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# THE IMPACTS OF PRICE AND INCOME CHANGES ON EXPENDITURE INEQUALITY OF KOREAN FARM HOUSEHOLD

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## I. Introduction

It is a commonplace to state that Korean standard of living and level of farmily income have been soared since the early of 1960's, but few people realize just how small the average Korean living cost really is, or how great is the range between the highest and the lowest living cost. In connection with this, Is the consumption expenditure or levels of living more equal today than it was in the past? Is there a relation between the economic growth and the expenditure distribution? If yes, what is the relationship between the inequality of expenditure and the income distribution in line with income growth and price change? These questions have attracted a good deal of attentions in Korea recently.

During the last several years there has been a definite shift of interest in the concern for economic development from that of economic growth to that of income distribution. Notable contributions have been made by Ban (1979), Choo (1978), Adelman (1974), which analyze trends in the overall income distribution and/or sources of income distribution in Korea. The last few years have witnessed a change in the tide-researchers have become deeply involved in the problems of poverty and expenditure distribution. Much contributions in the studies of poverty have been made by Suh (1979) which analyzed overall poverty and basic needs for Korean households. In abroad Mizoguchi and Saeki (1978) have done a study on expenditure inequality for Japanese case, but their paper does not involve the relationships among expenditure inequality and price as well as income change.

The present study is an attempt to examine the impacts of price and income changes on the expenditure inequality of Korean farm from 1963 to 1977.

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In Section II the Model is specified. In the following Section empirical results are discussed. Some implications are given in the last Section.

## II. Methodology

*A. The Data Sources and Scope of the Study*

The data on expenditure and income used for this study are taken from the "Farm Household Economy Survey" conducted by the Ministry of Agriculture and Fisheries, and the price data are taken from the "Price, Wages, and Charges Survey in Rural Area" conducted by the National Agricultural Cooperative Federation.

The present study mainly deals with the following expenditure items: food and beverage, housing, fuel and light, clothing, education, and miscellaneous expenditure.

*B. Model Specification*

This section is focused on the measurement of the effects of price and income changes on the expenditure inequality. For this purpose the following null hypotheses are presented:

(1) there is no change in expenditure inequality due to change in relative price.

(2) there is no change in expenditure inequality due to change in real income.

In testing these hypotheses we assume that expenditure inequality is a function of price and incomes, in which the income variables consist of classified incomes belong to different household groups ranked from the poorest to the richest. That is, the expenditure inequality function can be written as,

$$CR_j = f(P_j;\ Y_i)$$

where:

$CR_j =$ expenditure inequality represented in Gini concentration ratio in jth expenditure category.

$P_j =$ relative price level in jth bundle of commodity.

$Y_i =$ real income in ith income group, 1 . . . n.

If taking logarithmic transformation in both sides. We get the expenditure inequality equation in terms of price and income variables as follows:

$$(1) \quad \ln CR_j = a_j + \alpha_j \ln P_j + \sum_{i=1}^{n} \beta_{ij} \ln Y_i + \omega_j$$

where $\omega$ is the random disturfance.

The (1) shows the expenditure inequality equation in logarithmic form,

in which the degree of inequality of expenditure is explained by the income and price variables.

a. Specified Model

In practice, the following model is employed to test the given hypotheses in this study.

$$(2) \quad \ln CR_j = a_j + \alpha_j \ln P_j + \beta_{Lj} \ln Y_L + \beta_{Hj} \ln Y_H$$

where:

$Y_L$ = mean income of 60 percent household group from the lowest (poorest)

$Y_H$ = mean income of 40 percent household group from the highest (richest)

$j$ = expenditure categories such as food and beverage(FD), housing (HO), fuel and light(FL), clothing(CL), education(ED), and miscellaneous expenditure(MI).

b. Characteristics of employed variables

The model, in any case of categories, has three explanatory variables: relative price index, mean income of lower group, and mean income of higher group. The price index of a given bundle of commodity (or category) is deflated by the Price Index Paid by Farmers for Farm household Goods in place of the Price Index Paid by Farmers for All Goods so that relative price index is employed as price variable in the model. This is because the relative price concepts may have advantages in examining the real trends of price changes among all given items as compared to nominal price concepts.

As discussed earlier, expenditure inequality is a function of several mean incomes belong to classified income groups from the poorest to the richest. In the process of fitting the regression of the expenditure inequality function, it was found that as we increased the number of income variables in the model the results of regression shows statistically and logically worse than as employed a few number of income variables even though the coefficient of determinant $R^2$ shows high level. This may be owing mainly to the multicollinearity among the income variables. To avoid this specific problem and to find out significant and reasonable relationships between inequality and income changes, the specified model employs two kinds of incomes such as lower group's mean income and higher group's mean income. In order to make real value, income was deflated by Price Index Paid by Farmers for Household Goods.

While, the specified model holds Gini concentration ratio as the dependent variable. This Gini ratio was computed by using the Kakwani and Podder method (1976) which introduces a new coordinate system for the Lorenz curve. Table 1 shows the trends and changes of inequality

TABLE 1 TRENDS AND CHANGES OF INEQUALITY BY OVERTIME AND CATEGORIES, IN RURAL AREA, EQPUBLIC OF KOREA, 1963–77.

| | GINI CONCENTRATION RATIO (CR) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | TC | FD | | FL | | HO | | CL | | ED | | MI | |
| 1963 | 0.1834 | 0.1403 | (5) | 0.1118 | (6) | 0.1839 | (4) | 0.2483 | (3) | 0.4317 | (1) | 0.2875 | (2) |
| 1964 | 0.1870 | 0.1467 | (5) | 0.1058 | (6) | 0.2249 | (4) | 0.2475 | (3) | 0.4133 | (1) | 0.2650 | (2) |
| 1965 | 0.1753 | 0.1284 | (5) | 0.0980 | (6) | 0.1942 | (4) | 0.2194 | (3) | 0.3805 | (1) | 0.2398 | (2) |
| 1966 | 0.1797 | 0.1273 | (5) | 0.0905 | (6) | 0.1499 | (4) | 0.1946 | (3) | 0.4011 | (1) | 0.2555 | (2) |
| 1967 | 0.1773 | 0.1280 | (5) | 0.0915 | (6) | 0.1502 | (4) | 0.1934 | (3) | 0.3825 | (1) | 0.2418 | (2) |
| 1968 | 0.1578 | 0.1205 | (5) | 0.0797 | (6) | 0.1162 | (5) | 0.1639 | (3) | 0.3223 | (1) | 0.2901 | (2) |
| 1969 | 0.1682 | 0.1246 | (5) | 0.0978 | (6) | 0.1719 | (4) | 0.1790 | (3) | 0.2964 | (1) | 0.2236 | (2) |
| 1970 | 0.1626 | 0.1199 | (4) | 0.1091 | (5) | 0.0969 | (6) | 0.1621 | (3) | 0.2164 | (1) | 0.2385 | (2) |
| 1971 | 0.1664 | 0.1131 | (5) | 0.1070 | (6) | 0.1600 | (4) | 0.1931 | (3) | 0.2466 | (1) | 0.2475 | (2) |
| 1972 | 0.1475 | 0.1105 | (5) | 0.0906 | (6) | 0.1829 | (3) | 0.1647 | (4) | 0.2285 | (1) | 0.1923 | (2) |
| 1973 | 0.1516 | 0.0974 | (5) | 0.0834 | (6) | 0.1180 | (4) | 0.1686 | (3) | 0.2709 | (1) | 0.2252 | (2) |
| 1974 | 0.1720 | 0.1054 | (6) | 0.1110 | (5) | 0.2397 | (3) | 0.1928 | (4) | 0.3158 | (1) | 0.2511 | (2) |
| 1975 | 0.1700 | 0.1096 | (5) | 0.1010 | (6) | 0.2264 | (3) | 0.1899 | (4) | 0.2964 | (1) | 0.2377 | (2) |
| 1976 | 0.1077 | 0.1018 | (5) | 0.0952 | (6) | 0.1985 | (3) | 0.1721 | (4) | 0.3108 | (1) | 0.2411 | (2) |
| 1977 | 0.1466 | 0.1025 | (6) | 0.1032 | (5) | 0.1431 | (4) | 0.1520 | (3) | 0.2974 | (1) | 0.2160 | (2) |
| | | PERCENT POINT CHANGE OF CR | | | | | | | | | | | |
| fr. to | | | | | | | | | | | | | |
| 63–77 | −0.0368 | 0.0378 | (5) | −0.0086 | (6) | −0.0408 | (4) | −0.0963 | (2) | −0.1523 | (1) | −0.0715 | (3) |
| 63–72 | −0.0359 | −0.0297 | (4) | −0.0212 | (5) | −0.0010 | (6) | −0.0836 | (3) | −0.2032 | (1) | −0.0952 | (2) |
| 73–74 | 0.0212 | 0.0080 | (6) | 0.0276 | (3) | 0.1217 | (1) | 0.0242 | (5) | 0.0449 | (2) | 0.0259 | (4) |
| 74–77 | −0.0262 | −0.0029 | (6) | −0.0078 | (5) | −0.0966 | (1) | −0.0408 | (2) | −0.0354 | (3) | −0.0351 | (4) |

The figures in parenthesis stand for rank of each inequality.

estimated by over time and categories.

## III. Results and Discussion

### A. *Estimates of Expenditure Inequality Functions*

a. Statistical Implication

Results of regressions for the specified model are presented in Table 2. The coefficient of multiple determination $R^2$ is used for examining how well the independent variables explain the dependent variable.

As shown in Table 2, the values of $R^2$ are the highest in the food and beverage categories, implying that about 81 percent of the total variation of expenditure inequality for foodstuffs has been explained by the regression. It is notable that the values of $R^2$ for fuel and lights showed the lowest of all categories. For housing, clothing, education, and miscellaneous, all the values of determination coefficient showed somewhat high in the corresponding regressions.

We may with to know whether the partial regression coefficients are statistically significant, that is, whether they are significantly different from zero or not.

As shown in the same table, for price variable, the values of the "t" statistic are higher in housing than in other categories. This suggests that price elasticity of expenditure inequality for housing is significantly different from zero at better than five precent level. The price elasticity for foodstuffs is significantly different from zero at better than ten percent level. For clothing and education except fuel-lights and miscellaneous category, their price elasticity are significant at low level as shown in the

TABLE 2 Estimates of Expenditure Inequality Functions by Expenditure Categories, Based on Specified Model, in Rural Area of Korea, 1963–1977.

| Dependent Variable | Estimated Coefficients from Corresponding Categories | | | | |
|---|---|---|---|---|---|
| | $P_J$ | $Y_{LJ}$ | $Y_{HJ}$ | $R^2$ | F |
| CRFD | 0.5533 | −1.1534 | 0.6712 | 0.8133 | 15.98 |
| (Food and Beverage) | $(1.48)^{10}$ | $(-2.74)^{1}$ | $(1.57)^{10}$ | | |
| CRHO | 1.6681 | −2.4737 | 2.8214 | 0.5001 | 3.67 |
| (Housing) | $(1.91)^{5}$ | $(-1.82)^{1}$ | $(2.19)^{5}$ | | |
| CRFL | 0.1349 | −0.8574 | 0.9192 | 0.1745 | 0.78 |
| (Fuel and Light) | (0.34) | $(-1.16)^{20}$ | $(1.33)^{20}$ | | |
| CRCL | 0.2238 | −2.5477 | 2.2754 | 0.6818 | 7.86 |
| (Clothing) | $(0.55)^{25}$ | $(-3.34)^{1}$ | $(3.41)^{1}$ | | |
| CRED | 0.3976 | −3.9393 | 3.0992 | 0.6154 | 5.87 |
| (Education) | (0.86) | $(-3.43)^{1}$ | $(3.11)^{1}$ | | |
| CRMI | 0.0910 | −1.8254 | 1.6236 | 0.5346 | 4.21 |
| (Miscellaneous) | (0.16) | $(-2.99)^{1}$ | $(3.18)^{1}$ | | |

Figures in Parentheses are t-value and figures to the light hand of t-value are significant level.

table.

The values of the "t" statistic on the coefficients of income variables for both lower and upper groups are highly significant as compared with that of price variable as shown by the table. For clothing, education, and miscellaneous, all the income elasticities of expenditure inequality in both lower and upper income groups are significantly different from zero at better than one percent level. The "t" statistic for fuel and lights is significant only at the ten and twenty percent level. For foodstuffs and housing, their income elasticity of expenditure inequality are, on the whole, highly significant at around five percent level.

Considering the importance of precision of estimated coefficients in regression analysis, we are forced to investigate more than the partial regression coefficients in the given regression model. In this connection, we use the F-test to obtain a joint test for all estimated coefficients of explanatory variables.

The results of the F-test also can be seen in Table 2. The F (3,11)-values for food and beverage are the highest among all categories, implying that its fitted regressions are highly significant better than one percent level, and such a high significant tendency is also seen in clothing category. For housing,teducation, and miscellaneous the fitted regressions are significant better than the five percent level. In other words, their all estimated coefficients are not due to chance so that we reject simultaneously the null hypotheses that $\alpha = 0$, $\beta_L = 0$, and $\beta_H = 0$ at five percent level. The fitted regression is not significant at better than five percent level in fuel and lights.

Meanwhile, in the process of time series regressios of our models we have suspected whether or not the regressions hole serial correlation. It was found that there were not so serious serial correlation in the regressions in all categories. Durbin-Watson statistic for foodstuffs showed by 2.3, significant at the five percent level. This indicates that the disturbances are independent so that the disturbances are not serially corleated.

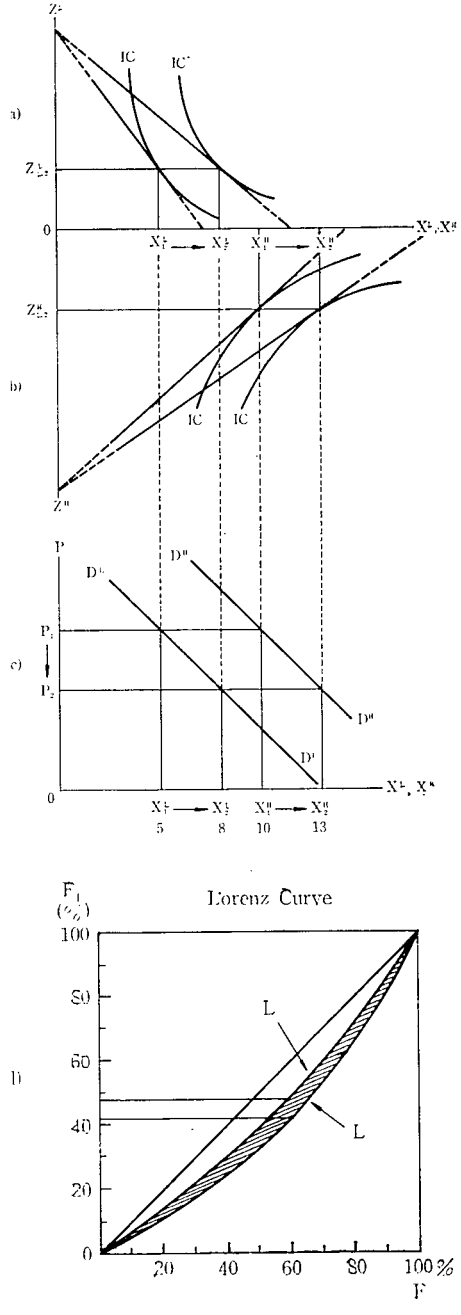
So far we have examined the results of regression given by the specified model. Apart from economic and logical judgement for them, we may preliminary conclude that the specified model, in any categories, except for fuel-lights are preferred at least statistically discussed so far.

b. The Sign of Parameters

As shown in Table 2, the price elasticity of expenditure inequality for all categories showed positive signs, implying that the expenditure inequality may decrease if the price decreases. This could be explained graphically in general. For convenience, we have critical considerations as follows:

(1) There are two normal goods such as X and Z,

FIGURE 1 PRICE EFFECTS ON EXPENDITURE INEQUALITY




(2) There are two groups of consumers such as the lower income group L composed of 60 units and the higher income group H composed of 40 units, in which each group has homegeneous behavior.

(3) The Price elasticity for the H group is lower than the L group.

(4) The goods X and Z consumed in different year are already given by the economy in a perfect competivite market,

(5) The income is constant for the given periods.

Graphically, the effects of price change on expenditure inequality are sketched in Figure 1. In sketch (a) of Figure 1, the demand for X goods increased by $X_1^L$ $X_2^L$ from $X_1^L$ to $X_2^L$ in the lower income group as the price of X decreased from $P_1$ to $P_2$ subject to others remaining the same, and the demand for X goods in the higher income group increased by $X_1^H$ $X_2^H$ from $X_1^H$ to $X_2^H$ as the price decreased from $P_1$ to $P_2$ as shown in sketch (b). The demand curves for X goods in both the lower and the higher income groups are derived from the sketch (a) and (b) into sketch (c) of Figure 1. In sketch (c), for convenience to examine the effects of price change on expenditure inequality in terms of Lorenz curve, the $X^L$ and $X^H$ are given intentionally based on Figure 1, that is;

$X_1^L = 5$, $X_2^L = 8$ (for the lower group)
and
$X_1^H = 10$, $X_2^H = 13$ (for the higher group).
From the above information and the assumption (4) mentioned in previous paragraph we have obtained the sketch (d) of Lorenz curve, in which the share of the lowest 60 percent group increased by net 6 percent from 42 percent in initial period to 48 percent in the later period. The share of the highest 40 percent group decreased by net 6 percent[1]. This tendency made the Lorenz cruve move from $L_1$ to $L_2$ in sketch (d). Consequently, the inequality for X goods decreased by the area with dashes due to decrease in price by the change of $(P_2-P_1)$. This indicates that the trend of inequality has same direction with the trend of price. Thus, the price elasticity of inequality for the X goods is defined as follows,

$$\varepsilon_p = \frac{\Delta CR}{\Delta P} \cdot \frac{P}{CR} \geq 0$$

where P and $CR > 0$, and the $\Delta CR$ and the $\Delta P$ have same signs. Thus, the price elasticity of inequality has a positive sign. This sign is consistent with the sign of price elasticity of our regression results shown in Table 1.

While the signs of income elasticity of expenditure inequality for all categories in the lower group are negative as shown in Table 2, implying that the inequality of expenditure may decrease if the income for the lower group increase. That is,

$$\varepsilon^L = \frac{\Delta CR}{\Delta Y^L} \cdot \frac{Y^L}{CR} = \frac{\partial \ln CR}{\partial \ln Y^L} < 0,$$

This sign would be accepted because if the lower group's income increases subject to the higher group's income and the price remaining the same, then the share of expenditure for lower group might be increased as long as the income elasticity for expenditure in that group is positive. The signs of income elasticity of expenditure inequality for all categories in the higher group are positive in the same table. This sign is also what we expected, because if the higher group's income increases subject to the lower group's income and the price remaining the same, then the share of ex-

[1] The computation are:
For the share of the lowest 60 percent group in initial period,

$$F_1 = \frac{(X_1^L)\,(n^L)}{(X_1^L)\,(n^L) + (X_1^H\, n^H)} = \frac{(5)\,(60)}{(5)\,(60) + (10)\,(40)} = 0.42$$

and for that in the compared period,

$$F_1^c = \frac{(X_2^L)\,(n^L)}{(X_2^L)\,(n^L) + (X_2^H)\,(n^H)} = \frac{(8)\,(60)}{(8)\,(60) + (13)\,(40)} = 0.48$$

where $n^L = 60$ and $n^H = 40$ are given by the assumption.

penditure for higher group should be increased as far as the higher group's income elasticity for expenditure is positive. It may be that the share of expenditure for the higher group cannot be increased without decrease in the share for the other group. Hence, the two income groups have reverse roles on the inequality change.

Likewise, the signs of all independent variables for all categories of regressions revealed reasonable implications.

*B. Analysis on Effects of Price and Income Changes on Expenditure Inequality*

In this section, our discussion is focused on the measurement of the effects of price and income change on the inequality based on the regression results of the specified model.

We have the analytical form as:

$$(3) \quad CR = a + \alpha \ln P + \beta_L \ln Y_L + \beta_H \ln Y_H$$

or

$$(4) \quad CR = A P^{\alpha} Y_L^{\beta_L} \cdot Y_H^{\beta_H}$$

We assume that $1 > CR > 0$, $P > 0$, $Y_L > 0$, $Y_H > 0$, $Y_H > Y_L$. By differentiating (3) with respect to $\ln P$, $\ln Y_L$ and $\ln Y_H$, respectively, we obtain the constant price elasticity to the $CR$, $\alpha$, over the years, the constant income elasticity to the $CR$ in lower group, $\beta_L$, and the constant income elasticity to the $CR$ in higher group, $\beta_H$. That is;

$$(5\text{–}1) \quad \frac{\partial \ln CR}{\partial \ln P} = \alpha$$

$$(5\text{–}1) \quad \frac{\partial \ln CR}{\partial \ln Y_L} = \beta_L$$

and

$$(5\text{–}3) \quad \frac{\partial \ln CR}{\partial \ln Y_H} = \beta_H.$$

By differentiating (4) with respect to $P$, $Y_L$ and $Y_H$ respectively, then the derivatives can be given:

$$(6\text{–}1) \quad \frac{\partial CR}{\partial P} = A\alpha P^{\alpha-1} Y_L^{\beta_L} Y_H^{\beta_H} = \alpha \frac{CR}{P}$$

$$(6\text{–}2) \quad \frac{\partial CR}{\partial_L Y} = AP^{\alpha} \beta_L Y_L^{\beta_L - 1} Y_H^{\beta} = \beta_L \frac{CR}{Y_L}$$

$$(6\text{–}3) \quad \frac{\partial CR}{\partial Y_H} = Ap^{\alpha} \beta_H Y_L^{\beta_L} Y_H^{\beta_H - 1} = \beta_H \frac{CR}{Y_L}.$$

Then, we obtain the marginal inequality of price $\alpha \frac{CR}{P}$, the marginal

inequality of lower group's income $\beta_L \frac{CR}{\Upsilon_L}$ and the marginal inequality of higher group's income $\beta_H \frac{CR}{\Upsilon_H}$.

Functions (3) and (6) suggest the following properties. These properties are illustrated graphically in Figure 2.

(i) It has downward curvature to the northeast when $0 < \alpha < 1$ in sketch (c).

(ii) It has upward curvature to the northeast when $\alpha > 1$ in sketch (c).

(iii) It has slow downward curvature to the southeast when $0 < |\beta_L| < 1$ or $-1 < \beta_L < 0$ in sketch (a)

(iv) It has steep downward curvature to thesoutheast when $|\beta_L| > 1$ or $\beta_L < -1$ in sketch (a).

(v) It has downward curvature to the northest when $0 < \beta_H < 1$ in sketch (b).

(vi) It has upward curvature to the northeast when $\beta_H < 1$ in sketch (b).

(vii) All curves range vertically within 0 and 1 since the assumption holds that $P > 0$, $\Upsilon_L > 0$, $\Upsilon_H > 0$, and $0 < CR < 1$, and horizontally not arrive at mean income line in sketch (a) and (b) since the assumption holds $\Upsilon_H > \Upsilon_L$.

In Figure 2, the sketch (a) shows the effect of the lower group's income change on inequality, and (b) shows the higher group's in come effect. Price change effect is sketched in (c).

Suppose that lower group's income increases by $\Upsilon_L^1$ $\Upsilon_L^2$ (or EB) from $\Upsilon_L^1$ to $\Upsilon_L^2$, higher group's income by $\Upsilon_H^1$ $\Upsilon_H^2$ (or EF) from $\Upsilon_H^1$ to $\Upsilon_H^2$, and the price by $P^1$ $P^2$ (or GJ) from $P^1$ to $P^2$ for unit time. For instance, the regression result for food and beverage in Table 2 holds;

$\alpha = 0.5533$, $\beta_L = -1.1534$, $\beta_H = 0.6712$

or $0 < \alpha < 1$, $|\beta_L| > 1$, $0 < \beta_H < 1$

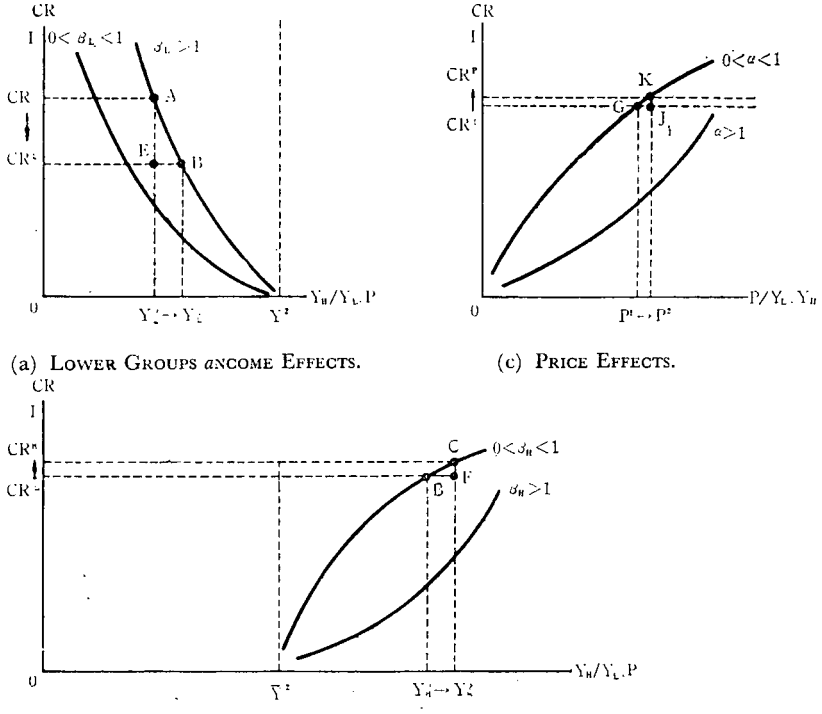
This category can be applied in Figure 2. In this case, the partial inequality effects given by the corresponding price and income changes are examined as follows:

(i) If lower group's income increases by EB from $\Upsilon_L^1$ to $\Upsilon_L^2$, then the inequality $CR^1$ decreases by $AE$ and arrives at $CR^L$ from the initial $CR^1$ in sketch (a). The partial change of inequality may be by $AE$ and the inequality $CR$ holds the level of 0 $CR^L$ due to change of lower group's income as the others remain the same.

(ii) If higher group's income increases by BF from $\Upsilon_H^1$ to $\Upsilon^2{}_H$ as the others are unchanged, then the inequality $CR^1$ increases by$CF$ and arrives at $CR^H$ from the original $CR^1$ in sketch (b).

(iii) If the price increases by $GJ$ from $P^1$ to $P^2$ subject to others remain-

FIGURE 2 PRICE AND INCOME EFFECTS ON EXPENDITURE INEQUALITY.




(a) LOWER GROUPS *a*NCOME EFFECTS. (c) PRICE EFFECTS.

(b) HIGHER GROUPS INCOME EFFECTS

ing the same, then the inequality $CR^1$ increases by $K\mathcal{J}$ and it arrives at $CR^P$ from the orginal $CR^1$ in sketch (c).

(iv) Consequently, the total effect on the inequality by changing of price and both group's income can be attained brom Figure 2 as follows:

| (7) $\Delta CR =$ | $K\mathcal{J}$ | $+ AE$ | $+ CE$ |
|---|---|---|---|
| Total effect | Price effect | Lower group income effect | Higher group income effect |

The (7) can be written generally in mathematic form as

$$(8)\quad dCR = \frac{\partial CR}{\partial P}\, dP + \frac{\partial CR}{\partial Y_L}\, dY_L + \frac{\partial CR}{\partial Y_H}\, dY_H$$

To take the advantage of simplicy of computation and economic interpretation, we can transfer this total differential (8) into the form including elasticity. For this purpose, if we substitute (6–1, 6–2, 6–3) in

TABLE 3 Annual Average Effects of Price and Income Change on Expenditure inequality by Category During 1963–1977, Rural in Republic of Korea.

unit: percent

| | | Food FD | Housing HO | Fuel and Lights FL | Clothing CL | Education ED | Miscellaneous MI | Total Expenditure |
|---|---|---|---|---|---|---|---|---|
| A) | Price effect ($\alpha_j$(dp/p)) | 0.369 | −0.529 | −0.200 | −0.447 | 1.770 | 0.181 | (0.320) |
| | d Pj/Pj | 0.667 | −0.317 | −1.480 | −1.999 | 4.451 | 1.993 | |
| B) | Lower group's income effect ($\beta_{Lj}$(dY/Y)) | −6.753 | −14.484 | −5.020 | −14.917 | −23.065 | −10.688 | (−11.084) |
| C) | Higher group's income effect ($\beta_{Hj}$(dY/Y)) | 3.888 | 16.342 | 5.324 | 13.179 | 17.951 | 9.404 | (9.015) |
| D) | Total income change effect (B + C) | −2.865 | 1.858 | 0.304 | −1.738 | −5.114 | −1.284 | (−2.069) |
| E) | Total price and income effect (A + D) | −2.496 | 1.329 | 0.104 | −2.185 | −3.344 | −1.103 | (−1.749) |
| F) | Actual rate of change of CR d CR/CR | −2.568 | 0.777 | 0.276 | −2.052 | −3.054 | −0.959 | (−1.960) |

Notes: The symbol $\alpha_j$ denotes price elasticity to the expenditure inequality in corresponding category, and $B_{Lj}$, $B_{Hj}$ denote the lower and higher group's income elasticity to the inequality in jth category.
And dP/P , dY/Y and dY/Y denote annual average percentage change of price, lower and higher group's income by suing 5-year moving average method, in which the dY/Y is 5.855 percent and the dY/Y is 5.792.
The figures in parentheses are concerned with the total expenditure item, in which the decomposition ratios for corresponding category was used as its weight.

(8) and divide (8) by CR in both sides, we then have,

$$(9)\quad \frac{dCR}{CR} = \alpha \frac{dP}{P} + \beta_L \frac{dY_L}{Y_L} + \beta_H \frac{dY_H}{Y_H}$$

$$\begin{pmatrix}\text{percentage}\\ \text{change of } CR\end{pmatrix} = \alpha\begin{pmatrix}\text{percentage}\\ \text{change of } P\end{pmatrix} + \beta_L\begin{pmatrix}\text{percentage}\\ \text{change of } Y_L\end{pmatrix} + \beta_H\begin{pmatrix}\text{percentage}\\ \text{change of } Y_H\end{pmatrix}$$

The (9) explains conceptual effects of price and income changes on expenditure inequality.

Comparison of the Effects of Price and Income Change on Expenditure Inequality by Category

Table 3 shows the annual average effects of price and income change on inequality changes in corresponding categories.

Before discussing those effects, we examine the trends of relative price and real income changes. As shown in Table 3, the relative price for food and beverage increased by 0.667 percent[2] annually during the period 1963–1977, implying the increase in nominal price for foodstuffs surpassing that for total farm household goods. Of all categories, the relative price for educational expenses increased by 4.45 percent a year on an average during the same period, showing the highest level of increase rate. In fact, the nominal price for total farm household goods increased by 15 percent a year on an average, but that for educational expenses rose by 21 percent annually during that period. On the other hand, the relative price for clothing decreased by two percent annually.

While the higher group's real mean income increased by 5.792 percent a year on an average, the lower group's income rose by 5.855, Overall, the average real income for all farm households increased by 5.819 percent annually during the period.

These tendency which took place in rural sector during that period influenced changes in the expenditure distribution of farm households so that the inequality for all categories except housing and fuel-lights improved significantly in recent years compared to the past.

For food and beverage, the lower group's income effect on its inequality shown by $-6.753$ percent, implying that its inequality decreased annually by $-6.753$ percent on an average through the years due to the increase in the lower group's income by 5.855 on an annual average subject to others remaining the same. On the other hand, the higher group's income effect was 3.888 percent, implying that its inequality increased annually by 3.888 percent due to the increase in higher group's income by 5.792 percent subject to others are unchanged. Likewise, the income effect on the inequality in higher group is opposite to that in lower group, indi-

[2] Computed by five-year moving average method, this method was applied to the computations for an annual average rate of changes in the 6 categories of relative price and inequalities as well as real incomes in both groups.

cating that the lower group's negative effect on inequality change for foodstuffs expenditure has been offset considerably by the higher group's positive effect on it. Consequently, the difference of −2.865 percent between the higher and lower group's income effects may be measures as the total income effect, moreover, considering the increase in both group's income all together during the period, such negative effect of −2.865 percent may be measured as the effect of the income growth in rural area on inequality change.

The relative price effect was 0.369 percent. This implies that the incquality for food and beverage increased by 0.369 a year on an average through the years due to the increase in its relative price by 0.667 percent annually. Consequently, the total price and income effect shown by −2.496 percent, indicating that the iequality for foodstuffs has been decreased annually by −2.496 percent on an average through the years 1963–1977. This figure almost corresponds to the actual rate of change of inequality (CR) in the (F) line of Table 3.

The effects of price and income changes on the inequality for other categories can be also explained in the same ways. The findings from Table 3 are given below.

(1) The price effects on inequality change for food and beverage, education, and miscellaneous were positive to the increase in corresponding relative price of these categories as shown by the figures in line (A) of the table. On the other hand, the price effects for housing, fuel-lihgts, and clothing were negative due to decreases in corresponding relative price of these categories. Likewise, the partial inequality change in any category depends on the degree and sign of its relative price change as well as those of its elasticity ($\alpha$).

(2) The lower group's income effects on inequality change for all categories showed negative, implyng that the lower group's income growth has reduced partially the inequalities in all categories as shown in the line (B).

(3) The higher group's income increases during the period led to partial increases in inequalities in all categories as shown by the figures in the line (C). It is noted that the higher group's income effects in terms of absolute value were less than the lower group's income effect in all categories except housing and fuel-lights.

(4) Consequently, the total income growth under the given income growth in both groups yield negative effects on inequality change for all categories except housing and fuel-lights for which positive effects were found as shown by the line (D) of the same table. As shown in the line (D) of the table, the total income effect showed the highest for education by -5.114 percent, and the second

one is seen for food and beverage by −2.865 percent.

(5) In all categories except housing and fuel-lights expenditure inequalities has decreased annually by the percentages shown in line (E) due to changes in relative price and real income growth under the given income growth rate in both groups. The expenditure inequalities for housing and fuel-lights, conversely, have increased by 1,329 percent and 0.104 percent a year on an average, respectively, due to the given relative price and income changes in each category. It should be noted that actually the inequality in corresponding the category has fluctuated since then but had a slightly upward trend. These results are brought about by the higher group's positive effect surpassed the lower group's negative effect during the period.

(6) Of all expenditure categories the inequalities for foodstuffs and education have declined fastest since the early sixties due to increases in income of the lower group even though the price and higher income group have blocked the passage to improvements of its inequality.

(7) Of the factors affecting inequality, the lower group's income effect was most important. Without exception the whole income effect surpassed the price effect in all categories.

(8) Total expenditure inequality has increased annually by 0.32 percent on an average through the heterogeneous relative price changes in all categories. The increases in income in both groups have decreased annually total inequality by −2.069 percent on an average.

(9) For price effects by categories on total ineqality change, the relative price change in housing and fuel-lights sectors have negative roles to the total inequality change, but the relative price changes in other sectors played positive roles on it. Of the price effects, those for foodstuffs and education sectors showed the most in the table.

Thus far, we have examined how the relative price and real income changes have influenced the inequality change for all categories. Through the discussions, we have realized the importance of the elasticities of each variables such as price, lower and higher group's income. In addition to that, the importance of the movements of actual economy such as actual price change in each item and actual income growth in lower and higher income groups are highly realized for this study.

## IV. Summary and Implications

The main objectives of this study were to examine the impacts of price and income changes on expenditure inequalities by categories. It was

hoped that the results of the analyses would be useful as bases for policy formulations in the efforts for more equal distribution of expenditure in the nation.

This study dealt with food and beverage, housing, fuel and lights, clothing, t ducation and miscellaneous expenditures during the period of 1963 to 1977 in rural area of Republic of Korea. The data used were based on the Farm Household Economy Survey conducted by the Ministry of Agriculture and Fisheries.

To estimate the inequalitues, the new coordinate system for the Lorenz curve (Kakwani and Podder 1976) was adopted to Korean rural data. To examine impacts of price and income changes on expenditures inequality, an expenditure inequality function was suggested and applied in this study.

The suggested expenditure inequality function to examine the impacts of price and income changes on expenditure inequality were regressed by the specified model. By categories, the results of regressions show that in all categories, except fuel-lights, the coefficients were significantly different from zero at better than 5 percent level.

In all cateogries, the price elasticity of expenditure inequality showed positive signs and the income elasticity of the lower 60 percent income group showed negative signs but that of the higher 40 percent income group showed positive sign as is expected. Further findings from regression were that: (1) the inequality for housing expenditure was positively elastic to the relative price changes, but for the rest of the categories were more or less inelastic to its own relative price change; (2) the inequality for education, clothing, housing and miscellaneous expenditure were highly negatively elastic to the lower group's income change, but that for foodstuffs and fuel-lights were somewhat unitary of inelastic negatively to the lower group's income change; and (3) the inequality for education, housing, clothing and miscellaneous were also fairly elastic positively to the higher group's income change.

The positive price effect to the changes in inequality of expenditure showed the highest in education. This positive effect of price were seen also in food and miscellaneous sectors due to increases in relative prices.

The negative effect of price to the changes in inequality was the highest in clothing and housing sectors and was also seen in fuel-lights sector due to decreases in relative prices.

The total negative effect of income to the changes in inequality showed the highest in education by annual average rate of 5 percent. This negative effect of income contributed much to the decreases in inequility of education expenditure through the years despite of the positive effect of price. This total negative effect of income were seen also in food and miscellaneous sectors.

The positive total icome effect were observed in the housing and fuel-lights categories, suggesting that a higher income growth rate of the lower group was needed in the past to expect the negative income effect in the rural area.

Consequently, the negative total price and income effects on the inequality of expenditure of the various categories, if arranged in descending order, are education, food and beverage, clothing, and miscellaneous. The positive effect of total price and income changes on the inequality were in the housing and fuel-lights sectors due to the positive income effect inspite of the negative effect of price.

Under the past economic situations in rural areas, all categories except housing and fuel-lights categories their expenditure inequality decreased annually by the figures shown in Table 3. This tendency was brought about the decreases in total inequality in rural area of Korea.

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