3	0.2	0.1	2.678	2.683	99.5
3,000 — 4,000	4	4	0.1	0.1	2.682	2.687	99.7
4,000 — 5,000	4	2	0.1	0.1	2.686	2.689	99.8
5,000 — 9,000	5	2	0.2	0.1	2.691	2.691	100.0
Total	2.691	2.691	100.0	100.0	2.691	2.691	100.0

	Total Income		The aggregate Income		%	
4291	4292	4291	4292	4291	4292	4291
5.9	13.600	15.900	13.600	15.900	0.9	1.1
15.6	52.000	52.200	65.600	68.100	4.3	4.7
35.3	154.500	159.300	220.100	227.400	14.5	15.7
52.9	788.000	188.800	408.100	416.200	26.9	27.7
66.0	179.500	177.000	587.600	593.200	38.7	408
75.6	159.000	154.200	746.600	747.400	49.1	51.4
83.0	142.800	139.300	889.400	886.700	58.5	61.0
86.9	88.800	84.800	978.200	971.500	64.4	66.9
89.8	73.800	71.100	105.200	1,042.600	69.2	71.8
92.0	61.000	59.000	1,113.000	1,101.600	73.2	75.8
95.4	109.200	108.000	1,222.200	1,209.600	80.4	83.3

97.2	70.000	67.200	1,292.200	1,276.800	85.0	87.9
98.1	38.400	40.000	1,330.600	1,316.800	87.6	90.7
98.7	27.000	28.800	1,357.600	1,345.600	89.3	92.6
99.1	38.000	24.000	1,395.600	1,369.600	91.8	94.3
99.6	25,000	30.000	1,420.600	1,399.600	93.5	96.4
99.7	18.000	9.000	1,438.600	1,408.600	94.7	97.0
99.8	16.000	16.000	1,454.600	1,424.600	95.7	98.1
99.9	20.000	10.000	1,474.600	1,434.600	97.0	98.8
100.0	45.000	18.000	1,519.600	1,452.600	100.0	100.0
100.0	1.519.600	1.470.600	1.519.600	1.452.600	100.0	100.0

Data No. 2 (Dyagram)

Lorenz Curve