Structural Change, Employment, and Income Distribution: The Case of Korea 1960-1970

Daemo Kim*

1. Introduction

Since Kuznets (1955) first presented the hypothesis that income inequality increases at the initial stage of growth and then eventually decreases, this hypothesis has been supported on several occasions[1]. Yet, it now seems clear that the time period required to reach the "eventual decrease" in inequality is beyond some tolerable span: Almost two decades of rapid growth in many developing countries has been of little or no benefit to a large group of their population and, during the past few years, the need for policies aiming explicitly at the income distribution in general, and the poverty problem in particular, has been increasingly called for.

Theories on the (size) distribution of income are one of the most poorly established in economics. Consequently, studies on income distribution frequently begin with the most basic questions like the following: What determines income distribution? Where or how can we possibly find the factors which contribute to income inequality? Kuznets (1963) again made a suggestion in this regard by raising the following question: Do structural changes that occur in the process of growth affect the distribution of the growing income among the population? What he suggested is that the factors which affect patterns of income distribution can probably be traced out by looking into the structural changes that occur with growth.

Recently, Bell and Duloy (1974) identified four poverty groups, based on access to remunerative employment and access to non-human assets. These four groups are small farmers, landless laborers and submarginal farmers, urban unemployed, and urban underemployed. Bell-Duloy's identification thus implies that access to cultivable land is

*The author is assistant professor of economics at Chung-Ang University.

1 See, for example, Oshima (1962) and Ahluwalia (1974).

crucial to the rural poverty problem[2], whereas access to employment opportunities is crucial to the urban poverty problem. This in turn implies that, in countries where the scope for improving the access to land is not bright, the only hopeful way to attack the poverty problem is to improve the access to employment opportunities.

The present study is intended to quantitatively identify factors which contributed to the change in patterns of income distribution in Korea between 1960-1970. Following Kuznets' suggestion, this study will begin with analyzing the structural change, or the change in output composition as conceived in the present study, which occurred during the period. In accordance with Bell-Duloy's identification, and in view of the fact that the supply of cultivable land is virtually fixed in Korea, the change in patterns of employment will be brought into a special focus. Factors which contributed to the change in output structure will first be quantitatively identified. How these factors systematically affected patterns of employment and income distribution will then be traced out.

Because of the lack of relevant data, the analysis of this study will be confined to agriculture, mining, and manufacturing, which together comprised roughly 65% of the economy's work force during the 1960's. Since major changes in output structure during the period occurred between agriculture and manufacturing[3], the analytical results of the present study are expected to shed some light on the explanation of the changing patterns of income distribution, despite the noncomprehensiveness of coverage.

2. Analytical Framework

The analytical framework consists of two steps. The first step is to quantitatively identify factors which contribute to the change in output structure. The second step is to link the results of the first step with the changes in patterns of employment and income distribution.

2.1. Decomposition of the Change in Output Structure.

The methodology of this subsection is basically that of Lewis and Soligo (1965). The cornerstone of Lewis-Soligo's methodology is the definition of the measurement of import substitution originally

2 An improvement in the terms of trade in favor of the agricultural sector may also alleviate the rural poverty problem. This possibility is ruled out of our discussion, however, since it is likely to deteriorate the urban poverty problem on the one hand and to slow down industrialization of the economy on the other.

3 According to the Bank of Korea, *Economic Statistics Yearbook* 1973, the share in GNP of agriculture, forestry, and fishery decreased from 41.3% to 28.0%, while that of mining and manufacturing increased from 12.1% to 22.8%, both between 1960-1970.

introduced by Chenery (1960).

We begin with the identity between total supply and total demand. Since total supply of a commodity is equal to its domestic production (Q) plus importation (M) while total demand is equal to domestic demand (D, which in turn is the sum of domestic intermediate demand DI and domestic final demand DF) plus exportation (X), we get for each industry:

$$\begin{aligned} Z &= Q + M \\ &= D + X = DI + DF + X \end{aligned} \tag{1}$$

Let u be the ratio of domestic production to total supply, $u = Q/Z$. A rise (fall) in u implies that the relative dependency of total supply upon importation decreases (increases). Therefore, if u increases (decreases) over time in an industry, that industry's import substitution is said to be positive (negative)[4]. On the basis of this definition, Lewis and Soligo (1965) partition the change in domestic production of each industry as following:

$$\begin{aligned} \triangle Q &= Q_t - Q_o \\ &= \triangle u \cdot (Z_o + \triangle Z) + u_o \cdot \triangle DI + u_o \cdot \triangle DF + u_o \cdot \triangle X \\ &= \triangle Q_M + \triangle Q_{DI} + \triangle Q_{DF} + \triangle Q_X \end{aligned} \tag{2a}$$

where subscripts o and t denote respectively the initial and the final periods under consideration.

In equation (2a), $\triangle Q_M$, $\triangle Q_{DI}$, $\triangle Q_{DF}$, $\triangle Q_X$ are intended to measure parts of the change in domestic production of an industry ascribed respectively to import substitution, the change in domestic intermediate demand, the change in domestic final demand, export expansion.

As correctly pointed out by Eysenbach (1969) and Fane (1971), however, equation (2a) is simply one of several possible ways to decompose the change in domestic production. Specifically, equation (2a) arbitrarily assumes that the value of u in the initial period (that is, u_o) is the norm, and recognizes the change in domestic production on the basis of this norm. But, the value of u in the final period (that is, u_t) is another equally viable norm. In this latter case, we get:

4 This is Chenery's (1960) original definition of import substitution.

(2b)

$$\begin{aligned}\triangle Q &= Q_t - Q_o \\ &= \triangle u \cdot Z_o + u_t \cdot \triangle DI + u_t \cdot \triangle DF + u_t \cdot \triangle X \\ &= \triangle Q_M + \triangle Q_{DI} + \triangle Q_{DF} + \triangle Q_X\end{aligned}$$

The difference between equations (2a) and (2b) lies in how the interaction term, $\triangle u \cdot \triangle Z$ is handled. Specifically, equation (2a) attributes this term totally to import substituion, whereas equation (2b) ascribes none of the interaction term to import substitution. In other words, equations (2a) and (2b) represent two extreme cases of handling the interaction term. One way to avoid such an extreme case is to take the average between the initial- and the final-period estimates as the norm. We then get:

(2)

$$\begin{aligned}\triangle Q &= Q_t - Q_o \\ &= \triangle u \cdot \overline{Z} + \overline{u} \cdot \triangle DI + \overline{u} \cdot \triangle DF + \overline{u} \cdot \triangle X \\ &= \triangle Q_M + \triangle Q_{DI} + \triangle Q_{DF} + \triangle Q_X\end{aligned}$$

where $\overline{Z} = (Z_t + Z_o)/2$

$\overline{u} = (u_t + u_o)/2$

Obviously, for each of the four terms, equation (2) will give an estimate which is between the two given by equations (2a) and (2b) respectively. Equation (2) will be used in this study.

2.2 Decomposition of the Change in Employment Patterns

Let n be the ratio of the number of workers employed in an industry (N) to domestic production of that industry (Q), n=N/Q. n so defined may vary for several reasons, among which probably the most important are technological progress and factor substitution. Consequently, a change in n over time will be conveniently called as "techno-substitution" effect. Based on this definition, we can break down the change in employment of an industry:

(3)

$$\begin{aligned}\triangle N &= N_t - N_o \\ &= n_t \cdot Q_t - n_o \cdot Q_o \\ &= \triangle n \cdot \overline{Q} + \overline{n} \cdot \triangle Q_M + \overline{n} \cdot \triangle Q_{DI} + \overline{n} \cdot \triangle Q_{DF} + \overline{n} \cdot \triangle Q_X \\ &\quad \text{(due to equation (2))} \\ &= \triangle N_T + \triangle N_M + \triangle N_{DI} + \triangle N_{DF} + \triangle N_X\end{aligned}$$

Equation (3) thus decomposes the change in employment of an industry into five parts, attributed respectively to the techno-substitution effect, import substitution, the change in domestic intermediate demand, the change in domestic final demand, and export

expansion.

Our next task is to formulate an equation which decomposes the change in employment of each bracket of workers. Let f^e be the ratio of the number of bracket e workers (N^e) to that of all workers (N) employed in an industry, $f^e=N^e/N$. Obviously, the whole set of f^e for an industry will show the class composition of employment within that industry. A change in f^e will therefore be called as "industry composition" effect. We now get:

$$
\begin{aligned}
(4)\quad \Delta N^e &= N^e_t - N^e_o \\
&= f^e_t \cdot N_t - f^e_o \cdot N_o \\
&= \Delta f^e \cdot \bar{N} + \bar{f}^e \cdot \Delta N_T + \bar{f}^e \cdot \Delta N_M + \bar{f}^e \cdot \Delta N_{DI} + \bar{f}^e \cdot \Delta N_{DF} + \bar{f}^e \cdot \Delta N_X \\
&\quad \text{(due to equation (3))} \\
&= \Delta N^e_{Cl} + \Delta N^e_T + \Delta N^e_M + \Delta N^e_{DI} + \Delta N^e_{DF} + \Delta N^e_X
\end{aligned}
$$

Equation (4) decomposes the change in employment of bracket e workers in an industry into six parts, ascribed respectively to the industry composition effect, etc. Notice that, when equation (4) is aggregated over all industries of the economy, the results will show not only the change in employment patterns in the whole economy but sources of that change.

2.3 Decomposition of the Change in Patterns of Income Distribution

Suppose we have information on the number (N^e) and average income (y^e) of each bracket of workers in the whole economy[5]. Then, we can estimate the share of *each bracket* in the economy. In practice, however, e specifies quite a number of income brackets, while our analytical interest is in shares of, say, *quintiles*. In this case, it is possible that workers of a particular bracket happen to be split over two or more neighboring quintiles. Furthermore, the fraction of these workers who belong to a particular quintile usually varies over time.

Let $k^{e,q}$ be the ratio of bracket e workers who belong to the q-th quintile ($N^{e,q}$) to total bracket e workers in the economy (N^e), $k^{e,q}=N^{e,q}/N^e$. $k^{e,q}$ so defined will vary if the class composition of employment in the whole economy changes. A change in $k^{e,q}$ will therefore be called as "economy composition" effect. We now get:

5 In the remaining part of this section, notations are for the whole economy rather than for individual industries.

(5) $\triangle N^{e,q} = N_t^{e,q} - N_o^{e,q}$

$= k_t^{e,q} \cdot N_t^e - k_o^{e,q} \cdot N_o^e$

$= \triangle k^{e,q} \cdot \bar{N}^e + \bar{k}^{e,q} \cdot \triangle N_{Cl}^e + \bar{k}^{e,q} \cdot \triangle N_T^e + \bar{k}^{e,q} \cdot \triangle N_M^e +$

$\bar{k}^{e,q} \cdot \triangle N_{DI}^e + \bar{k}^{e,q} \cdot \triangle N_{DF}^e + \bar{k}^{e,q} \cdot \triangle N_X^e$

(due to equation (4))

$= \triangle N_{C2}^{e,q} + \triangle N_{Cl}^{e,q} + \triangle N_T^{e,q} + \triangle N_M^{e,q} + \triangle N_{DI}^{e,q} + \triangle N_{DF}^{e,q} + \triangle N_X^{e,q}$

Equation (5) thus partitions the change in the number of bracket e workers who belong to the q-th quintile into seven parts, attributed respectively to the economy composition effect, etc. The economy composition effect $(\triangle N_{C2}^{e,q})$ and the industry composition effect $(\triangle N_{Cl}^{e,q})$ will be combined to be called as "composition effect" $(\triangle N_C^{e,q})$.

Now let $Y^{e,q}$ be the gross sum of incomes of bracket e workers who belong to the q-th quintile. We immediately have the following identity, $Y^{e,q} = y^e \cdot N^{e,q}$, where y^e is the average income of bracket e workers and $N^{e,q}$ is the number of bracket e workers who belong to the q-th quintile. From this identity follows:

(6)

$\triangle Y^{e,q} = Y_t^{e,q} - Y_o^{e,q}$

$= y_t^e \cdot N_t^{e,q} - y_o^e \cdot N_o^{e,q}$

$= \triangle y^e \cdot \bar{N}^{e,q} + \bar{y}^e \cdot \triangle N_C^{e,q} + \bar{y}^e \cdot \triangle N_T^{e,q} + \bar{y}^e \cdot \triangle N_M^{e,q} +$

$\bar{y}^e \triangle N \cdot_{DI}^{e,q} + \bar{y}^e \cdot \triangle N_{DF}^{e,q} + \bar{y}^e \cdot \triangle N_X^{e,q}$

(due to equation (5))

$= \triangle Y_Y^{e,q} + \triangle Y_C^{e,q} + \triangle Y_T^{e,q} + \triangle Y_M^{e,d} + \triangle Y_{DI}^{e,q} + \triangle Y_{DF}^{e,q} + \triangle Y_X^{e,q}$

Equation (6) breaks down the change in gross income of bracket e workers who belong to the q-th quintile into seven sources, ascribed respectively to the change in their average income, etc. Notice that, when equation (6) is aggregated over all brackets within each quintile, the results will show not only the change in the share of each quintile but sources of that change.

3. Analytical Results

This section presents analytical results computed according to the equations in the previous section. Sources of data are diverse and methods of industry classification are not the same among these sources. After proper matching operations, the number of industries is reduced to 37. Some of these industries are grouped into larger sectors to see the results on a more aggregated basis.

3.1 Change in Output Structure

Basic data used in this subsection are two input-output tables for 1960 and 1970 respectively[6]. The 1960 statistics are first inflated into figures in 1970 prices by using wholesale price indices of individual commodities. Computations are done according to equation (2). The results are presented in Tables A and B.

In Table A, column (1) represents domestic production of each industry in 1960. Column (2) in turn represents the change in this production between 1960-1970. Consequently, column (3) indicates the growth rate of domestic production during the same period.

According to Table A, gross domestic production[7] in the whole economy (bottom row of the table) increased by 295% between 1960-1970. At sectoral levels, agricultural output grew by only 121%, while manufacturing output expanded by 455%, reflecting rapid industrialization of the economy during the 1960's. Notable is the relatively low growth rate of mining production (203%), which is indicative of the fact that the rapid industrialization of the 1960's relied rather heavily on imported raw materials due to the poorly endowed natural resources of the econimy[8].

Among manufacturing sectors, food and beverages, textile products, and wood products, which together may be said to represent light industries, showed relatively low growth rates (329%, 338%, and 284% respectively). Paper products, chemical products, non-metallic mineral products, basic metal, and metal products and machinery, which may be said to represent heavy industries, in turn showed relatively high growth rates (532%, 881%, 680%, 1022%, and 623% respectively). Table A thus characterizes the Korean economy during the 1960's not only by industrialization in general but by industrialization

6 Sources of these two tables are Bank of Korea, *Economic Statistics Yearbook*, 1965 and 1973 volumes respectively.

7 "Gross domestic production" here is not to be confused with the more familiar GDP in national income accounts. The former includes gross value of output in each industry, while the latter includes only value added in each industry.

8 Korea's endowment of natural resources is notoriously poor. There are no known deposits of petroleum and virtually no iron ores. Even the major item, coal, is too poor in quality to be used for industrial purposes.

Table A

Change in Output Composition between 1960-1970

Industries and Sectors	Q_o (1)	$\triangle Q$ (2)	$\triangle Q/Q_o$ (3)
Agriculture	362438	438809	121.1%
Rice, barley & wheat	237252	199935	84.3%
Others	125186	238874	190.8%
Forestry	46203	19216	41.6%
Fishery	18349	47394	258.3%
Mining	20264	41218	203.4%
Coal	11530	13468	116.5%
Others	8704	27750	318.9%
Manufacturing	323578	1471946	454.9%
Food & beverages	105615	346982	328.5%
Processed food	76622	213762	279.0%
Beverages & tobacco	28993	133220	459.5%
Textile products	89454	301930	337.5%
Fiber spinning	25337	62044	244.9%
Textile fabrics	38415	52270	136.1%
Finished textile products	19572	180506	922.3%
Leather products	6130	7110	116.0%
Wood products	20014	56901	284.3%
Sawmills & plywood	13512	51483	381.0%
Wood products & furniture	6502	5418	83.3%
Paper products	12479	66358	531.8%
Paper products	4122	41353	1003.2%
Printing & publishing	8357	25005	299.2%
Chemical products	33305	293363	880.8%
Basic chemicals	5668	9005	158.9%
Chemical fertilizers	434	32002	7373.7%

Table A

(Continued)

Industries and Sectors	Q_0 (1)	$\triangle Q$ (2)	$\triangle Q/Q_0$ (3)
Finished chemical products	8873	114984	1295.9%
Petroleum & coal products	11273	117514	1042.4%
Rubber products	7057	19858	281.4%
Non-metal mineral products	9695	65955	680.3%
Basic metal	9661	98765	1022.3%
Iron & steel	7076	86968	1229.1%
Others	2585	11797	456.4%
Metal products & machinery	30387	189416	623.3%
Fabricated metal products	11709	20335	173.7%
Non-electrical machinery	9756	23852	244.5%
Electrical machinery	2075	61213	2950.0%
Transport equipment	6847	84016	1227.0%
Miscellaneous manufacturing	12968	52276	403.1%
Electricity	17183	41869	243.7%
Construction	59490	415708	698.8%
Building & maintenance	41912	228344	544.8%
Public utilities & others	17578	187364	1065.9%
Wholesale & retail trade	87212	405328	464.8%
Transportation	56075	215567	384.4%
Real estate	69792	103859	148.8%
Services	154619	316365	204.6%
Unclassified	23179	131571	567.6%
Total	1238382	3658545	295.4%

Sources: See subsection (3.1).

Notes: Q_0 is the value of output in 1960 and $\triangle Q$ is the change in this value between 1960-1970, both in million won in 1970 prices.

Table B

Decomposition of the Change in Output Comosition

Industries and Sectors	$\Delta Q/Q_0$ (1)	$\Delta Q_D/Q_0$ (2)	$\Delta Q_X/Q_0$ (3)	$\Delta Q_M/Q_0$ (4)
Agriculture	121.1%	130.2%	.7%	−9.9%
Rice, barley & wheat	84.3%	101.9%	−.8%	−16.8%
Others	190.8%	184.0%	3.6%	3.2%
Forestry	41.6%	110.2%	−.5%	−68.1%
Fishery	258.3%	186.0%	74.0%	−1.6%
Mining	203.4%	302.2%	31.2%	−129.7%
Coal	116.5%	112.8%	4.4%	−.7%
Others	318.8%	553.1%	66.8%	−301.9%
Manufacturing	454.9%	439.8%	63.1%	−48.1%
Food & beverages	328.5%	325.1%	13.1%	−9.6%
Processed food	279.0%	278.8%	17.5%	−17.3%
Beverages & tobacco	459.5%	447.5%	1.3%	10.7%
Textile products	337.5%	245.8%	105.4%	−13.4%
Fiber spinning	244.9%	205.6%	57.2%	−17.8%
Textile fabrics	136.1%	139.2%	29.6%	−32.7%
Finished textile prod.	922.3%	548.6%	345.7%	27.9%
Leather products	116.0%	110.9%	12.1%	−6.9%
Wood products	284.3%	147.1%	136.2%	1.3%
Sawmills & plywood	381.0%	176.8%	198.9%	5.3%
Wood prod. & furniture	83.3%	84.6%	5.9%	−7.1%
Paper products	531.8%	507.1%	8.8%	16.0%
Paper products	1003.2%	924.6%	18.8%	59.9%
Printing & publishing	299.3%	301.1%	3.8%	−5.7%
Chemical products	880.8%	943.5%	55.1%	−117.8%
Basic chemicals	158.9%	384.8%	1.8%	−227.8%
Chemical fertilizers	7373.7%	7148.7%	390.6%	−165.7%

Table B

(Continued)

Industriesand sectors	$\Delta Q/Q_o$ (1)	$\Delta Q_D/Q_o$ (2)	$\Delta Q_X/Q_o$ (3)	$\Delta Q_M/Q_o$ (4)
Finished chemical prod.	1295.9%	1528.1%	26.6%	−258.7%
Petroleum & coal prod.	1042.4%	985.0%	75.5%	−18.1%
Rubber products	281.4%	209.2%	80.7%	−8.5%
Non-metal mineral prod.	680.2%	629.6%	25.4%	25.3%
Basic metal	1022.3%	1042.0%	40.7%	−60.4%
Iron & steel	1229.1%	1211.7%	37.9%	−20.6%
Others	456.4%	577.6%	48.3%	−169.5%
Metal prod. & machinery	623.3%	840.1%	41.0%	−257.8%
Fabricated metal prod.	173.7%	242.3%	27.4%	−96.1%
Non-elect. machinery	244.5%	720.5%	8.8%	−484.7%
Electrical machinery	2950.0%	2264.8%	354.8%	330.5%
Transport equipment	1227.0%	1601.0%	15.2%	−389.1%
Misc. manufacturing	403.1%	115.2%	230.8%	57.1%
Electricity	243.7%	230.3%	13.6%	−.2%
Construction	698.8%	688.9%	9.9%	.0%
Building & maintenance	544.8%	548.2%	−3.3%	.0%
Public utilities & others	106..9%	1024.6%	41.3%	.0%
Wholesale & retail trade	464.8%	446.7%	18.4%	−.3%
Transportation	384.4%	322.0%	65.2%	−2.7%
Real estate	148.8%	147.7%	.7%	.4%
Servcies	204.6%	195.5%	5.1%	4.0%
Unclassified	567.6%	462.5%	87.1%	18.0%
Total	295.4%	287.5%	25.6%	−17.6%

Sources: See subsection (3.1).

Notes: Q_o is the value of output in 1960 and ΔQ is the change in this value between 1960-1970. ΔQ_D, ΔQ_X, and ΔQ_M are parts of ΔQ attributable respectively to the change in domestic demand, export expansion, and import substitution.

relatively in favor of heavy industries.

Table B shows structural sources of the change in domestic production of each industry. Here, column (1) is the same as column (3) of Table A, indicating the growth rate of domestic production between 1960-1970. Columns (2) through (4) represent growth rates of domestic production attributed respectively to the change in domestic demand (intermediate plus final), export expansion, and import substitution.

According to Table B, the change in domestic demand played the crucial role not only in the overall growth of domestic production but also in the change in output structure. Specifically, during the 1960's, gross domestic production grew by 288% due solely to the change in domestic demand, while export expansion and import substitution contributed to the growth by 26% and −18% respectively. The change in domestic demand alone created a gap in growth rates of output between agricultural and manufacturing sectors by 310 percentage points (=440%−130%) in favor of the latter. The same gaps created by export expansion and import substitution were 62 and −38 percentage points respectively.

Although both export expansion and import substitution played relatively minor roles, the former contributed positively, while the latter negatively, to the expansion of most of the industries. This reflects the economy's switch from import substitution to export promotion strategy in the early 1960's[9]. Also notable is the fact that both export expansion and import substitution contributed to the expansion of individual industries on a selective basis. Specifically, the positive contribution of export expansion was exceptionally high for finished textile products, sawmill and plywood, chemical fertilizers, electrical machinery, and miscellaneous manufacturing, most of which are known to be labor-intensive[10]. The highest negative contribution of import substitution in turn was found in minerals

9 During the 1950's and the early 1960's import substitution was the major strategy of industrialization and light consumer goods grew to a substantial extent under extensive government protection. In the early 1960's, Korea switched to the export promotion strategy and accordingly introduced several policy measures such as currency devaluation, interest subsidies to exporters, export-import link system, etc.

10 According to the Bank of Korea's estimates for 1968, with the exception of chemical fertilizers, these industries had capital-labor ratios below the manufacturing average, mostly by a great margin, in any of the following three definitions; tangible fixed assets per employee, machinery and equipment per employee, and liabilities and net worth per employee. See Economic Planning Board, *Korea Statistical Yearbook*, 1973 volume, pp. 252-255.

other than coal, most of the chemical products, non-ferrous metals, non-electrical machinery, and transport equipment, most of which are known to be capital-intensive[11]. Note that the contribution of the change in domestic demand was also substantially higher in these capital-intensive industries than the manufacturing average. This suggests that the exceptionally high negative contribution of import substitution in these industries was caused by the accelerated importation of materials, machinery, and equipment needed for industrialization.

3.2 Change in Patterns of Income Distribution.

This subsection traces out the change in income distribution implied by the change in output structure discussed in the previous subsection. As mentioned in the introduction, analyses of this and the subsequent subsections are confined to agriculture, mining, and manufacturing due to lack of relevant data. Because of some characteristics peculiar to agriculture, the approach employed for the agricultural sector is somewhat different from that employed for the mining-manufacturing category.

Mining and manufacturing

The 1970 input-output table contains data on both value added by labor (V_t) and the number of workers employed (N_t). From this information is computed the average labor income (w_t) of workers in each industry according to the following identity:

(7) $V = w \cdot N$

The 1960 input-output table, however, contains data only on value added by labor (V_0), but not on the number (N_0) or average labor income (w_0) of workers employed. Accordingly, the 1960 average labor income is obtained from an independent source[12], and the number of workers employed is estimated according to equation (7).

The next task is to get the average labor income (w^e) and the number (N^e) of each bracket of workers in each industry. Data on this type of information (that is, w^e-N^e pairs) are available only

11 According to the same source as in footnote 10, these industries except non-electrical machinery had capital-labor ratios substantially higher than the manufacturing average.

12 The source of this information is the Bank of Korea, *Economic Statistics Yearbook*, 1972 volume, pp. 332-333.

for 1967[13]. Therefore, w^e and N^e for 1960 and 1970 are estimated on the basis of the following conditions: (1) The ratio of each bracket of workers (N^e) to all workers (N) within each industry remained unchanged between 1960-1970. (2) The average labor income of each bracket of workers (w^e) within each industry grew at the same rate as the average labor income of all workers (w) within that industry[14].

For each bracket of workers in each industry, the average labor income (w^e) is to be converted into average total (that is, labor plus non-labor) income (y^e). Once again, however, data on this type of information are not directly available. What is available is data on labor income and total income of a few brackets of all urban workers (not in each industry) for several different years[15]. What is needed is, therefore, to derive a formulation from these available data, which may be used to convert the labor income (w^e) into total income (y^e) for each bracket of workers in each industry. Specifically, the following equation is obtained:

$$(8)\quad \frac{(w^e/y^e)^{0.29}-1}{0.29} = -0.13831 - 0.13230\,\frac{(w^e/w)^{0.29}-1}{0.29}$$

where w^e=average labor income of bracket e workers
y^e=average total income of bracket e workers
w =average labor income of all workers

Equation (8) is used to convert average labor income (w^e) into average total income (y^e) for each bracket of workers in each industry[16].

The analytical results so far obtained in this subsection are

13 The source of data on w^e-N^e pairs is the Bank of Korea, *Report on Wage Survey*, 1967 volume, in which workers are classified into 18 income brackets.

14 Condition (1) implies that the composition of employment within each industry was constant over time. That is, $\Delta N^e_{Cl} = 0$ in equation (4). Condition (2) has an analogous interpretation: The structure of labor income among different brackets of workers was constant within each industry.

15 The sources of these data are Economic Planning Board, *Korea Statistical Yearbook*, several volumes.

16 The model used in equation (8) is first presented by Box and Cox (1964). Both time-series and cross-section data are pooled together, which give 37 observations of w^e-y^e pairs for computation. Standard deviations for constant and coefficient are 0.01182 and 0.00435. R^2 is 0.7915. Both F and t statistics are significant at 0.5% level.

w^e-y^e-N^e triplets for each bracket of workers in each industry. They are aggregated, bracket by bracket, over all industries in the mining-manufacturing category. These final results are presented in the upper part of Table C.

Agriculture

As mentioned earlier, a different approach is employed for the agricultural sector. For 1960 and 1970 respectively, figures of total value added (rather than value added by labor) for all agricultural subsectors (that is, "rice, barley, and wheat" and "other agriculture" in Table A or B) are added together to obtain the total value added in the whole agricultural sector. From this and the data on the number of total farm households[17] is determined the average farming income per farm household, for each of the two years, according to equation (7), where V, w, and N now denote respectively total value added, average farming income, and the number of farm households.

The number of each bracket (in terms of land holdings) of farm households is then determined from the data on the fraction of each bracket to total farm households.[18] The average farming income of each bracket of farm households is in turn estimated from the information on ratios of farming income among different brackets. The average farming income is then converted into average total (that is, farming plus non-farming) income by using the data on ratios of farming to total income for each bracket of farm households. Finally, these estimates for farm households are transformed into those for individual farmers by using the information on the average number of workers in each bracket of farm households. These final results are presented in the lower part of Table C.

Shares of quintiles

To see the change in income distribution more systematically, workers are classified into quintiles and the share of each quintile in gross sum of incomes is estimated, for 1960 and 1970 respectively, on the basis of the information in Table C. Estimations are done respectively for mining-manufacturing workers (to be called hereinafter as "M workers") alone, farmers alone, and M workers and farmers combined. The results are presented in columns (1) and (2) of Table D. Column (3) of the table shows the increase (decrease) by percentage points in the share of each quintile between 1960-1970. Notice, however, that column (3) does not directly reflect

17 Except the data on value added, sources of all information for the agricultural sector are Economic Planning Board, *Korea Statistical Yearbook*, several volumes.

18 In the orginal source of data, farm households are classified into four brackets according to their land holdings.

Table C

Patterns of Income Distribution in 1960 and in 1970

	1960			1970		
Mining-manufacturing workers						
Income Bracket	**Labor Income**	**Total Income**	**No. of Workers**	**Labor Income**	**Total Income**	**No. of Workers**
(1)	34482	34797	59861	59310	59891	152803
(2)	54377	58074	118809	92544	97776	312636
(3)	73296	80161	54584	127165	139318	140969
(4)	90219	101358	43515	150781	168673	113337
(5)	99144	112763	32803	175105	199819	76128
(6)	112826	130580	27929	202324	236048	64425
(7)	127160	149526	23762	230896	274275	49101
(8)	145456	174441	31654	263192	318654	79270
(9)	173870	214617	27953	304706	377503	64260
(10)	195017	245185	20373	363034	463315	44523
(11)	221556	284678	13630	407807	531067	30946
(12)	246672	322845	9308	456073	606321	18961
(13)	294282	398012	14746	542834	746725	33459
(14)	367282	520091	6844	656958	941127	15991
(15)	444828	656496	6907	808213	1212306	16430
(16)	574110	900684	2378	1041886	1660388	5640
(17)	783441	1331720	1197	1428584	2477850	2897
(18)	896763	1596902	342	1685501	3063673	908
All	115415	141790	499598	198008	275131	1222690
Farmers						
Land Holding	**Farming Income**	**Total Income**	**No. of Farmers**	**Farming Income**	**Total Income**	**No. of Farmers**
—.5	39886	58353	1415207	60878	119736	1306096
.5—1.0	54530	67407	1454109	98841	133375	1595493
1.0-2.0	84132	96996	1396393	148798	178453	1466332
2.0—	115360	126435	416134	190089	223421	418355
All	64389	78742	4681843	111764	151337	4786476

Sources: See subsection (3.2)

Notes: Incomes are in won in 1970 prices. Land holdings are in hectares.

the relative degree of improvement (deterioration) of each quintile's living standard, since an increase (decrease) in the share by one percentage point means relatively more improvement (deterioration) for the lower quintile than for the higher one. This point is taken into account in column (4), which will be called hereinafter as "improvement (deterioration) index".

According to columns (1) and (2) of Table D, income distribution was more equal among farmers than among M workers over the period of 1960-1970. Shares of the bottom and the top quintiles were respectively somewhere around 15% and 27% among farmers, and 6% and 50% among M workers. The distribution for farmers and M workers combined was in between, with the shares of the two extreme quintiles being around 12% and 34% respectively.

Table D

Shares of Quintiles in 1960 and in 1970

Quintiles	1960 (1)	1970 (2)	(2)—(1) (3)	(3)/(1) (4)
Mining-manufacturing workers				
1st quintile.	6.22%	6.05%	—.18%	—2.86%
2nd quintile.	8.85%	8.31%	—.55%	—6.17%
3rd quintile.	13.67%	12.76%	—91%	—6.67%
4th quintile.	21.40%	21.03%	—.37%	—1.74%
5th quintile.	49.86%	51.86%	+2.01%	+9.38%
Farmers				
1st quintile.	14.82%	15.82%	+1.00%	+6.77%
2nd quintile.	15.94%	16.97%	+1.03%	+6.43%
3rd quintile.	17.12%	17.63%	+.41%	+2.42%
4th quintile.	24.15%	23.40%	—.75%	—3.12%
5th quintile.	27.96%	26.18%	—1.78%	—6.36%
Mining-manufacturing workers and farmers combined				
1st quintile.	13.43%	12.49%	—.94%	—7.02%
2nd quintile.	14.75%	14.89%	+.15%	+1.01%
3rd quint.	16.10%	16.07%	—.03%	—.16%
4th quintile.	22.87%	20.93%	—1.94%	—8.50%
5th quintile.	32.86%	35.62%	+2.76%	+8.40%

Source: Table C.

Columns (3) and (4) of Table D show in what direction and to what extent each of the three distributions changed between 1960-

1970. Among M workers, the share of only the top quintile increased by some 2 percentage points while the share of each of the remaining quintiles decreased, an apparent symptom of increasing inequality. Among the lower four quintiles, however, column (4) shows that the deterioration index was higher for the middle two quintiles than for the other two. Overall, therefore, it is not exactly unequivocal whether or not the distribution among M workers may be said to have moved toward increasing inequality.

The distribution among farmers in turn showed an unambiguous change. Column (3) indicates that the share increased for each of the lower three quintiles while it decreased for each of the higher two quintiles. Furthermore, column (4) shows that the improvement (deterioration) index was higher for lower(higher) quintiles. Therefore, the distribution among farmers may be unequivocally said to have moved toward decreasing inequality.

Finally, income distribution for M workers and farmers combined showed a more complex movement. Here, like for M workers alone, the share of the top quintile increased markedly by almost 3 percentage points, as shown in column (3). But, the share of the second quintile also increased, though to a much lesser extent. Moreover, among the remaining three quintiles, column (4) indicates no uniform pattern in the movement of the deterioration index. Once again, therefore, it is not exactly clear whether or not the distribution for M workers and farmers combined may be said to have moved toward more inequality.

As already suggested in the previous three paragraphs, if the share of each and every quintile is to be examined, it is only under highly restricted circumstances that a definite statement can be made as to whether a particular distribution has moved toward increasing or decreasing inequality. Practically, however, a rough statement can be made by focusing only on the shares of the bottom and the top quintiles. Looked at along this line, Table D indicates that the distribution became more unequal among M workers alone, more equal among farmers alone, and more unequal for M workers and farmers combined, all between 1960-1970.

3.3 Change in Patterns of Employment

Most estimations needed for this subsection have already been done in the previous subsection. Specifically, for the mining-manufacturing category, the number of all workers(N) and that of each bracket of workers(N^e) in each industry have been obtained for 1960 and 1970 respectively. Analogous estimates have been obtained also for the agricultural sector. Computations to be done in this subsection are, therefore, to break down the changes in employment

($\triangle N$ and $\triangle N^e$) into several components according to equations (3) and (4). The results of broken down components of $\triangle N$ are presented in Tables E and F. The results of broken down components of $\triangle N^e$ in turn are aggregated, bracket by bracket, over all industries in the mining-manufacturing category. The resulting estimates for the 18 brackets of M workers are then grouped into those for 6 larger brackets for simplification of our discussion. These grouped estimates, together with the estimates for the agricultural sector, are presented in Tables G and H.

In Table G, column (1) represents the number of bracket e workers employed in 1960 and column (2) the increase in this number between 1960-1970. Consequently, column (3) indicates the growth rate of employment of bracket e workers during the same period. As shown in the table, employment of M workers grew at the rate of 145%, whereas that of farmers increased by a little more than 2%, an obvious result of rapid industrialization during the 1960's.

Table G also shows that, within the mining-manufacturing category, the growth rate of employment was higher the closer the bracket

Table E

Change in Employment by Industry between 1960-1970

Industries and Sectors	N_o (1)	$\triangle N$ (2)	$\triangle N/N_o$ (3)
Agriculture	4681.8	104.6	2.2%
Mining	84.7	21.7	25.6%
Coal	41.5	−3.1	−7.5%
Others	43.2	24.8	57.4%
Manufacturing	414.9	701.4	169.1%
Food & beverages	96.4	114.9	119.2%
Processed food	56.9	109.4	192.3%
Beverages & tobacco	39.5	5.5	13.9%
Textile products	126.1	241.4	191.4%
Fiber spinning	23.5	29.0	123.4%
Textile fabrics	60.3	29.6	49.1%
Finished textile products	28.0	183.7	656.1%
Leather products	14.3	−.9	−6.3%
Wood products	18.5	29.4	158.9%
Sawmills & plywood	10.3	22.5	218.4%
Wood products & furniture	8.2	6.9	84.1%

Table E

(Continued)

Industries and Sectors	N_o	$\triangle N$	$\triangle N/N_o$
	(1)	(2)	(3)
Paper products	27.4	31.2	113.9%
Paper products	7.5	17.1	228.0%
Printing & publishing	19.8	14.1	71.2%
Chemical products	45.7	70.6	154.5%
Basic chemicals	7.3	.6	8.2%
Chemical fertilizers	.7	5.1	728.6%
Finished chemical products	9.2	52.2	567.4%
Petroleum & coal products	13.6	3.2	23.5%
Rubber products	14.9	9.5	63.8%
Non-metal mineral products	23.8	29.4	123.5%
Basic metal	10.0	24.8	248.0%
Iron & steel	7.1	22.1	331.3%
Others	2.9	2.7	93.1%
Metal products & machinery	53.3	92.5	173.5%
Fabricated metal products	14.2	15.8	111.3%
Non-electrical machinery	16.4	16.7	101.8%
Electrical machinery	3.2	35.5	1109.4%
Transport equipment	19.5	24.5	125.6%
Miscellaneous manufacturing	13.8	67.2	487.0%
Total	5181.5	827.7	16.0%

Sources: See subsection (3.3)

Notes: Column (1) is the number of workers (farmers) employed in 1960 and column (2) is the change in this number between 1960-1970, both in thousand workers.

under consideration was to either extreme. In other words, the change in employment patterns among M workers was characterized by bipolarization, which in itself must have tended to increase inequality among M workers. Exactly the opposite tendency was shown by the change in employment of farmers. Here, the number of farmers grew faster for the middle two brackets than for the two extreme ones, which in itself must have tended to equalize the distribution among farmers.

Table H shows sources of the change in employment. Column (1) is the same as column (3) of Table G, indicating the growth rate of employment of each bracket of workers. Columns (2) through (7)

represent the growth rates of employment attributed solely to the change in domestic intermediate demand, the change in domestic final demand, export expansion, import substitution, the techno-substitution effect (or the change in labor-output ratio), and the industry composition effect (or the change in class composition of employment within individual industries). Colum (7) is zero for the mining-manufacturing category because of condition (1) on page 228.

For the mining-manufacturing category, columns (2) and (3) show that, while contribution of the change in domestic final demand showed a mixed tendency, that of the change in domestic intermediate demand was more favorable for the employment generation of upper-income groups. This latter aspect is consistent with our previous finding that, during the 1960's, heavy industries expanded far more rapidly than light industries. Specifically, heavy industries are expected to use as inputs relatively more of skill-intensive products than light industries. Consequently, faster growth of heavy industries is expected to create patterns of intermediate demand relatively in favor of skill-intensive products, which in turn is expected to generate patterns of labor demand in favor of skilled workers, as was the case

Table F

Decomposition of the Change in Employment Patterns by Industry

Industries and Sectors	$\triangle N/N_o$	$\triangle N_D/N_o$	$\triangle N_X/N_o$	$\triangle N_M/N_o$	$\triangle N_T/N_o$
	(1)	(2)	(3)	(4)	(5)
Agriculture	2.2%	95.2%	.5%	−7.2%	−86.3%
Mining	25.6%	233.5%	25.0%	−105.9%	−127.0%
Coal	−7.5%	80.4%	3.2%	−.5%	−90.6%
Others	57.4%	380.4%	45.9%	−207.1%	−161.9%
Manufacturing	169.0%	336.5%	51.1%	−37.1%	−181.5%
Food & beverages	119.2%	256.0%	9.5%	−6.4%	−139.9%
Processed food	192.3%	246.8%	15.5%	−15.3%	−54.8%
Beverages & tobacco	13.9%	269.3%	.8%	6.4%	−262.6%
Textile products	191.4%	200.8%	88.1%	−10.6%	−86.8%
Fiber spinning	123.4%	169.3%	47.1%	−14.7%	−78.3%
Textile fabrics	49.1%	113.6%	24.1%	−26.7%	−61.9%
Finished text. prod.	656.1%	477.2%	300.7%	24.3%	−146.1%
Leather products	−6.3%	79.4%	8.7%	−4.9%	−89.4%
Wood products	158.9%	119.4%	94.6%	−.7%	−54.4%
Sawmills & plywood	218.4%	146.9%	165.3%	4.4%	−98.2%
Wood prod. & furn.	84.1%	84.6%	5.9%	−7.1%	.6%

Table F

(Continued)

Industries and Sectors	$\triangle N/N_0$ (1)	$\triangle N_D/N_0$ (2)	$\triangle N_X/N_0$ (3)	$\triangle N_M/N_0$ (4)	$\triangle N_T/N_0$ (5)
Paper products	113.9%	319.6%	5.3%	7.7%	−218.7%
Paper products	228.0%	599.8%	12.2%	38.8%	−422.7%
Print. & publish.	71.2%	215.1%	2.7%	−4.1%	−142.6%
Chemical products	154.5%	542.3%	38.7%	−70.6%	−356.5%
Basic chemicals	8.2%	272.8%	1.3%	−161.5%	−104.4%
Chem. fertilizers	728.6%	3970.3%	217.0%	−92.0%	−3367.0%
Finished chem. prod.	567.4%	1129.3%	19.6%	−191.2%	−390.3%
Petr. & coal prod.	23.5%	545.8%	41.8%	−10.0%	−554.0%
Rubber products	63.8%	149.5%	57.6%	−6.0%	−137.3%
Non-metal min. prod.	123.5%	405.0%	16.3%	16.3%	−314.1%
Basic metal	248.0%	676.1%	27.1%	−42.7%	−412.5%
Iron & steel	311.3%	793.3%	24.8%	−13.5%	−493.4%
Others	93.1%	396.0%	32.5%	−114.1%	−214.2%
Mtl. prod. & machinery	173.5%	670.5%	26.7%	−210.4%	−313.4%
Fabricated mtl. prod.	111.3%	214.7%	24.3%	−85.1%	−42.6%
Non-elect. machinery	101.8%	571.3%	7.0%	−384.4%	−92.0%
Elect. machinery	1109.4%	1581.3%	247.8%	230.8%	−950.5%
Transport equipment	125.6%	936.8%	8.9%	−227.7%	−592.2%
Misc. manufacturing	487.0%	124.8%	250.1%	61.8%	50.3%

Sources: See subsection (3.3).

Notes: N is the number of workers (farmers) employed in 1960 and $\triangle N$ is the change in this number between 1960-1970. $\triangle N_D$, $\triangle N_X$, $\triangle N_M$, and $\triangle N_T$ are parts of $\triangle N$ attributable respectively to the change in domestic demand, export expansion, import substitution, and the techno-substitution effect.

shown in column (2)[19]. Note further that the gaps in growth rates of employment among different brackets created by the change in domestic intermediate demand were so dominant that the contribution of the change in domestic total (that is, intermediate plus final) demand also showed a tendency to favor the employment generation

19 It is implicitly assumed that, within the mining-manufacturng category, workers of higher bracket have skills of higher level.

of upper-income groups[20].

Columns (4) and (5) of Table H show the contribution of international trade to generating new employment. According to column (4), export expansion contributed more favorably to the employment creation of lower-income groups, reflecting that exportation during the 1960's centered on products which required low-skilled labor. Column (5) in turn indicates that, with the possible exception of the very top bracket, the contribution of import substitution was more unfavorable for the employment generation of higher-income groups. This is also consistent with our previous finding that impotration during the 1960's concentrated primarily on heavy industrial products such as raw materials, machinery, and equipment, which were relatively skill-intensive. Overall, therefore, international trade during

Table G

Change in Employment Patterns by Class, 1960-1970

Classes	N_0^e (1)	$\triangle N^e$ (2)	$\triangle N^e / N_0^e$ (3)
Mining-manufacturing workers			
Brackets (1)—(3)	233253	373155	160.0%
Brackets (4)—(6)	104249	149641	145.5%
Brackets (7)—(9)	86369	106267	123.0%
Brackets (10)—(12)	43311	51118	118.0%
Brackets (13)—(15)	28496	37385	131.2%
Brackets (16)—(18)	3918	5527	141.1%
All	**499596**	**723093**	**144.7%**
Farmers			
— .5 hectares	1415207	−109111	−7.7%
.5—1.0 hectares	1454109	141384	9.7%
1.0—2.0 hectares	1396393	70139	5.0%
2.0 hectares	416134	2221	.5%
All	**4681843**	**104633**	**2.2%**

Sources: See subsection (3.3)

Notes: Column (1) is the number of each class of workers (farmers) employed in 1960 and column(2) is the change in this number between 1960-1970.

20 If columns (2) and (3) of Table H are added together row by row, the resulting figures are bigger for the upper brackets than for the lower ones.

Table H

Decomposition of the Change in Employment Patterns by Class

Classses	$\triangle N^e/N_0^e$ (1)	$\triangle N_{DI}^e/N_0^e$ (2)	$\triangle N_{DF}^e/N_0^e$ (3)	$\triangle N_X^e/N_0^e$ (4)	$\triangle N_M^e/N_0^e$ (5)	$\triangle N_T^e/N_0^e$ (6)	$\triangle N_{Cl}^e/N_0^e$ (7)
Mining-manufacturing workers							
Brackets (1)—(3)	160.0%	179.3%	128.1%	52.2%	−37.5%	−162.2%	—
Brackets (4)—(6)	143.5%	204.3%	109.3%	50.8%	−48.4%	−172.3%	—
Brackets (7)—(9)	123.0%	213.1%	104.8%	39.1%	−57.1%	−176.7%	—
Brackets (10)—(12)	118.0%	244.3%	117.2%	30.8%	−76.2%	−198.1%	—
Brackets (13)—(15)	131.2%	250.0%	119.6%	37.1%	−75.3%	−200.2%	—
Brackets (16)—(18)	141.1%	248.7%	98.4%	34.2%	−46.4%	−193.8%	—
All	144.7%	200.6%	118.5%	46.7%	−48.7%	−172.3%	—
Farmers							
— .5 hectares	−7.7%	30.0%	60.6%	.5%	−6.9%	−82.1%	−9.8%
.5—1.0 hectares	9.7%	32.7%	66.0%	.6%	−7.5%	−89.5%	7.4%
1.0—2.0 hectares	5.0%	31.9%	64.6%	.5%	−7.3%	−87.5%	2.8%
2.0— hecsares	.5%	31.3%	63.2%	.5%	−7.2%	−85.6%	−1.7%
All	2.2%	31.5%	63.7%	.5%	−7.2%	−86.3%	—

Sources: See subsection (3.3)

Notes: N_0^e is the number of class e workers (farmers) employed in 1960 and $\triangle N^e$ is the change in this number between 1960-1970. $\triangle N_{DI}^e$, $\triangle N_{DF}^e$, $\triangle N_X^e$, $\triangle N_M^e$, $\triangle N_T^e$, and $\triangle N_{Cl}^e$ are parts of $\triangle N^e$ due respectively to the change in domestic intermediate demand, the change in domestic final demand, export expansion, import substitution, the techno-substitution effect, and the industry composition effect.

the 1960's contributed to the generation of new employment relatively in favor of lower-income groups by exporting less skill-intensive products and against upper-income groups by importing more skill-intensive products.

Finally, contribution of the techno-substitution effect (column (6)) was relatively more unfavorable for the employment creation of upper-income groups. This implies that both technological progress and factor substitution tended to increase labor productivity (or the inverse of labor-output ratio) relatively more in heavy industries than in light industries, since the employment structure of heavy industries was relatively more skill-intensive than that of light industries.

The lower panel of Table H shows similar information for the agricultural sector. Note, however, that each of columns (2) through (6) indicates virtually the same figure for different brackets of farmers as well as for the whole agricultural sector. This stems from the way the agricultural sector in handled in this study: Namely, all farmers in the whole agricultural sector (rather than some farmers in individual agricultural subsectors) are broken down into 4 brackets and, hence, changes in weights among these subsectors do not affect the employment structure in the whole sector. More importantly, however, the closeness of figures in each of columns (2) through (6) is in fact consistent with our expectation. Specifically, the agricultural sector in Korea is characterized by a structure of very small owner-operated farms, who grow largely the same crop items with practically the same farming techniques. Therefore, a change in, say, domestic demand is not expected to affect different brackets of farmers to a significantly different extent.

3.4 Sources of the Change in Income Distribution

It has been pointed out in subsection (3.2) that, during 1960-1970, income distribution became more unequal among M workers alone, more equal among farmers alone, and more unequal for M workers and farmers combined. This subsection is now intended to identify sources of these changes in income distribution. Basic sets of information used are those in Tables C, F, and H. The analytical framework used is equations (5) and (6). Estimations are done respectively for M workers alone, farmers alone, and M workers and farmers combined. The results are presented in Tables I, J, and K.

In Table I, column (1) represents the gross sum of incomes of all workers in each quintile in 1960. Column (2) indicates the growth rate of this sum during 1960-1970 and, hence, reflects relative improvement of workers' living standard among different quintiles[21].

21 The ordering of column (2) of Table I is the same as the ordering of improvement index (that is, column (4)) of the top panel of Table D. That is, the two orderings are consistent with each other, so they should be.

Columns (3) through (8) show the growth rates of the gross sum of incomes due respectively to the structural sources now familiar to us. Columns (9) and (10) indicate the growth rates due respectively to the change in labor income and to that in non-labor income[22]. At the bottom row of Table I, the difference between the top and the bottom quintiles is presented to see the degree of equalizing or unequalizing tendency of each source.

According to column (3) of Table I, the change in domestic intermediate demand contributed consistently more favorably for higher quintiles. As pointed out in subsection (3.3), this reflects the faster expansion of heavy industries during the 1960's, which created patterns of intermediate demand relatively in favor of skilled workers. The change in domestic final demand in turn showed a mixed tendency as shown in column (4). Its contribution was most favorable for the bottom quintile but, among the remaining quintiles, was more favorable for the higher quintiles than for the lower ones.

Both export expansion and import substitution tended to narrow the inequality among M workers, as shown in columns (5) and (6). The former reflects the concentration of exportation during the 1960's on products requiring relatively low-skilled workers. The latter in turn reflects the increased importation of skill-intensive products such as raw materials, machinery, and equipment, which was made necessary as a result of the faster growth of heavy industries.

Contribution of the techno-substitution effect was also more unfavorable for higher quintiles (column (7)), thus tending to equalize the distribution among M workers. Again, this implies that both technological progress and factor substitution tended to increase labor productivity relatively more in heavy industries which had a relatively more skill-intensive employment structure, thus hurting the employment generation of upper-income groups. Contribution of the composition effect or the change in class composition of employment in turn showed a tendency to increase the inequality among M workers (column (8)). Underlying this was the bipolarization of employment patterns as shown in the top panel of Table G. That is, growth rates of employment were higher for workers closer to either extreme. Consequently, while higher quintiles were occupied by relatively more of higher-bracket workers, lower quintiles were occupied by relatively more of lower-bracket workers. Obviously, both phenomena must have tended to increase the inequality.

22 Column (9) is obtained as following. Let w^e and y^e be respectively labor and total incomes of bracket e workers. $\Delta Y^{e,q}_{Y1} = \Delta w^e \cdot N^{e,q}$ is first estimated analogously to $\Delta Y^{e,q}_{Y}$ in equation (6). The results are then aggregated over all e within each quintile. Column (10) is similarly estimated. $\Delta Y^{e,q}_{Y2} = \Delta (y^e - w^e) \cdot N^{e,q}$ is first estimated and the results are then aggregated over all e.

Columns (9) and (10) indicate another notable aspect. The change in labor income (column (9)) tended to decrease the inequality among M workers. But, the change in non-labor income (column (10)) not only tended to increase the inequality but created bigger gaps in growth rates of gross income among different quintiles than the change in labor income. Conceivably, there are two factors to consider in relation to the unequalizing contribution of the change in non-labor income. One is the possibility of increased concentration of non-human assets to upper-income groups. The other is the possibility of an increase in the relative rate of returns to non-human against human assets. Evidence indicates, however, that the relative rate actually decreased in Korea during the 1960's[23]. That is, the inequality-increasing contribution of the change in non-labor income was due totally to the increased concentration of non-human assets to upper-income groups.

Analogous results for farmers are presented in Table J. Except for columns (9) and (10), each column of Table J maintains exactly the same meaning as its corresponding column of Table I. Columns (9) and (10) now show contributions of the change in farming income and the change in non-farming income respectively.

As shown in Table J, contributions of the structural sources (columns (3) through (8)) were rather minor. As pointed out in subsection (3.3), this is consistent with our expectation, although it stems from the way the agricultural sector is handled in this study. The most significant finding in Table J is that, while the change in farming income tended to unequalize the distribution among farmers, the change in non-farming income tended to equalize the distribution. Moreover, the equalizing gap by 52 percentage points in growth rates of gross income created by the change in non-farming income completely dominated the unequalizing gap by 27 percentage points created by the change in farming income. In fact, what was mainly responsible for the decreasing inequality among farmers was the change in non-farming income.

Looking back at Table C, we see that the average total income of M workers increased by 73% (from 141790 to 245131 won), whereas that of farmers increased by 92% (from 78742 to 151337 won), during

23 Economic Planning Board, *Korea Statistical Yearbook*, several volumes give the following information; "value added per employee (V/L)", "personnel expense per employee (w)", and capital-labor ratio (K/L) where capital is defined in three different ways, namely "tangible fixed assets", "machinery and equipment", and "liabilities and net worth" The rate of returns to capital (r) is estimated according to the following equation; $V = wL + rK$ or $r = ((V/L) - w)/(K/L)$. The resulting (r/w) shows a consistently decreasing tendency during the 1960's, regardless of whatever definition of capital is used.

Table I

Sources of the Change in Income Distribution among M Workers

(Growth Rate of Gross Income Attributable to:)

Quintile	Gross Income in 1960 Y_o^q (1)	Growth Rate of Gross Income $\Delta Y^q/Y_o^q$ (2)	Change in Inter-mediate Demand $\Delta Y_{DI}^q/Y_o^q$ (3)	Change in Final Demand $\Delta Y_{DF}^q/Y_o^q$ (4)	Export Expan-sion $\Delta Y_X^q/Y_o^q$ (5)	Import Substi-tution $\Delta Y_M^q/Y_o^q$ (6)	Techno-Substi-tution Effect $\Delta Y_T^q/Y_o^q$ (7)	Compo-sition Effect $\Delta Y_C^q/Y_o^q$ (8)	Change in Labor Income $\Delta Y_{Y1}^q/Y_o^q$ (9)	Change in Non-Labor Income $\Delta Y_{Y2}^q/Y_o^q$ (10)
1st quint.	4409	311.0%	225.0%	175.1%	64.6%	−49.4%	−207.5%	−16.7%	116.2%	3.7%
2nd quint.	6270	297.0%	229.4%	155.9%	70.7%	−43.8%	−205.2%	−25.9%	109.3%	6.7%
3rd quint.	9682	294.9%	254.4%	145.2%	70.9%	−54.5%	−217.1%	−21.2%	105.5%	11.7%
4th quint.	15159	315.8%	304.4%	160.3%	56.3%	−82.4%	−261.5%	4.7%	112.1%	21.9%
5th quint.	35317	340.1%	353.1%	160.3%	52.5%	−99.9%	−279.1%	10.5%	102.5%	40.6%
5th-1st		+29.1%	+128.1%	−14.8%	−12.4%	−50.5%	−71.6%	+27.2%	−13.7%	+36.9%

Sources: See subsection (3.4).

Notes: Column (1) is in million won in 1970 prices.

Column (7) indicates effect of change in labor productivity.

Column (8) indicates effect of change in class composition of employment.

Table J

Sources of the Change in Income Distribution among Farmers

(Growth Rase of Gross Income Attributable to)

Quintile	Gross Income in 1960 Y_o^q (1)	Growth Rate of Gross Income $\Delta Y^q/Y_o^q$ (2)	Change in Inter mediate Demand $\Delta Y_{DI}^q/Y_o^q$ (3)	Change in Final Demand $\Delta Y_{DF}^q/Y_o^q$ (4)	Export Expansion $\Delta Y_X^q/Y_o^q$ (5)	Import Substitution $\Delta Y_M^q/Y_o^q$ (6)	Techno-Substitution Effect $\Delta Y_T^q/Y_o^q$ (7)	Composition Effect $\Delta Y_C^q/Y_o^q$ (8)	Change in Farming Income $\Delta Y_{Y1}^q/M_o^q$ (9)	Change in Non-Farming Income $\Delta Y_{Y2}^q/Y_o^q$ (10)
1st quint.	54640	109.8%	48.2%	97.5%	.8%	−11.1%	−132.0%	.0%	36.4%	70.0%
2nd quint.	58783	109.1%	47.7%	96.4%	.8%	−10.9%	−130.6%	2.7%	55.0%	48.1%
3rd quint.	63118	102.3%	47.0%	95.0%	.8%	−10.8%	−128.7%	.0%	66.5%	32.5%
4th quint.	89043	90.4%	45.1%	91.1%	.8%	−10.3%	−123.4%	1.3%	67.7%	18.1%
5th quint.	103075	84.0%	44.1%	89.2%	.8%	−10.1%	−120.8%	−.3%	63.5%	17.6%
5th-1st		−25.8%	−4.1%	−8.3%	.0%	+1.0%	+11.2%	−.3%	−27.1%	−52.4%

Sources: See subsection (3.4).

Notes: Column (1) is in million won in 1970 prices.
Column (7) indicates effect of change in labor prodnctivity.
Column (8) indicates effect of change in class composition of employment.

1960-1970. Note, however, the average farming income increased only by 74% (from 64339 to 111764 won) during the same period. In other words, the change in non-farming income was also responsible for decreasing the gap in average total income between M workers and farmers.

The evidence that the change in non-farming income contributed not only to decreasing the gap in income between M workers and farmers (Table C) but to equalizing the distribution among farmers (Table J) suggests an important aspect in the general context of development. As industrialization proceeds, farmers may conceivably show two types of response. One is outright migration into urban sectors. The other is increased participation in non-agricultural activities (while maintaining their basic status as farmers). Furthermore, in this latter type of response, small farmers are likely to participate relatively more in these activities than large farmers.

Table K finally presents analogous results for M workers and farmers combined. With the exception of column (9), each column is interpreted exactly the same way as its corresponding column in the previous two tables. In column (9), contribution of the change in total income (that is, labor plus non-labor income for M workers, and farming plus non-farming income for farmers) is presented for the obvious reason that the separate sources of income are not meaningfully comparable between M workers and farmers.

According to column (2) of Table K, the growth rate of gross income was substantially higher for the top quintile than for the remaining ones. Among the lower four quintiles, however, the rate was higher for the middle two quintiles than for the other two, and this contradicts our expectation. Specifically, the lower four quintiles of Table K were occupied mostly by farmers. Since the distribution among farmers moved toward more equality during the 1960's (Table J), the distribution among the lower four quintiles in Table K is also expected to have moved toward more equality.

The contradiction in the above paragraph was in fact a result of statistical hazard. When both M workers and farmers together were classified into quintiles based on the information in Table C, only the first and the third quintiles happened to include M workers[24]. The consequence of this aspect was notably reflected in column (3) of Table K. Specifically, among the lower four quintiles, those which included M workers showed significantly larger estimates than those which did not. Looking back at column (3) of Tables I and J, we see that the change in domestic intermediate de-

24 In 1970, the fourth quintile also included M workers. But, the number was negligibly small.

Table K

Sources of the Change in Income Distribution for M Workers and Farmers Combined

Quintile	Gross Income in 1960 Y_o^q (1)	Growth Rate of Gross Income $\Delta Y^q/Y_o^q$ (2)	Growth Rate of Gross Income Attributable to: Change in Intermediate Demand $\Delta Y_{DI}^q/Y_o^q$ (3)	Change in Final Demand $\Delta Y_{DF}^q/Y_o^q$ (4)	Export Expansion $\Delta Y_X^q/Y_o^q$ (5)	Import Substitution $\Delta Y_M^q/Y_o^q$ (6)	Techno-Substitution Effect $\Delta Y_T^p/Y_o^q$ (7)	Composition Effect $\Delta Y_C^q/Y_o^q$ (8)	Change in Income $\Delta Y_Y^q/Y_o^q$ (9)
1st quint.	59027	116.7%	73.0%	101.9%	11.4%	−15.7%	−134.9%	−21.0%	101.9%
2nd quint.	64805	135.4%	50.9%	102.9%	.9%	−11.7%	−139.4%	21.8%	109.9%
3rd quint.	70735	132.7%	66.8%	101.3%	7.5%	−14.8%	−138.7%	6.9%	103.6%
4th quint.	100516	113.2%	48.2%	96.3%	1.1%	−11.0%	−130.4%	18.6%	90.6%
5th quint.	144411	152.6%	150.7%	110.9%	21.0%	−40.5%	−170.8%	15.8%	97.1%
5th-Avg.		+28.1%	+91.0%	+10.3%	+15.8%	−27.2%	−35.0%	+9.2%	−4.4%

Sources: See subsection (3.4).

Notes: Column (1) is in million won in 1970 prices.

Avg. at the bottom row is average of lower four quintiles.

mand contributed far more favorably for M workers than for farmers. Since, among the lower four quintiles of Table K, the relative weight of M workers increased only in the first and the third quintiles, contribution of the change in domestic intermediate demand showed higher standings in these quintiles than in the other two (column (3) of Table K).

The point in the above paragraph is as follows: The phenomenon that only some (not all) of the quintiles happened to include M workers produced significant biases in the estimates. This phenomenon stemmed from the statistical arbitrariness that, in the original sources of data, workers (especially farmers) were classified into rather thick brackets. If they had been more finely classified, each quintile would have included a more realistic combination of both M workers and farmers and, hence, the biases contained in the estimates would have been less serious. For this reason, our discussion in relation to Table K is confined to the comparison between the top and the remaining quintiles, which virtually means the comparison between M workers and farmers. Accordingly, in the bottom row of Table K is presented the difference between the top and the average of the remaining quintiles rather than the difference between the top and the bottom quintiles.

According to columns (3) and (4) of Table K, the change in domestic demand (both intermediate and final) tended to unequalize the countrywide (that is, M workers plus farmers in the present study) distribution. Moreover, the change in domestic intermediate demand was the most unequalizing source of all, creating a gap in growth rates of gross income by 91 percentage points between the top and the remaining quintiles. The general implication of this evidence is as follows: As long as industrialization is pursued as the prime goal of the economy, patterns of domestic demand inevitably change in favor of industrial products. Since the average income of industrial workers is usually substantially higher than that of farmers, the inequality-widening tendency of the change in domestic demand is an inevitable consequence of industrialization.

Column (5) of Table K indicates another notable aspect. It has been pointed out that export expansion was one of the sources which contributed to narrowing the inequality among M workers (Table I). Now in the countrywide distribution, this source switched its role completely, creating an unequalizing gap in growth rates of gross income by 16 percentage points – not insignificant in view of the actual gap by 28 percentage points shown in column (2). This evidence is suggestive of the general possibility that even a policy measure intended to help low-income industrial workers may turn out to be one which in fact helps upper-income groups in the countrywide distribution, if the gap in income between agricultural and

industrial sectors is significantly large.

Another source which needs somewhat detailed discussion is the composition effect or the change in class composition of employment. According to column (8) of Table K, this source also tended to widen the inequality in the countrywide distribution. Underlying this was the rapid industrialization, which raised the relative weight of M workers in the economy. In general, however, an increase in the relative weight of M workers in itself does not necessarily raise the share of upper-income groups even if the income of M workers is higher than that of farmers. Specifically, as the relative weight of M workers increases, high-income farmers who have been in, say, the top quintile will be gradually replaced by M workers. This will increase the gross income of the top quintile, since the in-coming M workers have higher income than the out-going farmers. But, the average income of the out-going (from the top quintile) farmers is also higher than that of the lower quintiles. Therefore, the gross income of the lower quintiles will also increase. Depending upon the relative magnitudes of the increase in gross income between the top and the remaining quintiles, the share of the top quintile may increase or decrease as a consequence of the increase in the relative weight of M workers. The resulting thesis is: It is only when the gap in income between M workers and farmers is substantially big that the increase in the relative weight of M workers raises the share of upper-income groups. And its antithesis is: If the gap is below a certain level, the increase in the relative weight of M workers may well lower the share of upper-income groups. As reflected in column (8) of Table K, the gap in income between M workers and farmers was substantially big in Korea during the 1960's.

The tendency shown by each of the remaining sources is consistent with our expectation. Import substitution (column (6)) tended to equalize the countrywide distribution, indicating that import dependency increased relatively more in the mining-manufacturing category than in the agricultural sector. The techno-substitution effect (column (7)) also showed a tendency to decrease the inequality. This reflects that, during the 1960's, both technological progress and factor substitution tended to increase labor productivity relatively more in the mining-manufacuring category than in the agricultural sector and, hence, tended to exert relatively more adverse effects on the employment creation of M workers than that of farmers. Finally, the change in income (column (9)) showed a tendency to equalize the countrywide distribution. This is consistent with our previous finding that the average income of farmers grew faster than that of M workers (Table C).

4. Conclusion

The Korean economy during 1960-1970 has been analyzed to

see how structural factors contributed to the change in patterns of income distribution. During this period, the government introduced various policy measures in efforts to encourage development of the economy. The main characteristics of these policy measures were: (1) The highest priority was always put on industrialization. (2) In the early 1960's, import substitution was replaced by export promotion as the basic strategy of industrialization. (3) From the mid-1960's, emphasis was laid on heavy industries.

As a result, the economy underwent tremendous changes both in its size and in its structure. GNP more than doubled and per capita GNP increased by some 76% between 1960-1970, both in constant prices. Most of the industrial sectors expanded far more rapidly than non-industrial sectors and, among the former, heavy and chemical industries grew faster than light industries.

In this process of industrialization, income distribution became more unequal among M workers alone, more equal among farmers alone, and more unequal for M workers and farmers combined. Especially notable is the finding that structural sources (columns (3) through (8) in Tables I, J, and K) played dominant roles in the unequalizing distributions among M workers alone and for M workers and farmers combined, while they played relatively minor roles in the equalizing distribution among farmers. This is consistent with Kuznets' (1963) suggestion that structural changes are probably responsible for the increasing inequality at the initial stage of growth.

It has been shown that the most unequalizing source in the countrywide distribution was the change in domestic demand, especially domestic intermediate dtmand (Table K). This evidence, though found in the case of Korea, is expected to prevail in most of the developing countries. It is true that development and industrialization are used almost synonymously in the real world. As industrialization proceeds, domestic demand will inevitably change in favor of industrial products. This in turn will create patterns of labor demand in favor of industrial workers. Since industrial workers usually have substantially higher income than farmers, the inequality in the countrywide distribution will inevitably widen as a result of industrialization.

With the most unequalizing source accepted as an inevitable result of industrialization, there seems to be little to do for a more equal distribution. Indeed, but not absolutely hopeless. It has been pointed out on page 247 that, if the gap in income between M workers and farmers is below a certain level, an increase in the relative weight of M workers may well reduce the inequality in the countrywide distribution. This suggests a strategy to help raise farmers' income. What immediately strikes us is some type of farm support program.

In the case of Korea, however, the change in farming income showed a tendency to widen the inequality among farmers (Table J), who still constitute a majority of the economy's work force. A more appropriate policy measure must therefore be one which helps raise farmers' non-farming income. As shown, the change in non-farming income not only tended to narrow the gap in income between M workers and farmers (Table C) but was the major source of equalizing the distribution among farmers (Table J). Since farmers are expected to be low-skilled in non-agricultural activities, the policy measure to help raise farmers' non-farming income must be one which provides more opportunities for farmers to participate in less skill-intensive activities. Probably the most promising course is to link farmers with the export promotion strategy concentrating on less skill-intensive industrial products. As shown, this type of export promotion strategy also tended to reduce the inequality among M workers (Table I).

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