

Poverty Perception and Income Distribution in Korea

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Starting with a simple utility function, this paper attempts to derive the concepts of income and distribution effects on poverty. A new concept of marginal propensity to feel is also established and estimated. Results show high statistical significances based on Korean data.

I

A number of studies has in the past shown that it would almost be an unattainable task to establish an unanimously agreed-upon poverty income line in Korea [1]. The situation may have been the same in other countries as well. There are in general three levels of poverty incomes in Korea ; the first being an "official" line, based on which the government authority doles out subsidies, grants, etc to those households whose income falls below the line ; the second a level supported by the labor unions, which allegedly based on costs of living ; and the last one estimated by scholarly circles. Since each of these lines somehow reflects one's own interest, it is not unnatural that the level suggested by the labor unions is always highest while that of the government lowest.

It is widely convinced that there are several definitions of poverty income level and all of these definitions are worth to be paid attention. An institutionalized level may officially be imposed upon in implementing government welfare policies while a subjective but controversial level may statistically be estimated for academic interests

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among others [4]. This paper deals with estimations of subjective poverty income based on utility function approach, identification of factors that determine the poverty income line, and estimation of influences of identified factors on the poverty income line in Korea.

II

Suppose we have a utility function established for the i th household as

$$U_i = U_i(y_i, \mu, \sigma^2) \quad (1)$$

$$\frac{\partial U_i}{\partial y_i} > 0, \quad \frac{\partial^2 U_i}{\partial y_i^2} < 0, \quad \frac{\partial U_i}{\partial \mu} < 0, \quad \frac{\partial U_i}{\partial \sigma^2} < 0 \quad (2)$$

where U_i , y_i , μ , and σ^2 denote the i th household's utility level, the i th household's income, a mean income of the society where the i th household belongs and an inequality measure of size-income distribution of the society. Equations (2) indicate that Equation (1) is a positive function of household income with diminishing utility and that one feels poorer as the mean social income increases and income distribution is more deteriorated.

Taking total differentiation of Equation (1), Equation (3) is obtained.

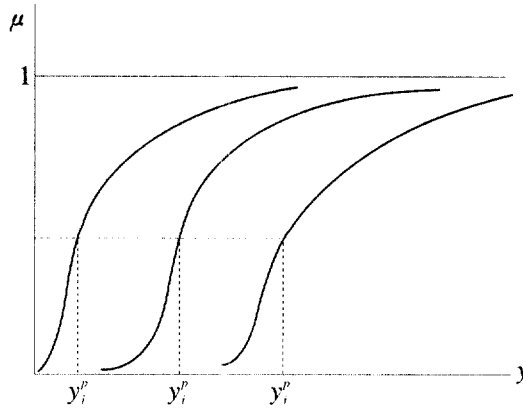
$$dU_i = \frac{\partial U_i}{\partial y_i} dy_i + \frac{\partial U_i}{\partial \mu} d\mu + \frac{\partial U_i}{\partial \sigma^2} d\sigma^2 \quad (3)$$

With given levels of μ and σ^2 in a short run, Equation (1) may be rewritten with an explicit consideration of a poverty utility level and its corresponding income level, which may safely be defined as poverty income line, as Equation (4)

$$U_i^p = U_i(y_i^p, \mu, \sigma^2) \quad (4)$$

Since a utility level, at which a household feels poor, may be considered fixed, Equation (3) can be rewritten as Equation (5), letting $dU_i^p = 0$.

<Figure 1>



$$dy_i^p = \frac{- \left(\frac{\partial U_i}{\partial \mu} d\mu + \frac{\partial U_i}{\partial \sigma^2} d\sigma^2 \right)}{\frac{\partial U_i}{\partial y_i}} \tag{5}$$

The analysis made so far may succinctly be illustrated in <Figure 1>. In the diagram *x*-axis denotes household income while *y*-axis the utility associated with income. The relation between income and utility is drawn in an ogive between zero and one scale. As the mean social income increases, the income-utility ogive shifts to right with given income distribution, and the poverty income line also has to shift to right to reach the same utility level of poverty.

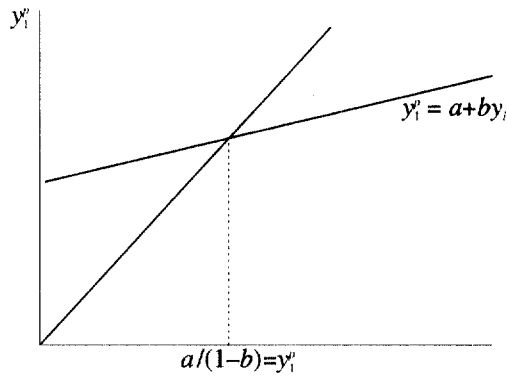
Once Equation (5) is aggregated over *i*, we have a function as Equation (6)

$$y^p = f(\mu, \sigma^2) \tag{6}$$

where the income effect $\frac{\partial y^p}{\partial \mu} > 0$ and the distribution effect $\frac{\partial y^p}{\partial \sigma^2} > 0$

In aggregating Equation (5) and consequently deriving Equation (6), the Leiden method may be employed. Each of households under survey is asked to indicated current income and the minimum income level at which the household would feel poor. Under the hypothesis that lower the level of current income, the minimum poverty level of income would be lower and vice versa, an linear equation is established between the

<Figure 2>



current income as an explanatory variable and the poverty income line at which the household feels poor as an explained variable.

$$y_i^p = a + by_i + u_i \tag{7}$$

with a further hypothesis that $0 < b < 1$. Equation (7) tells us that at a lower current income level a household would indicate an underbiased poverty income line while the opposite is true with case of a higher income household. In order to eliminate both biases an $y_i^p = y_i$ level poverty line is obtained as

$$y_i^p = a / (1-b) \tag{8}$$

which may simply be illustrated as <Figure 2>.

Equation (8) again reflects the hypothesis incorporated in Equation (5).

III

Data needed to establish poverty income line were collected for the year 1980, 1994, and 1995 respectively. Poverty income lines for remaining years from 1970 through 1992 were quoted from estimates made by other researchers [4]. Detailed explanation concerning 1980 estimates has already been reported elsewhere [5]. The two most recent estimates from 1994 and 1995 were based on the survey data collected through the efforts made by the ministry of Health and Welfare. 632 and 549 households were

〈Table 1〉 1994 Survey Responses

No. of Household Members	No. of Responses	No. of Responses Used in Analysis
1	44	39
2	64	64
3	121	121
4	199	183
5	119	119
6 and more	85	85
Total	632	611

〈Table 2〉 1995 Survey Responses

No. of Household Members	No. of Responses	No. of Responses Used in Analysis
1	47	47
2	58	57
3	107	106
4	183	181
5	99	98
6 and more	55	52
Total	549	541

asked for 1994 and 1995, respectively, concerning number of members of family, current monthly disposable income, gender of head of household, type of housing, and the poverty income line the households consider as the lowest level to survive. Not all of the responses were usable due to inconsistent and irrational figures in the questionnaires. The summary of the two survey is shown in 〈Table 1〉 and 〈Table 2〉. A number of trial regressions were made to test several hypothesis. Some of important hypothesis tested are as follows :

1. Gender of head of a household plays a significant role in establishing a poverty income line. Rejected.
2. Ownership of the house the household occupies plays a significant role in establishing a poverty income line. Rejected.
3. Gender and ownership jointly affects to a poverty income line. Rejected.
4. Current household income plays a significant role in establishing a poverty income line. Accepted.

<Table 3> 1994 Estimates and Statistics of $y^p = \hat{a} + \hat{b}y + \hat{u}$

No. of variables	r^2	\hat{a}	\hat{b}	Statistics	$\frac{\hat{a}}{1-\hat{b}}$ (95%)
	(F)	(t-statistics)	(t-statistics)	(t, F)	
using all data	0.352 0.351	37.531 (12.715)	0.647 (18.192)	330.970 (1, 609)	1,063,201
only 1	0.690 0.681	14.313 (6.944)	0.608 (9.067)	82.207 (1, 37)	461,710
only 2	0.245 0.233	32.502 (6.118)	0.416 (4.483)	20.094 (1, 62)	556,849
only 3	0.169 0.161	40.686 (5.926)	0.502 (4.912)	24.125 (1, 119)	816,988
only 4	0.230 0.226	50.721 (8.092)	0.525 (7.353)	54.065 (1, 181)	1,067,811
only 5	0.340 0.335	44.988 (5.971)	0.623 (7.771)	60.390 (1, 117)	1,193,316
more than 5	0.198 0.188	73.008 (7.156)	0.436 (4.522)	20.489 (1, 83)	1,294,468

<Table 4> 1995 Estimates and Statistics of $y^p = \hat{a} + \hat{b}y + \hat{u}$

No. of variables	r^2	\hat{a}	\hat{b}	Statistics	$\frac{\hat{a}}{1-\hat{b}}$ (95%)
	(F)	(t-statistics)	(t-statistics)	(t, F)	
using all data	0.190 0.188	70.206 (21.258)	0.317 (11.239)	126.316 (1, 539)	1,028,697
only 1	0.556 0.546	23.319 (5.013)	0.502 (7.504)	56.309 (1, 45)	468,253
only 2	0.408 0.397	47.785 (6.938)	0.427 (6.213)	38.602 (1, 56)	833,944
only 3	0.143 0.135	76.217 (12.625)	0.203 (4.147)	17.194 (1, 103)	956,299
only 4	0.082 0.077	87.550 (14.105)	0.205 (4.002)	16.013 (1, 179)	1,101,258
only 5	0.072 0.062	97.039 (10.693)	0.200 (2.726)	7.432 (1, 96)	1,212,988
more than 5	0.153 0.137	86.650 (6.595)	0.308 (3.011)	9.064 (1, 50)	1,252,168

〈Table 5〉 Degree of Lognormal Fitness in Terms of r

Year	r	Year	r
1970	0.9995	1983	0.9977
1971	0.9913	1984	0.9979
1972	0.9972	1985	0.9948
1973	0.9952	1986	0.9926
1974 ¹⁾	0.9711	1987	0.9861
1975	0.9967	1988	0.9793
1976	0.9972	1989	0.9948
1977	0.9979	1990	0.9860
1978	0.9984	1991	0.9746
1979	0.9988	1992	0.9985
1980 ¹⁾	0.9874	1993	0.9965
1981 ¹⁾	0.9803	1994	0.9969
1982	0.9961	1995	0.9948

1) Fitness tests were made in PDF form instead of CDF.

From 〈Table 3〉 and 〈Table 4〉, it is immediately clear that, as number of members of household increases, the poverty income line rises. However, the steps of increases in the poverty income lines do not show consistency between 1994 and 1995. In 1994, the highest jump was made between two-member households and three-member households, while in 1995 it happened between one and two. The results of two surveys for 1994 and 1995, however, show a striking similarity.

The mean household income was simply obtained from the Family Income and Expenditure Survey (Household Survey) data compiled by the National Statistics Office. Under the hypothesis that household income distribution follows a lognormal probability density function, the data from the Household Survey were fitted into lognormal distribution and the test results are very significant as shown in 〈Table 5〉. The second centered moments of lognormal distributions are used as measures for inequality of household income distribution. These are basic data used for tests.

IV

It is now fairly simple to test the following hypothesis :

1. The income effect on poverty income lines is positive. In terms of marginal

<Table 6> Estimates and Relevant Statistics of Equation (9)

Estimates	0.7911	2.1561	$r^2 = 0.8940$	1.0876
t-statistics	33.7969	2.1698	$\bar{r}^2 = 0.8874$	

propensity to feel poor (MPFP), $\frac{\Delta y^p}{\Delta y}$, it is less than one.

2. The distribution effect on poverty income line is also positive, i. e., one feels poorer, as inequality in household size-income distribution worsens.
3. With industrialization and increasing per household income in general, poverty incidence in Korea show a drastically declining trend.

In order to test Hypotheses 1 and 2, several forms of regressions have been tried and the best result is obtained as

$$\ln y_i^p = \beta \ln \mu_i + \gamma \sigma_i^2 + u_i \tag{9}$$

where β indicates an income elasticity of poverty perception, i. e.,

$$\beta = \frac{\partial y^p}{\partial \mu} \frac{\mu}{y^p} \tag{10}$$

The estimates are obtained as shown in <Table 6>. Estimates and relevant statistics show that Hypothesis 1 and 2 are accepted with significance of more than 95 percent, and the MPFP is calculated at around 0.14 when ₩10,000 increment is realized in mean household income. The basic data used in the estimation of Equation (9) are summarized in <Table 7>.

It is also simple to test Hypothesis 3. Based on the estimated poverty income line, the cumulative share of households up to that line is estimated annually from the fitted lognormal distribution of household income, as shown in <Table 9>, and the following Equation (11) is estimated

$$p = k \exp(\alpha \mu) \tag{11}$$

where p is the poverty incidence in percentage, μ mean household income, and k and α two parameters to be estimated. Estimates of k and α and relevant statistics are shown in

〈Table 7〉 Household Income, Poverty Lines and Inequality

1970	28180	233177	2751	22763.31	0.22220			8.27
1971	33340	243185	3438	25077.08	0.20490			7.29
1972	38080	248732.7	4129	26969.99	0.20820			6.53
1973	45850	290608.1	5276	33440.52	0.23830			6.33
1974	47780	243259.4	7290	37115.13	0.22450			5.09
1975	65540	266276.5	10190	41400.02	0.31770			4.06
1976	88270	311128.8	13829	48743.62	0.34790			3.52
1977	105910	338836.2	17156	54886.92	0.37860			3.19
1978	144510	403921.8	22465	62792.22	0.35130			2.79
1979	194794	460276.7	28239	66741.05	0.33010			2.36
1980	234048	429873.0	33744	61967.12	0.33800			1.83
1981	280953	424362.9			0.33730	58639.68	38834.23	1.51
1982	317052	447239.1			0.34120	61642.95	43718.40	1.41
1983	364019	496805.8	49088	66994.31	0.33860			1.36
1984	402297	536670.8			0.35770	73784.81	55477.30	1.33
1985	431183	561400.3			0.36520	77708.45	59775.73	1.30
1986	481018	609227.1			0.36040	82047.34	65116.93	1.26
1987	561675	690557.9			0.37730	93960.20	77016.56	1.22
1988	657215	754580.1	74221	85216.70	0.35140			1.14
1989	804900	874044.0	79491	86319.66	0.33870			1.08
1990	943300	943300.0	85055	85055.00	0.33910			1.00
1991	1155860	1056371.0	90766	82757.23	0.32130			0.91
1992	1356100	1168044.0			0.29062	118723.80	138050.93	0.86
1993	1477800	1211796.0			0.28904	121205.06	163790.62	0.82
1994	1701300	1310001.0	266953	205553.81	0.30237			0.77
1995	1911100	1414214.0	275315	203732.73	0.30414			0.74

- Source: (1) NSO Household Survey data in terms of per household per month.
(2) (1) × (8)
(3) See Yoon [4]. Per capita per month data based on 4-member households.
(4) (3) × (8)
(5) σ^2 of Lognormal PDF
(6) \hat{y}^p from Equation (9)
(7) (6) / (8)
(8) Official CPI Inverse.

〈Table 8〉 Trend Estimates

Parameter	β	α	ρ
Estimates	36.070	- 0.00000296	0.677
<i>t</i> -statistics	10.713	- 6.839	

〈Table 9〉 The Data Used in Estimation of Equation (1)

Year	Poverty Income Line	Log Value of Poverty Income Line	Percentage under Poverty Income Line
1975	40760.000	10.615	28.887
1976	55316.000	10.921	31.155
1977	68624.000	11.136	34.862
1978	89860.000	11.406	30.793
1979	112956.000	11.635	24.990
1980	134976.000	11.813	25.333
1981	173589.001	12.064	20.354
1982	191923.776	12.165	19.507
1983	196352.000	12.188	22.092
1984	235223.752	12.368	18.478
1985	249862.551	12.429	18.330
1986	267630.582	12.497	16.438
1987	311146.902	12.648	16.818
1988	296884.000	12.601	14.458
1989	317964.000	12.669	10.044
1990	340220.000	12.737	7.070
1991	363064.000	12.802	3.885
1992	538398.627	13.196	4.330
1993	624042.262	13.343	5.441
1994	993065.160	13.809	16.378
1995	1021418.650	13.837	12.798

〈Table 8〉. Even though the degree of fitness is not very good, the Student *t*-statistics of α estimate shows a strong significance, which statistically supports the hypothesis that the poverty incidence has declined over time along with increasing mean household income. The data used in the estimation of Equation (11) is shown in 〈Table 9〉.

V

An absolute poverty income level which demarcates one kind of biological survival level of income may be used as one of plausible indicators of measuring poverty in a least developed country. However, as an economy grows and less number of households

experience this type of poverty, a feeling of relative deprivation among a low income group would be more appropriate in measuring an overall poverty, which may be termed as relative poverty. This study has attempted to measure this latter type of poverty, which low income group population may subjectively perceive.

The level of utility at which an average household feels poor may not be associated with a fixed income level that permits biological survival. It may vary relying on what other people consume and where one is situated in the social strata of economic life. Based on the time-series data of Korea, it is evidenced that poverty perception among low income group of people highly depends upon the gap between one's own income and an average income of the society and how unequally income is distributed socially. However, it is also witnessed that as an economy is getting more prosperous, the poverty incidence, i. e., the proportion of population feeling subjectively poor, declines.

❖ REFERENCES ❖

1. Choo, Hakchoong, Bark, Soon-II and Suk Bum Yoon, "Korea : Poverty in a Tiger Country," Chapter 6 in Else Oyen, S. M. Miller and Syed Abdus Samad (eds.), *Poverty A Global Review*, Oslo: Scandinavian University Press, 1996, pp. 86 ~ 99.
2. Hagenaaars, A. J. M. and B. M. S. van Praag, "A Synthesis of Poverty Line Definition," *Review of Income and Wealth*, 31(2), 1985, pp. 139~153.
3. National Statistical Office, *Annual Report on the Family Income and Expenditure Survey*, Various Issues.
4. Yoon, Suk Bum, *Poverty in Korea*, Seoul ; Sekyungsa, 1994.
5. ——— and Tae Kyu Park, "Strategies and Programmes for Raising the Productivity of the Poor and the Eradication of Poverty in Korea," Chapter 6 in S. Mukhopadhyay (ed.), *The Poor in Asia : Productivity-Raising Programmes and Strategies*, Kuala Lumpur; Asian and Pacific Development Centre, 1985, pp. 451~537.