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The Case of Korea 1960-1970

by

Daemo Kim

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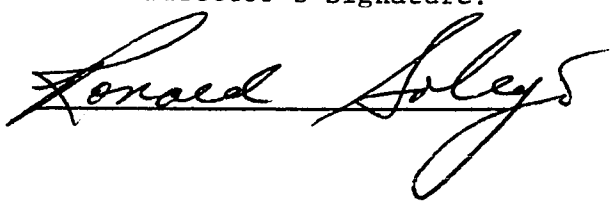

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1. Introduction

Since Kuznets(1955) first presented the hypothesis that income inequality increases at the earlier 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 distribution of income in general, and the poverty problem in particular, has been increasingly called for.

Policy-building procedures usually require systematic factual evidence. To trace out such evidence in turn requires a well-established theoretical framework. But, theories on the (size) distribution of income are one of the most poorly established in economics. Consequently, analysis of income distribution frequently begins 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 the patterns of income distribution can probably be traced out by looking

---

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

into the structural changes that occur with growth.

On reflection, this is rather a matter of course. In general, an individual's income comes from two sources; namely, returns to his human assets (or labor) and to his non-human assets (or assets in a narrower sense). Therefore, whenever patterns of employment and asset ownership or relative returns between human and non-human assets change, the patterns of income distribution are also expected to change. And the patterns of employment and asset ownership as well as the relative returns between human and non-human assets are very likely to change when the economy undergoes massive structural changes.

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 crucial to the rural poverty problem[1] 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 systematically analyze the change

---

1. The rural poverty problem alone may be alleviated by improvement in the terms of trade between agricultural and industrial sectors in favor of the former. This possibility is ruled out of our discussion, however, since such improvement in the terms of trade is likely to deteriorate the urban poverty problem on the one hand and, probably more importantly, to slow down industrialization on the other.

in patterns of income distribution that occurred in Korea between 1960-1970. Literature on income distribution in Korea, though very scanty, suggests that Korea has been characterized by relatively low inequality compared to other developing countries. According to Adelman(1974), the distribution of income in Korea during the 1960's was "among the best in the developing world". Ahluwalia(1974) also puts Korea in the group of countries having relatively moderate inequality. Brown(1973) conjectures that the major policy measures taken in Korea during the 1960's tended to improve the distribution of income. Fei and Ranis (1976) in turn focus on the particular strategy of export promotion and suggest that, during the late 1960's and the early 1970's, this strategy contributed greatly to generating new employment and, hence, to alleviating the poverty problem. But, most of these discussions are limited to the industrial sector alone, with the vast agricultural sector frequently neglected.

The purpose of the present study is 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 structure as conceived in this study, which occurred during the period. In accordance with Bell-Duloy's identification, and in view of the fact that the amount 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 the patterns of employment and income distribution will then be traced out.

Because of the lack of relevant data, the analysis of the present 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[1], the analytical results of this study are expected to shed some light on the explanation of the changing patterns of income distribution, despite the non-comprehensiveness of coverage.

In section (2), characteristics of the major economic policies taken in Korea during the 1960's will be discussed. Section (3) will describe the analytical framework to be used in the present study. Section (4) will then present analytical results. Brief concluding remarks will follow in section (5).

---

1. See Table A in section (2).

2. Characteristics of Economic Policies in Korea during the 1960's and Their Implications Concerning Income Distribution

Up until the early 1960's, Korea was a predominantly agricultural economy, with more than 40% of its GNP and some 60% of its population originating from the agricultural sector. With the launch of the first five-year economic plan in 1962, however, the highest priority was put on industrialization. Furthermore, with the start of the second plan in 1967, emphasis in the course of industrialization was laid on heavy industries. Accordingly, the general direction of economic policies during the 1960's was characterized not only by industrialization in general but also by industrialization with particular emphasis put on heavy industries.

As an economy with extremely poor endowment of natural resources[1], the industrialization strategy of Korea had to be closely related to its strategy in international trade. During the 1950's and the early 1960's, import substitution was the major strategy of industrialization and light consumer goods industries grew to a substantial extent under extensive government protection. By the early 1960's, therefore, Korea had to make a choice between two alternatives: whether to pursue further import substitution in intermediate and heavy industries or to switch to the strategy of export promotion. It chose the latter alternative.

---

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

Some indicators of the Korean economy are presented in Table A. As shown, the economy underwent tremendous changes both in its size and in its structure during the 1960's. GNP more than doubled between 1960-1970. During the same period, exports jumped tremendously from 33 million dollars to 835 million dollars, while imports also increased substantially from 344 million dollars to 1984 million dollars. Table A also shows that the major structural change during the 1960's occurred between agriculture and manufacturing. Specifically, between 1960-1970, the share in GNP of agriculture, forestry, and fishery decreased from 41% to 28%, whereas that of mining and manufacturing increased from 12% to about 23%. There was also a fundamental change in the composition of exports. The ratio of primary to manufactured exports changed from 86% vs. 14% to 23% vs. 77% between 1960-1970. The composition of imports in turn remained relatively stable during the same period.

The strategy of industrilization in general resulted in an increase in the relative weight of industrial workers in the whole economy. Since there was a big gap in average income between industrial workers and farmers and since the number of industrial workers was still much smaller than that of farmers, the increase in relative weight of industrial workers meant a relative increase in the upper-income groups. Consequently, the industrialization during the 1960's is likely to have increased the inequality in the countrywide distribution, as pointed out by Kuznets (1955).

The fact that emphasis was put on heavy industries during the

Table A. Some Indicators of Korean Economy in 1960 and 1970

	1960	1970
GNP (billion won in 1970 prices)	1,130	2,589
Shares in GNP of		
Agriculture, Forestry, and Fishery	41.3%	28.0%
Mining and Manufacturing	12.1%	22.8%
Others	46.6%	49.2%
Total Exports (million U.S. dollars)	33	835
Composition of Exports[1]		
Primary[2]	85.8%	22.6%
Manufactured[3]	14.2%	77.4%
Total Imports (million U.S. dollars)	344	1,984
Composition of Imports[1]		
Primary[2]	42.6%	44.2%
Manufactured[3]	57.4%	55.8%

1) The item "not elsewhere classified" is omitted from this estimation.
2) Primary includes food, beverages, live animals, oils and fats, tobacco, minerals.
3) Manufactured includes manufactured goods, machinery, transport equipment, chemicals.

Sources: Bank of Korea, Economic Statistics Yearbook, 1973 for GNP.
Economic Planning Board, Korea Statistical Yearbook, 1970 and 1974 for exports and imports.

1960's is also likely to have had unfavorable effects on income distribution. For one thing, heavy industries are considered relatively more capital-intensive than light industries. Consequently, the incremental employment per unit value of new investment is supposed to be smaller in heavy industries than in light industries. For another, heavy industries are usually more skill-intensive than light industries. Therefore, putting emphasis on heavy industries is expected to benefit high-skilled workers relatively more than low-skilled workers. Since skill levels are considered to be positively related with income levels, the strategy of putting particular emphasis on heavy industries during the 1960's is expected to have increased the inequality even among the industrial workers.

Export expansion during the 1960's concentrated almost exclusively on light industrial products requiring relatively low-skilled labor. That is, export expansion contributed to creating new employment of relatively low-skilled workers. Therefore, the strategy of export promotion during the 1960's is expected to have shown a tendency to decrease the inequality at least among the industrial workers.

Although it is beyond the scope of the present study to discuss each of the specific policy actions taken during the 1960's, some of them are worthy of note in relation to their effects on employment and income distribution. Like in many other developing countries, lack of capital was one of the most binding constraints to industrialization in Korea. The government accordingly introduced several policy measures to mobilize funds. To raise public savings, the government carried out

two major tax reforms respectively in 1961 and 1967. But, the main contribution to raising rax revenues was made by administrative improvement to straighten out widely prevailing corruption rather than by legislative reforms[1]. Since high-income groups are more likely than low-income groups to have benefited from corruption, the improvement in tax administration may well have worked in the direction toward more equality. The government also raised bank rates of interest in 1965 to mobilize private savings. Seemingly, this action appears to have benefited upper-income groups, who derive relatively more of their income from non-human assets. But, Brown (1973) suggests that, since high-income groups are much more likely to have put money in real estate, private money market, or direct investment, the proportion of assets and new savings put into time and savings deposits may well have been higher among lower-income groups than among upper-income groups.

Although domestic savings increased tremendously as a result of these policy actions[2], they were not enough to meet the even faster growing need for capital. Therefore, a series of policy measures were introduced during the 1960's to induce foreign capital[3]. Consequently,

---

1. Tae (1972) stresses the importance of this administrative improvement by pointing out that, during the 1960's, tax revenues grew almost twice as fast as GNP although there was no substantial increase in tax rates after the 1961 tax reform.

2. The ratio of domestic savings, both private and public, to GNP rose from about 3% in the early 1960's to some 17% in the late 1960's.

3. Beginning with the 1961 Law for Encouragement of Foreign Capital Inducement, a series of guidelines were stipulated every year until they were consolidated into the 1965 Foreign Capital Inducement Law. The general feature of these measures was to provide favorable conditions for foreign loans.

there was a big rise in foreign capital inflow[1]. Since big businesses are likely to have had easier access to such funds than small businesses, the measures taken to induce foreign loans are expected to have shown a tendency to increase the inequality.

The single most important revision taken to encourage exports occurred in 1964, when the government floated the exchange rate, which actually meant devaluation of the Korean currency, the won[2]. Aside from its contribution to export expansion, this 1964 devaluation made imported machinery and equipment relatively more expensive and, together with the 1965 raise of bank interest rates, contributed to increasing the labor-capital ratio[3] and, hence, to generating new employment.

---

1. Foreign loans, private and public, totalled 325 million dollars during the eight-year period of 1959-1966 while, during the single year of 1969, they amounted to 548 million dollars.

2. Several other incentives were given to exporters, such as interest subsidies, tax exemption on imported materials for exports, export-import link system, and discounts on certain public utility charges on exports. Westphal and Kim (1974) evaluate these and other export incentive policies in connection with their contributions to growth, though not to income distribution.

3. There is evidence that the labor-capital ratio in the industrial sector increased during 1960's. See, for example, Fei and Ranis (1976).

3. Analytical Framework

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

In the first step, the change in domestic production of each industry is decomposed into four components; change in domestic intermediate demand, change in domestic final demand, export expansion, and import substitution. The methodology to be used here 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 introduced by Chenery(1960). According to Chenery, import substitution of a commodity is said to have occurred if the ratio of that commodity's importation to its total supply (that is, importation plus domestic production) decreases over time[1]. Based on this definition, the change in domestic production of each industry is decomposed into the four components mentioned above.

In the second step of the analytical framework, the change in employment of each class of workers in each industry is similarly decomposed by using the results of the first step. Finally, the gross

---

1. In this definition of Chenery's, only direct importation of the commodity is taken into account while its backward linkages with other commodities via input-output relations are not. Morley and Smith(1970) modified the measurement of import substitution to include not only direct importation but also its backward linkages. For purposes of the present study, Chenery's is more appropriate.

sum of incomes of each class of workers is partitioned into several components to see how each of these components contributes to the change in income distribution.

The following notations are used throughout this study. For each industry,

Q domestic production

DI domestic intermediate demand

DF domestic final demand

D domestic demand, both final and intermediate; DI + DF

M importation

X exportation

Z total supply (= Q + M) or total demand(= D + X)

V value added by labor

w labor income of an average worker

w^e labor income of an average class e worker

y total (that is, labor plus non-labor) income of an average worker

y^e total income of an average class e worker

N number of all workers employed

N^e number of class e workers employed

Y^e gross sum of incomes of class e workers

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

3.1 Change in the Structure of Domestic Production

The analytical framework to decompose the change in domestic production begins 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 for a commodity is equal to its domestic demand (D) plus exportation (X), we get for each industry:

$$Z = Q + M = D + X = DI + DF + X$$

Let u be the ratio of domestic production to total supply of an industry; $u = Q/Z$. A rise (fall) in u over time implies that the relative dependency of total supply upon importation decreases (increases) over time. Therefore, if u increases (decreases) in an industry, that industry's import substitution is said to be positive (negative)[1]. On the basis of this definition, Lewis and Soligo(1965) decompose the change in domestic production of each industry as follows:

$$\begin{aligned}
(1a)\quad dQ &= Q_t - Q_o \\
&= u_t Z_t - u_o Z_o \\
&= (u_t - u_o)Z_t + u_o(Z_t - Z_o) \\
&= du Z_t + u_o dZ \\
&= du(Z_o + dZ) + u_o dZ \\
&= du(Z_o + dZ) + u_o(dDI + dDF + dX) \\
&= dQ_M + dQ_{DI} + dQ_{DF} + dQ_X
\end{aligned}$$

---

1. This is Chenery's(1960) original definition of import substitution. Morley-Smith's(1970) modified version, which accounts for both direct importation and its backward linkages, uses the inverse Leontief matrix. Specifically, u is defined as the ratio of Q to its corresponding element of $Q + (I - A)^{-1}M$, where Q, M, and A are now matrices of domestic production, importation, and input coefficients respectively and I is the identity matrix.

$$= dQ_M + dQ_D + dQ_X$$

where $dQ_M = du(Z_o + dZ)$

$$dQ_{DI} = u_o dDI$$

$$dQ_{DF} = u_o dDF$$

$$dQ_X = u_o dX$$

$$dQ_D = dQ_{DI} + dQ_{DF}$$

In equation (1a), dQ_M, dQ_D, and dQ_X are intended to measure parts of the change in domestic production of an industry ascribed solely to import substitution, change in domestic demand, and export expansion respectively. Specifically, dQ_M represents the change in domestic production of an industry which would result if import substitution (positive or negative) occurred in that industry with both domestic and export demand held constant. dQ_D in turn represents the change in domestic production which would result if domestic demand changed with no import substitution or export expansion. dQ_X is similarly interpreted.

As correctly pointed out by Eysenbach(1969) and Fane(1971), however, equation (1a) is simply one of several possible ways to partition the change in domestic production. Specifically, equation (1a) arbitrarily assumes that the ratio of domestic production to total supply 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 same ratio in the final period (that is, u_t) is another equally viable norm. In this latter case, we get:

(1b) $dQ = Q_t - Q_o$

$$= u_t Z_t - u_o Z_o$$

$$= (u_t - u_o)Z_o + u_t(Z_t - Z_o)$$

$$= duZ_o + u_t dZ$$

$$= duZ_o + (u_o + du)dZ$$

$$= duZ_o + (u_o + du)dD + (u_o + du)dX$$

$$= dQ_M + dQ_D + dQ_X$$

where $dQ_M = duZ_o$

$dQ_D = (u_o + du)dD$

$dQ_X = (u_o + du)dX$

It can be easily seen that equations (1a) and (1b) will give the same sign to each of the three terms. For instance, if the estimate of dQ_M based on equation (1a) is positive (negative), then the same estimate based on equation (1b) will also be positive (negative). But, these two estimates may differ in magnitude. Specifically, equation (1a) is normally expected to give a larger (in absolute value) estimate for dQ_M than equation (1b), since total supply of an average industry is expected to increase over time (that is, $Z_t > Z_o$ or $dZ > 0$). For dQ_D and dQ_X, which equation will give larger estimates depends upon whether u increases or decreases over time. If u increases (that is, $u_t > u_o$ or $du > 0$ or positive import substitution), equation (1b) will give larger estimates. If u decreases over time, equation (1a) will give larger estimates.

The arbitrariness of making a choice between equations (1a) and (1b) is in fact one of making a decision on how to handle the interaction term dudZ. Specifically, equation (1a) attributes this term

totally to import substitution while equation (1b) ascribes none of the interaction term to import substitution. In other words, equations (1a) and (1b) represent two extreme cases of handling the interaction term, and the truth is believed to lie in between. One way to avoid such extreme cases is to take as the norm some kind of average between the initial- and the final-period estimates. Taking the arithmetic average of these two estimates, we get:

$$
\begin{aligned}
(1)\quad dQ &= Q_t - Q_o \\
&= u_t Z_t - u_o Z_o \\
&= (u_t - u_o)\frac{Z_t + Z_o}{2} + \frac{u_t + u_o}{2}(Z_t - Z_o) \\
&= du\bar{Z} + \bar{u}dZ \\
&= du\bar{Z} + \bar{u}dD + \bar{u}dX \\
&= dQ_M + dQ_D + dQ_X
\end{aligned}
$$

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

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

$dQ_M = du\bar{Z}$

$dQ_D = \bar{u}dD$

$dQ_X = \bar{u}dX$

Obviously, for each of the three terms, equation (1) will give an estimate which is between the two given by equations (1a) and (1b) respectively. Equation (1) will be used in the present study.

3.2 Change in Employment Patterns

The results of the previous subsection are used to decompose the change in employment. Let n be the ratio of the number of workers

employed in an industry to domestic production of that industry; $n = N/Q$. The inverse of n indicates domestic production per worker or, in short, labor productivity. Labor productivity in an industry may vary for several reasons. Probably the most important of them are technological progress and factor substitution. Consequently, a change in n over time will be conveniently called the "techno-substitution" effect. Based on the definition of n and the idea discussed in the previous subsection in relation to equations (1a), (1b), and (1), we can now break down the change in employment of an industry as follows:

$$
\begin{aligned}
(2)\quad dN &= N_t - N_o \\
&= n_t Q_t - n_o Q_o \\
&= (n_t - n_o)\frac{Q_t + Q_o}{2} + \frac{n_t + n_o}{2}(Q_t - Q_o) \\
&= d\bar{n}\bar{Q} + \bar{n}dQ \\
&= d\bar{n}\bar{Q} + \bar{n}(dQ_D + dQ_X + dQ_M) \\
&\quad \text{(due to equation (1))} \\
&= dN_T + dN_D + dN_X + dN_M
\end{aligned}
$$

where $dN_T = d\bar{n}\bar{Q}$

$dN_D = \bar{n}dQ_D$

$dN_X = \bar{n}dQ_X$

$dN_M = \bar{n}dQ_M$

dN_T measures the change in employment of an industry which would result if there were a change in labor productivity with the change in domestic demand, export expansion, and import substitution all held to zero. That is, dN_T represents that part of the change in employment

which is ascribed to the techno-substitution effect. dN_D, dN_X, and dN_M in turn represent the remaining parts of the change in employment which are attributable respectively to the change in domestic demand, export expansion, and import substitution. Equation (2) thus partitions the change in employment of an industry into four parts.

Under the ideal circumstance where sets of data to be used are consistent with each other, equations (1) and (2) link the change in domestic production (dQ) with the change in employment (dN). In practice, however, sources of data may differ and methods of industry classification and/or data compilation may not be the same among these different sources. Specifically, sets of data most appropriate for use in equation (1) are usually found in the form of input-output tables. These tables normally contain information on value added by labor (V). If they also contain information on any one of labor income (w) and employment (N), then the other can be estimated by the identity (3) below. If none of these two sets of data are available from the input-output tables, however, only one of the two sets of information is obtained from an independent source and the other set is estimated according to the following equation (3)[1]:

(3) $V = wN$

where V = value added by labor in an industry

---

1. If both sets of information are obtained from independent sources, equation (3) may well be violated due to possible differences in methods of industry classification and/or data compilation between these independent sources and the input-output table from which data on V are obtained.

w = labor income of an average worker in that industry

N = number of workers employed in that industry

Our next task is to formulate an equation which partitions the change in employment of each class of workers. Define the following ratio; $f^e = N^e/N$ where N^e and N are respectively the number of class e workers and that of all workers employed in an industry. Obviously, the whole set of f^e for an industry will show the class composition of employment within that industry. Therefore, a change in f^e will be conveniently called the "industry composition" effect[1]. From the definition of f^e, we can partition the change in employment of each class of workers in an industry as follows:

$$
\begin{aligned}
(4)\quad dN^e &= N^e_t - N^e_o \\
&= f^e_t N_t - f^e_o N_o \\
&= (f^e_t - f^e_o)\frac{N_t + N_o}{2} + \frac{f^e_t + f^e_o}{2}(N_t - N_o) \\
&= df^e\bar{N} + \bar{f}^e dN \\
&= df^e\bar{N} + \bar{f}^e(dN_T + dN_D + dN_X + dN_M) \\
&\quad \text{(due to equation (2))} \\
&= dN^e_{Cl} + dN^e_T + dN^e_D + dN^e_X + dN^e_M \\
&\text{where } dN^e_{Cl} = df^e\bar{N} \\
&\qquad dN^e_T = \bar{f}^e dN_T \\
&\qquad \text{etc.}
\end{aligned}
$$

---

1. The "economy composition" effect will be defined in the next subsection in contrast with the "industry composition" effect defined here.

dN^e_{Cl} measures that part of dN^e which is attributable solely to the industry composition effect or the change in the composition of employment within the industry under consideration. Note that $\Sigma_e dN^e_{Cl} = \bar{N}\Sigma_e df^e = 0$, where summation applies to all e within an industry. That is, the industry composition effect, if aggregated over all classes of workers within an industry, will always degenerate as the case should be. dN^e_T, dN^e_D, dN^e_X, and dN^e_M measure the other parts of dN^e which are due respectively to the techno-substitution effect, the change in domestic demand, export expansion, and import substitution. Equation (4) thus breaks down the change in employment of each class of workers in an industry into five sources.

Notice that equations (2) and (4) can both be additively aggregated over any arbitrary group of industries. Especially when the latter is aggregated over all industries in the economy, the results will show not only the change in employment patterns in the whole economy but also sources of that change.

3.3 Change in Patterns of Income Distribution

This subsection provides the analytical framework which will trace out sources of the change in income distribution. Let N^e be, as before, the number of class e workers in an industry. Let y^e and Y^e be respectively the average income and the gross sum of incomes of class e workers employed in that industry. Immediately following is the identity; $Y^e = y^e N^e$. We now get:

(5) $dY^e = Y^e_t - Y^e_o$

$$= y_t^e N_t^e - y_o^e N_o^e$$

$$= (y_t^e - y_o^e)\frac{N_t^e + N_o^e}{2} + \frac{y_t^e + y_o^e}{2}(N_t^e - N_o^e)$$

$$= dy^e \overline{N}^e + \overline{y}^e dN^e$$

$$= dy^e \overline{N}^e + \overline{y}^e (dN_{Cl}^e + dN_T^e + dN_D^e + dN_X^e + dN_M^e)$$

(due to equation (4))

$$= dY_Y^e + dY_{Cl}^e + dY_T^e + dY_D^e + dY_X^e + dY_M^e$$

where $dY_Y^e = dy^e \overline{N}^e$

$dY_{Cl}^e = \overline{y}^e dN_{Cl}^e$

etc.

Equation (5) decomposes, for each industry, the change in the gross sum of incomes of bracket e workers into six sources; dY_Y^e due to the change in their average income[1], dY_{Cl}^e due to the industry composition effect (or the change in class composition of employment within the industry), dY_T^e due to the techno-substitution effect (or the change in labor productivity), dY_D^e due to the change in domestic demand, dY_X^e due to export expansion, and dY_M^e due to import substitution. Notice that equation (5) can also be additively aggregated over any arbitrary group of industries, since each term in equation (5) is simply in terms of monetary unit. Especially when this equation is aggregated over all industries in the economy, the results will show sources of the change in gross sum of incomes for each bracket of workers in the whole economy.

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1. dY_Y^e may be further decomposed according to sources of income; typically into two parts, due respectively to labor and non-labor sources for ordinary workers, and due respectively to farming and non-farming sources for farmers.

These aggregated results can be used in the analysis of income distribution in the whole economy, as long as the bracket specification of e is maintained. In practice, however, e may specify a number of income brackets (18 brackets for mining and manufacturing and 4 for agriculture in the present study), 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. Under such circumstances, equation (5) as well as its predecessor equation (4) is not directly applicable.

Suppose we have information on the number (N^e) and average income (y^e) of each bracket of workers in the whole economy[1]. Let $k^{e,q}$ be the ratio of bracket e workers who belong to the q-th quintile ($N^{e,q}$) to all bracket e workers (N^e) in the economy; $k^{e,q} = N^{e,q}/N^e$. $k^{e,q}$ so defined will change over time if the class composition of employment in the whole economy changes. Therefore, a change in $k^{e,q}$ will be called the "economy composition" effect. From the definition of $k^{e,q}$ follows equation (4') below:

$$
\begin{aligned}
(4') \quad dN^{e,q} &= N_t^{e,q} - N_o^{e,q} \\
&= k_t^{e,q} N_t^e - k_o^{e,q} N_o^e \\
&= (k_t^{e,q} - k_o^{e,q}) \frac{N_t^e + N_o^e}{2} + \frac{k_t^{e,q} + k_o^{e,q}}{2} (N_t^e - N_o^e) \\
&= dk^{e,q} \bar{N}^e + \bar{k}^{e,q} dN^e
\end{aligned}
$$

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

$$= dk^{e,q}\bar{N}^{e} + \bar{k}^{e,q}(dN^{e}_{C1} + dN^{e}_{T} + dN^{e}_{D} + dN^{e}_{X} + dN^{e}_{M})$$

(due to equation (4))

$$= dN^{e,q}_{C2} + dN^{e,q}_{C1} + dN^{e,q}_{T} + dN^{e,q}_{D} + dN^{e,q}_{X} + dN^{e,q}_{M}$$

$$= dN^{e,q}_{C} + dN^{e,q}_{T} + dN^{e,q}_{D} + dN^{e,q}_{X} + dN^{e,q}_{M}$$

where $dN^{e,q}_{C2} = dk^{e,q}\bar{N}^{e}$

$dN^{e,q}_{C1} = \bar{k}^{e,q}dN^{e}_{C1}$

etc., and

$dN^{e,q}_{C} = dN^{e,q}_{C2} + dN^{e,q}_{C1}$

Equation (4') thus decomposes the change in the number of bracket e workers who belong to the q-th quintile ($dN^{e,q}$) into six components. $dN^{e,q}_{C2}$ measures that part of $dN^{e,q}$ attributable to the economy composition effect (or the change in class composition of employment in the whole economy). Each of the other terms is interpreted analogously to its corresponding term in equation (4). $dN^{e,q}_{C}$, which combines the economy composition effect ($dN^{e,q}_{C2}$) and the industry composition effect ($dN^{e,q}_{C1}$), will be called just the "composition" effect.

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; $Y^{e,q} = y^{e}N^{e,q}$. From this follows:

(5') $$dY^{e,q} = Y^{e,q}_{t} - Y^{e,q}_{o}$$

$$= y^{e}_{t}N^{e,q}_{t} - y^{e}_{o}N^{e,q}_{o}$$

$$= (y^{e}_{t} - y^{e}_{o})\frac{N^{e,q}_{t} + N^{e,q}_{o}}{2} + \frac{y^{e}_{t} + y^{e}_{o}}{2}(N^{e,q}_{t} - N^{e,q}_{o})$$

$$= dy^{e}\bar{N}^{e,q} + \bar{y}^{e}dN^{e,q}$$

$$= dy^{e}\bar{N}^{e,q} + \bar{y}^{e}(dN^{e,q}_{C} + dN^{e,q}_{T} + dN^{e,q}_{D} + dN^{e,q}_{X} + dN^{e,q}_{M})$$

(due to equation (4'))

$$= dY_Y^{e,q} + dY_C^{e,q} + dY_T^{e,q} + dY_D^{e,q} + dY_X^{e,q} + dY_M^{e,q}$$

where $dY_Y^{e,q} = dy^e \bar{N}^{e,q}$

$dY_C^{e,q} = \bar{y}^e dN_C^{e,q}$

etc.

Equation (5') breaks down the change in the gross sum of incomes of bracket e workers who belong to the q-th quintile ($dY^{e,q}$) into six sources. Each term in equation (5') is interpreted analogously to its corresponding term in equation (5). When equation (5') is aggregated over all brackets within each quintile, the results will provide information concerning the following questions:

(1) How did the share of each quintile change during the period under consideration?

(2) To what extent did each of the six sources shown in equation (5') contribute to the change in the share of each quintile?

3.4 Application to the Agricultural Sector

The analytical framework so far discussed is directly applicable to most of the non-agricultural industries, where workers mostly work as wage earners and in only one of the industries as described in the sources of data used. When the framework is to apply to the agricultural sector, however, some modifications are necessary because of certain characteristics peculiar to this sector.

In many countries of the world, a typical farm household owns some amount of farmland which is operated by family workers with their own farming equipment. Consequently, a typical farm household's farming income contains both value added by labor and value added by non-

labor. This is more true in the case of Korea, where the agricultural sector is characterized by a structure of very small owner-operated farms[1]. Pure wage farmers are virtually non-existent. Therefore, the concept of labor income is not clear nor meaningful in the agricultural sector. The significance of this fact is that equation (3), which includes labor income (w), is not in itself applicable to the agricultural sector.

There is another characteristic which is peculiar to the agricultural sector and causes some trouble when it comes to directly applying the analytical framework to this sector. Usual sources of data to be used classify the agricultural sector into more than one subsector and a typical farmer normally engages in more than one of these subsectors. Consequently, equations (2) through (5), which contain employment in each industry (N), are not directly applicable to the agricultural subsectors individually.

One way to handle these problems is to apply the analytical framework on an aggregated basis. In fact, simple reinterpretation of variables makes the framework still applicable to the agricultural sector. Specifically:

(1) Any of the equations (1a), (1b), and (1) can be used directly to the individual agricultural subsectors without any modification.

(2) Interpret N's in equations (2) through (5) as the number of

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1. Behind this characteristic lie two land reforms, respectively in 1947 and in 1950. The main features of these reforms were to abolish tenant farming and to limit land holdings to 3 hectares per household. See Brown(1973), pp. 38-39, for details.

farmers in the whole agricultural sector rather than in individual subsectors, with superscripts and subscripts, if any, defined as usual.

(3) Use as Q's in equation (2) the values for the whole agricultural sector rather than for individual subsectors.

(4) Interpret w and V in equation (3) respectively as farming income (rather than labor income) of an average farmer and total value added (rather than value added by labor) in the whole agricultural sector (rather than in individual subsectors).

4. Analytical Results

This section presents analytical results computed from 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. Except for the agricultural sector, all computations are done for individual industries. Some of these results are aggregated to obtain estimates for larger sectors. For the agricultural sector, analysis of output composition is similarly done for individual agricultural subsectors. In the remaining analyses of employment and income distribution, however, data on agricultural subsectors are first aggregated and computations are done from these aggregated data as mentioned in subsection (3.4).

Subsection (4.1) will discuss the change in output structure which occurred between 1960-1970. Patterns of income distribution implied by this output structure will be analyzed in subsection (4.2). Subsection (4.3) will analyze the change in patterns of employment during the same period. Finally, sources of the change in income distribution discussed in subsection (4.2) will be traced out in subsection (4.4).

4.1 Change in Output Composition

In this subsection, the change in the structure of domestic production which occurred between 1960-1970 is analyzed. Basic data used are two input-output tables for 1960 and 1970 respectively[1]. The 1960

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

statistics on domestic production (Q), domestic intermediate demand (DI), domestic final demand (DF), exportation (X), and importation (M) are first inflated into figures in 1970 prices by using wholesale price indices of individual commodities. Computations are then done according to equation (1). The results are presented in Tables B and C.

In Table B, column (1) represents domestic production of each industry in 1960. Column (2) in turn represents the change in domestic production between 1960-1970. Consequently, column (3) indicates the growth rate of domestic production during the same period. Both columns (1) and (2) are in million won in 1970 prices.

According to Table B, gross domestic production[1] in the whole economy (bottom row of the table) increased by 295% between 1960-1970. At sectoral levels, while agricultural output expanded by only 121%, manufacturing output grew by 455%, reflecting rapid industrialization of the economy during the same period. Construction expanded even faster (699%), and both wholesale-retail trade and transportation grew much faster than the national average of 295%. Among the remaining sectors, all except the unclassified showed growth rates lower than the average, mostly by a substantial margin. Especially notable is the low growth rate of mining production (203%), which is indicative of the fact that the rapid industrialization relied rather heavily on imported materials, which in turn was made inevitable due to the poorly endowed

---

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

Table B. Change in Output Composition between 1960-1970

Industries and Sectors	Q_o (1)	dQ (2)	dQ/Q_o (3)
Agriculture	362,438	438,809	121.1%
Rice, barley & wheat	237,252	199,935	84.3%
Others	125,186	238,874	190.8%
Forestry	46,203	19,216	41.6%
Fishery	18,349	47,394	258.3%
Mining	20,264	41,218	203.4%
Coal	11,560	13,468	116.5%
Others	8,704	27,750	318.9%
Manufacturing	323,578	1,471,946	454.9%
Food & beverages	105,615	346,982	328.5%
Processed food	76,622	213,762	279.0%
Beverages & tobacco	28,993	133,220	459.5%
Textile products	89,454	301,930	337.5%
Fiber spinning	25,337	62,044	244.9%
Textile fabrics	38,415	52,270	136.1%

Sources: See subsection (4.1).
Notes: Q_o is the value of output in 1960 and dQ is the change in this value between 1960-1970, both in million won in 1970 prices.

Table B. (Continued)

Industries and Sectors	Q_o (1)	dQ (2)	dQ/Q_o (3)
Finished textile products	19,572	180,506	922.3%
Leather products	6,130	7,110	116.0%
Wood products	20,014	56,901	284.3%
Sawmills & plywood	13,512	51,483	381.0%
Wood products & furniture	6,502	5,418	83.3%
Paper products	12,479	66,358	531.8%
Paper products	4,122	41,353	1003.2%
Printing & publishing	8,357	25,005	299.2%
Chemical products	33,305	293,363	880.8%
Basic chemicals	5,668	9,005	158.9%
Chemical fertilizers	434	32,002	7373.7%
Finished chemical products	8,873	114,984	1295.9%
Petroleum & coal products	11,273	117,514	1042.4%
Rubber products	7,057	19,858	281.4%
Non-metal mineral products	9,695	65,955	680.3%
Basic metal	9,661	98,765	1022.3%
Iron & steel	7,076	86,968	1229.1%
Others	2,585	11,797	456.4%
Metal products & machinery	30,387	189,416	623.3%

Table B. (Continued)

Industries and Sectors	Q_o (1)	dQ (2)	dQ/Q_o (3)
Fabricated metal products	11,709	20,335	173.7%
Non-electrical machinery	9,756	23,852	244.5%
Electrical machinery	2,075	61,213	2950.0%
Transport equipment	6,847	84,016	1227.0%
Miscellaneous manufacturing	12,968	52,276	403.1%
Electricity	17,183	41,869	243.7%
Construction	59,490	415,708	698.8%
Building & maintenance	41,912	228,344	544.8%
Public utilities & others	17,578	187,364	1065.9%
Wholesale & retail trade	87,212	405,328	464.8%
Transportation	56,075	215,567	384.4%
Real estate	69,792	103,859	148.8%
Services	154,619	316,365	204.6%
Unclassified	23,179	131,571	567.6%
Total	1,238,382	3,658,545	295.4%

natural resources of the economy.

Among the manufacturing sectors, basic metal, chemical products, non-metallic mineral products, and metal products (including machinery), which may be said to represent heavy industries, expanded far more rapidly than the other sectors (respectively 1022%, 881%, 680%, and 623% against the manufacturing average of 455%). Therefore, Table B characterizes the performance of Korean economy during the 1960's not only by industrialization in general but also by industrialization relatively in favor of heavy rather than light industries. This reflects the general direction of economic policies during the 1960's; namely, industrialization with emphasis laid on heavy industries.

Table C shows structural sources of the change in domestic production of each industry. Here, column (1) is the same as column (3) of Table B, showing the rate of growth of domestic production. dQ_D in column (2) indicates that part of the change in domestic production attributable solely to the change in domestic demand or the change in domestic production which would have resulted if only domestic demand had changed with no export expansion or import substitution. Consequently, column (2) indicates the growth rate of domestic production which would have been if there had been only the change in domestic demand with no export expansion or import substitution. dQ_X and dQ_M are the remaining parts of the change in domestic production attributable respectively to export expansion and import substitution, and columns (3) and (4) are analogously interpreted.

According to Table C, the change in domestic demand played the crucial role not only in the overall growth of domestic production but

Table C. Decomposition of the Change in Output Composition

Industries and Sectors	dQ/Q_o (1)	dQ_D/Q_o (2)	dQ_X/Q_o (3)	dQ_M/Q_o (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%	-301.0%
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%	105.5%	-13.4%
Fiber spinning	244.9%	205.6%	57.2%	-17.8%
Textile fabrics	136.1%	139.2%	29.6%	-32.7%

Sources: See subsection (4.1).
Notes: Q_o is the value of output in 1960 and dQ is the change in this value between 1960-1970. dQ_D, dQ_X, and dQ_M are parts of dQ attributable respectively to the change in domestic demand, export expansion, and import substitution.

Table C. (Continued)

Industries and Sectors	dQ/Q_o (1)	dQ_D/Q_o (2)	dQ_X/Q_o (3)	dQ_M/Q_o (4)
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%
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%

Table C. (Continued)

Industries and Sectors	dQ/Q_o (1)	dQ_D/Q_o (2)	dQ_X/Q_o (3)	dQ_M/Q_o (4)
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	1065.9%	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%
Services	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%

also in its composition. Specifically, during 1960-1970, gross domestic production grew by 288% due solely to the change in domestic demand, while export expansion and import substitution contributed to the growth of gross domestic production by 26% and -18% respectively. This general tendency was also true for individual industries: In all but miscellaneous manufacturing, contribution of the change in domestic demand completely dominated those of export expansion and import substitution. Table C also indicates that it was basically the change in domestic demand which contributed to the change in output structure of the economy. Specifically, due to this source alone, manufacturing output expanded by 440% while agricultural output grew by only 130% during 1960-1970. In fact, where the rate of output growth was high, contribution of the change in domestic demand was also generally high.

Although 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. Another notable feature shown in Table C is that both export expansion and import substitution contributed to 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 (respectively 346%, 199%, 391%, 355%, and 231% against the national average of 26% and the manufacturing average of 63%). Except for the chemical fertilizers, these industries are generally known to be labor-intensive

ones[1]. The evidence thus indicates that, under the new environment of export promotion strategy, most of the export activities during the 1960's centered on some labor-intensive products in accordance with the economy's comparative advantage in abundant labor. The highest negative contribution of import substitution in turn was found in minerals 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 industries[2]. Note that the contribution of the change in domestic demand was also substantially higher in these industries than the manufacturing average. This suggests that the exceptionally high negative contribution of import substitution in these industries was caused by the increased importation of materials, machinery, and equipment needed for industrialization.

To sum up, the Korean economy during 1960-1970 was characterized by industrialization relatively in favor of heavy industries. The change in domestic demand played the dominant role, while both export expansion and import substitution played relatively minor roles, in this process of industrialization. Between the latter two, export

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1. According to the Bank of Korea's estimates for 1968, all of these four industries (other than chemical fertilizers) 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 equipment per employee", and "liabilities and net worth per employee". See Economic Planning Board, Korea Statistical Yearbook, 1973 volume, pp. 252-255.

2. According to the same source as in footnote 1 on this page, all except nonelectrical machinery had capital-labor ratios substantially higher than the manufacturing average.

expansion contributed positively, while import substitution negatively, in most of the industries, reflecting the economy's switch from import substitution to export promotion strategy. More notably, export expansion was an exceptionally important source of growth in some labor-intensive goods such as textile products, wood products, and miscellaneous manufacturing. This is consistent with the economy's comparative advantage in abundant labor. The negative contribution of import substitution in turn was exceptionally high for some capital-intensive industries such as minerals, basic metals, chemical products, machinery, and equipment, for which the positive contribution of the change in domestic demand was also much higher than the average. This reflects the increased importation of materials, machinery, and equipment needed for industrialization.

4.2 Change in Patterns of Income Distribution

In the previous subsection, the change in output structure which took place in Korea during 1960-1970 has been analyzed. This subsection now traces out the change in income distribution implied by the change in output structure. Specifically, for 1960 and 1970 respectively, average income (y^e) and the number (N^e) of each class of workers which correspond to the output structure shown in the previous subsection are first determined. Based on this information, shares of quintiles are estimated, also for 1960 and 1970 respectively, to see which quintile benefited relatively more from the change in output structure. As mentioned in section (1), analyses of this and the subsequent subsections are confined to agriculture,

mining, and manufacturing due to lack of relevant data. Also as discussed in subsection (3.4), two different approaches are employed for mining-manufacturing and agriculture because of some characteristics peculiar to the agricultural sector.

Mining and manufacturing

In the 1970 input-output table, data on both value added by labor (V_t) and the number of workers employed (N_t) are available for each industry in the mining-manufacturing category (to be called hereinafter as M category). From this information is computed the average labor income (w_t) of workers in each industry according to equation (3). Consequently, the resulting estimate for the average labor income includes both regular wage earnings and extra labor earnings such as overtime pay and bonus, since the value added by labor includes all compensation to employees. The 1960 input-output table, however, contains data only on value added by labor (V_o), but not on average labor income or the number of workers employed. Therefore, the 1960 average labor income (w_o) is obtained from an independent source, and then the number of workers employed in each industry (N_o) is estimated according to equation (3). Information on w_o, which includes both regular wage earnings and extra labor earnings, is not directly available, however. What is available is data on average regular earnings of workers in each industry[1]. These statistics are converted into average labor income (w_o) by using the 1967 information on ratios of aver-

1. The source of these data is Bank of Korea, Economic Statistics Yearbook, 1972 volume, pp. 332-333.

age extra earnings to average regular earnings for individual industries[1].

What has been obtained so far is the average labor income (w) and the number (N) of all workers employed in each industry. The next task is to get the average labor income (w^e) and the number (N^e) of each class of workers in each industry. Data on this type of information (that is, w^e-N^e pairs) are available only for 1967, in which workers are classified by 18 income brackets. Therefore, w^e and N^e for 1960 and for 1970 are estimated on the basis of the following conditions:

(1) The ratio of each bracket of workers to all workers within each industry remained unchanged between 1960-1970. That is, N^e/N was constant over time within each industry.

(2) The average labor income of each bracket of workers within each industry grew at the same rate as the average labor income of all workers within that industry. That is, w^e grew at the same rate as w within each industry.

Implications of these two conditions are straightforward. Condition (1) says N^e/N ($=f^e$) remained unchanged. That is, $f^e_t = f^e_o$ or $df^e = 0$ and, therefore, $dN^e_{Ci} = 0$ in equation (4). In other words, condition (1) says the composition of employment within each industry

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1. The source of this information is Bank of Korea, Report on Wage Survey, 1967 volume.

2. The source of data on these w^e-N^e pairs is the same as in footnote 1 on this page.

was constant over time and, consequently, the change in the number of each bracket of workers within each industry which was attributable to the industry composition effect was zero. Condition (2) has an analogous implication: Namely, the structure of labor income among different brackets of workers remained unchanged within each industry.

The analytical results thus obtained in this subsection are estimates, for 1960 and 1970 respectively, on the number (N^e) and average labor income (w^e) of each bracket of workers within each industry in the M category. Our next task is to get information on average total (that is, labor plus non-labor) income of each bracket of workers within each industry (y^e) for the same two years. But, once again, data on such 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[1]. What is needed is, therefore, to derive a formulation from these available data, which may be used to convert the labor income of each bracket of workers within each industry (w^e) to their total income (y^e).

The approach employed in this study to derive such a formulation is based on the general idea that higher-income groups get relatively more of their income from non-labor sources than lower-income groups. What this suggests is that the ratio of labor income to total income

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1. Sources of these data are Economic Planning Board, Korea Statistical Yearbook, several volumes.

be formulated as a function of the level of total income or, for that matter, as a function of the level of labor income[1]. Thus

$$w^e/y^e = f(w^e)$$

where w^e and y^e are labor income and total income of an average bracket e worker (not necessarily within each industry).

The above formulation is not yet satisfactory for our purpose. The available data on labor income and total income of urban workers cover only four or five brackets for each year. To increase the number of observations, therefore, both time-series and cross-section data are to be pooled together and this casts another problem in relation to the above formulation. To see the problem more clearly, suppose w^e and y^e grow in the same proportion. Then, w^e/y^e will remain constant over time, while w^e increases. That is to say, the dependent variable of the above formulation may remain unchanged even though its explanatory variable varies. Ordinary monotonic functions simply do not deal with such a situation. This type of dilemma can be overcome by introducing as the explanatory variable a relative quantity w^e/w, the ratio of average labor income of bracket e workers to that of all workers. Thus

$$w^e/y^e = g(w^e/w)$$

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1. The last part of this statement is based on the implicit assumption that the functional relation is monotonic.

As the specific functional form of this latter formulation, the model presented by Box and Cox (1964) is used. The following result (6) is obtained by regression[1].

$$(6)\quad \frac{(w^e/y^e)^{0.29}-1}{0.29} = -0.13831 - 0.13230\cdot\frac{(w^e/w)^{0.29}-1}{0.29}$$

where w^e = average labor income of bracket e workers

w = average labor income of all workers

y^e = average total income of bracket e workers

The previously obtained estimates for average labor income (w^e) of each bracket of workers in each industry are now converted to those for average total income (y^e) according to equation (6). The analytical results so far obtained are therefore w^e-y^e-N^e triplets for each industry. They are aggregated, bracket by bracket, over all of the industries in the M category[2]. The 1960 income figures are inflated into those in 1970 prices by using the wholesale price index of consumer goods. These final results are presented in the upper panel of Table D.

Agriculture

As mentioned in subsection (3.4), a different approach is em-

1. Additional information about equation (6) is as follows. Altogether 37 observations of paired w^e and y^e are used to derive the equation. Standard errors for constant and coefficient are 0.01182 and 0.00534 respectively. R^2 is 0.7915. Both F and t statistics are significant at 0.5% level.

2. In the aggregation of w^e and y^e, weights used are obviously N^e.

ployed for the agricultural sector (to be called hereinafter as A 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 B) are added together to obtain the total value added (V) in the whole A sector. From this and the data on total number of farm households[1] is determined average farming income per farm household, for each of the two years, according to equation (3), where N and w now denote respectively the number and average farming income of farm households. The number of each class (in terms of land holdings) of farm households is then determined from the data on the fraction of each class to total farm households. The average farming income of each class of farm households is in turn estimated from the information on the ratios of farming income among different classes. The 1960 average farming income so obtained is inflated into figures in 1970 prices by using the price index received by farmers. Finally, the average farming income is converted into average total income by using the information on ratios of farming to total income for each class of farm households[2].

What has been so far obtained for the A sector is estimates for

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

2. The earliest year for which the information on fractions and ratios described in this paragraph is available is 1963, which is used in this study as a surrogate for 1960. Note that what is used here is relative, rather than absolute, figures. Fragmentary evidence shows that no significant changes took place in these relative figures between 1960-1963.

the number, average farming income, and average total income of each of the 4 classes of farm households. These results are now transformed into their corresponding estimates for individual farmers (rather than farm households) by using the data on the average number of workers in each class of farm households[1]. These last estimates for the number, average farming income, and average total income of each class of farmers are presented in the lower panel of Table D.

Some summary statistics of Table D show notable features. In 1960, less than 0.5 million workers were employed in the M category while the A sector comprised almost 4.7 million workers. Between 1960-1970, however, the number of M workers increased by more than 0.7 million or 145%, while that of A workers (or farmers) increased only by 0.1 million or 2%. Consequently, between 1960-1970, the ratio of M workers to farmers increased from merely 11% to more than 25%. Obviously, this is a result of rapid industrialization achieved during the period in Korea. The distributive implication of this phenomenon is also obvious: Since the average income of M workers was substantially higher than that of farmers over the whole period of 1960-1970, a large portion of farmers who used to belong to the upper-income groups in 1960 must have been replaced by M workers by 1970.

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1. Distribution of household income is normally considered more meaningful than that of personal income and, hence, converting estimates for households into those for individual farmers may be considered analytically retrogressive. The reason why such a retrogressive step is taken in this study is to make it possible to directly compare the estimates for the A sector with those for the M category, since the latter being on the per-worker basis.

Table D. 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)	54877	58074	118809	92544	97776	312636
(3)	73296	80161	54584	127165	139318	140969
(4)	90219	101358	43515	150781	168673	113337
(5)	99144	112763	32806	175105	199819	76128
(6)	112826	130580	27929	202624	236048	64425
(7)	127160	149526	23762	230896	274275	49101
(8)	145456	174441	34654	263192	318654	79276
(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	542894	746725	33459

Sources: See subsection (4.2).
Notes: Incomes are in won in 1970 prices.
Land holdings for farmers are in hectares.

Table D. (Continued)

	1960			1970		
Mining-manufacturing workers (continued)						
Income Bracket	Labor Income	Total Income	No. of Workers	Labor Income	Total Income	No. of Workers
(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	245131	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	178458	1466532
2.0-	115360	126435	416134	190089	223421	418355
All	64339	78742	4681843	111764	151337	4786476

Although there was a large gap in average income between M workers and farmers over the whole period of 1960-1970, the gap decreased in a relative sense during the period. Specifically, the ratio of farmers' to M workers' income was about 55% (78.7 to 141.8 thousand won) in 1960. But, the same ratio increased to 62% (151.3 to 245.1 thousand won) in 1970. Notice also that, while the ratio of labor to total income for M workers remained virtually unchanged during 1960-1970 (115.4 to 141.8 thousand won or 81.4% in 1960 and 198.0 to 245.1 thousand won or 80.8% in 1970), the ratio of farming to total income for farmers decreased significantly during the same period (from 64.3 against 78.7 thousand won or 81.7% in 1960 to 111.8 against 151.3 thousand won or 73.9% in 1970). In other words, what was crucially responsible for the decrease in relative gap in income between M workers and farmers was farmers' non-farming income. This is indicative of the phenomenon that, as industrialization proceeded, farmers tended to participate increasingly more in non-agricultural activities (while maintaining their status as farmers). This is also suggestive of the general possibility that industrialization may imply some tendency to decrease inequality in distribution by providing more opportunities for farmers to participate in non-agricultural activities.

To see the change in income distribution more systematically, workers are classified into quintiles and the share of each quintile in total income is estimated, for 1960 and 1970, on the basis of the information in Table D. Estimations are done respectively for M workers alone, farmers alone, and M workers and farmers combined. The results

are presented in columns (1) and (2) of Table E. Column (3) 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 the relative degree of improvement (deterioration) of each quintile's living standard. This is because, between any two quintiles, 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 aspect is taken into account in column (4), which is obtained by dividing column (3) by column (1). Column (4) will be called hereinafter as "improvement (deterioration) index".

According to columns (1) and (2) of Table E, 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 the former, and 6% and 50% among the latter. 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 E also shows in what direction and to what extent each of the three distributions changed during 1960-1970. Among M workers, column (3) shows that the share of only the top quintile increased by some 2 percentage points, whereas the share of each of the remaining quintiles decreased, an obvious indication of increasing inequality. Among the lower four quintiles, however, column (4) shows that the

Table E. Shares of Quintiles in 1960 and in 1970

Quintiles	1960 (1)	1970 (2)	(2)-(1) (3)	(3)/(1) (4)
Mining-manufacturing workers				
1st quint.	6.22%	6.05%	-.18%	-2.86%
2nd quint.	8.85%	8.31%	-.55%	-6.17%
3rd quint.	13.67%	12.76%	-.91%	-6.67%
4th quint.	21.40%	21.03%	-.37%	-1.74%
5th quint.	49.86%	51.86%	+2.01%	+9.38%
Farmers				
1st quint.	14.82%	15.82%	+1.00%	+6.77%
2nd quint.	15.95%	16.97%	+1.03%	+6.43%
3rd quint.	17.12%	17.63%	+.41%	+2.42%
4th quint.	24.15%	23.40%	-.75%	-3.12%
5th quint.	27.96%	26.18%	-1.78%	-6.36%
Mining-manufacturing workers and farmers combined				
1st quint.	13.43%	12.49%	-.94%	-7.02%
2nd quint.	14.75%	14.89%	+.15%	+1.01%
3rd quint.	16.01%	16.07%	-.03%	-.16%
4th quint.	22.87%	20.93%	-1.94%	-8.50%
5th quint.	32.86%	35.62%	+2.76%	+8.40%

Source: Table D.

deterioration index was higher for the middle two quintiles than for the other two. Overall, therefore, it is not exactly unambiguous whether or not the distribution among M workers may be said to have moved toward increasing inequality.

The distribution among farmers showed a more uniform change. Here, column (3) indicates that the share increased for each of the lower three quintiles, whereas it decreased for each of the higher two quintiles. Furthermore, according to column (4), the improvement (deterioration) index was higher for lower (higher) quintiles. In other words, the income distribution among farmers moved unambiguously toward decreasing inequality.

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 during 1960-1970, as shown in column (3). But, the share of the second quintile also increased, though to a much lesser extent. Furthermore, among the remaining three quintiles, column (4) indicates no uniform pattern in the movement of the deterioration index. Overall, therefore, it is again not exactly unequivocal whether or not the distribution for M workers and farmers combined may be said to have moved toward increasing inequality.

As discussed so far, 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. In the

three cases of Table E, the distribution among farmers became unambiguously more equal. But, the other two showed a kind of mixed tendency. One practical way to make a rough judgement is to focus only on the shares of the bottom and the top quintiles. Looked at along this line, Table E indicates that the distribution became more equal among farmers alone, and more unequal both among M workers alone and for M workers and farmers combined.

4.3 Change in Patterns of Employment

In the previous subsection, changes in income distribution which occurred between 1960-1970 have been analyzed. The next task is to trace out sources of these changes. The present subsection, which is intended to analyze changes in employment patterns during the same period, is an intermediate step toward this task in the sense that the results of this subsection will be carried over and used in the next subsection to identify sources of the changes in income distribution. However, this subsection also stands on its own ground in accordance with our interest in income distribution, since problems of poverty are closely related to problems of employment in general as pointed out by Bell-Duloy (1974) and, in particular, it seems to be clear that the rapid increase in employment of M workers was responsible for the marked increase in share of the very top quintile during 1960-1970 in Korea.

Most estimations needed for this subsection have already been done in the previous subsection. Specifically, for the M category,

the number of all workers (N) and that of each class (income bracket) of workers (N^e) employed in each industry have been obtained, both for 1960 and for 1970. The number of all farmers (N) and that of each class (with respect to cultivable land) of farmers (N^e) have also been obtained for the A sector. Computations left to be done in this subsection are, therefore, to break down the changes in employment (dN and dN^e) into several components specified in equations (2) and (4). All computations for the M category are done on the basis of individual industries. For the A sector, computations are done on the basis of the aggregated data as mentioned in subsection (3.4). The estimated results of broken down components of dN are presented in Tables F and G. The results of broken down components of dN^e in turn are aggregated, class by class, over all industries in the M category. The resulting estimates for the 18 brackets of M workers are again grouped into estimates for 6 larger brackets for simplification of our discussion. These grouped estimates, together with those for the A sector, are presented in Tables H and I.

In Table F, column (1) represents the number of workers employed in each industry in 1960 and column (2) the increase in this number during 1960-1970. Consequently, column (3) indicates the growth rate of employment in each industry during the same period. According to this table, total employment of all farmers and M workers together increased by 16% during 1960-1970. At sectoral levels, the number of farmers increased by a little more than 2%, that of mining workers by some 25%, and the number of manufacturing workers increased by 169%.

Table F. Change in Employment Patterns by Industry between 1960-1970

Industries and Sectors	N_o (1)	dN (2)	dN/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%
Paper products	27.4	31.2	113.9%

Sources: See subsection (4.3).
Notes: N_o is the number of workers (farmers) employed in 1960 and dN is the change in this number between 1960-1970, both in thousand workers (farmers).

Table F. (Continued)

Industries and Sectors	N_o (1)	dN (2)	dN/N_o (3)
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	311.3%
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%

Within the manufacturing, conspicuously high growth rates of employment were found in finished textile products, chemical fertilizers, finished chemical products, and electrical machinery (respectively 656%, 729%, 567%, and 1109% against the manufacturing average of 169%). And these industries were the ones whose domestic production also expanded much faster than most of the other industries (Table B). In fact, with a few exceptions, the growth rate of employment was generally higher where the growth rate of domestic production was higher[1]. The significance of this aspect is that, at least within manufacturing, strategies to expand domestic production were compatible with strategies to create new employment.

Those industries excepted from this general feature are also worthy of note. Most notable of them are petroleum and coal products and transport equipment. Each of these industries marked one of the fastest growth in terms of domestic production (respectively 1296% and 1227% against the manufacturing average of 455%, as shown in Table B). But, both industries showed very poor performance in creating new employment (24% and 126% against the manufacturing average of 169%, as shown in Table F), suggesting that these two industries tended to depend heavily on labor-saving techniques. A contrasting phenomenon was found in processed food and miscellaneous manufacturing. These industries showed relatively lower rates of output growth than the

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1. Spearman rank-correlation coefficient between employment growth (column (3) of Table F) and output growth (column (3) of Table B) is 0.6354 for all of the 23 manufacturing industries, which is statistically significant at 1% level.

other industries (279% and 403% against the manufacturing average of 455%). Yet, in terms of employment creation, they did an excellent performance (192% and 487% against the manufacturing average of 169%), reflecting that these two industries tended to rely relatively more on labor-using techniques.

What is immediately concerned with the total employment in the whole economy is the size rather than the rate of new employment created by each industry. Looked at from this angle, two industries stood in prominence; namely, processed food and finished textile products. These two industries accounted for new employment of 293 thousand workers or about 42% of the total increase in manufacturing workers. The single most important industry in generating new employment was finished textile products. In 1960, this industry was rather small, accommodating only 28 thousand workers or about 6.7% of the total employment of manufacturing workers. During 1960-1970, this industry created new employment of 184 thousand workers, accounting for more than 26% of the total increase in manufacturing workers.

Table G shows sources of the increase in employment. Here, column (1) is the same as column (3) of Table F, indicating the growth rate of employment in each industry during 1960-1970. Column (2) shows the growth rate due solely to the change in domestic demand or the rate that would have resulted if only domestic demand had changed with no export expansion, import substitution, or techno-substitution effect. Columns (3) and (4) in turn show the growth rates of employment due respectively to export expansion and import substitution.

Table G. Decomposition of the Change in Employment Patterns by Industry

Industries and Sectors	dN/N_o (1)	dN_D/N_o (2)	dN_X/N_o (3)	dN_M/N_o (4)	dN_T/N_o (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%
Paper products	113.9%	319.6%	5.3%	7.7%	-218.7%

Sources: See subsection (4.3).

Notes: N_o is the number of workers (farmers) employed in 1960 and dN is the change in this number between 1960-1970. dN_D, dN_X, dN_M and dN_T are parts of dN due respectively to the change in domestic demand, export expansion, import substitution and techno-substitution effect.

Table G. (Continued)

Industries and Sectors	dN/N_o (1)	dN_D/N_o (2)	dN_X/N_o (3)	dN_M/N_o (4)	dN_T/N_o (5)
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%
Petrol. & 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-mtl mineral 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%

Finally, column (5) indicates the growth rate ascribed solely to the techno-substitution effect or the rate that would have been if only labor productivity had changed with no change in domestic demand, export expansion, or import substitution.

According to Table G, the change in domestic demand and export expansion contributed positively, while import substitution and techno-substitution effect negatively, to the generation of new employment in all of agriculture, mining, and manufacturing. As to the degree of contribution, the change in domestic demand and the techno-substitution effect dominated over export expansion and import substitution also in all of the three categories[1]. What was primarily responsible for the large gaps in employment growth (column (1)) among the three categories was also the change in domestic demand (column (2)), which alone created a gap by 135 percentage points (= 234% - 95%) between agriculture and mining in favor of the latter, and a gap by 103 percentage points (= 337% - 234%) between mining and manufacturing also in favor of the latter. Export expansion also tended to widen these gaps, though to a lesser extent, while the techno-substitution effect tended to narrow the gaps. Import substitution in

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1. This finding appears to contradict the belief held by many that export expansion in Korea contributed greatly to the creation of new employment. See Fei and Ranis (1976) and Adelman (1974) for this belief. Our finding has a good intuitive ground for justification: Since the size of domestic demand is incomparably bigger than that of export expansion, even a low growth rate of the former may have a far greater impact on employment than a substantially higher growth rate of the latter. Therefore, the belief of "great" contribution by export expansion must be interpreted as "great" at the margin or as "great" in comparison to other economies' experiences.

turn showed a mixed tendency, with its negative contribution being highest for the mining sector. This again indicates that the industrialization during the 1960's relied greatly on imported raw materials.

Table G also shows several interesting aspects within the manufacturing category. First of all, finished textile products, sawmills and plywood, and miscellaneous manufacturing showed certain common aspects. For these industries, the positive contribution of export expansion was either higher than or comparably close to the positive contribution of the change in domestic demand (column (3) vs. column (2))[1]. Note that all of these three industries showed growth rates of employment higher than the manufacturing average of 169% (column (1)). Note also that all of these industries are highly labor-intensive[2]. The evidence therefore indicates that export expansion contributed substantially to the employment generation of some labor-intensive industries by concentrating on labor-intensive products. The negative contribution of import substitution in turn was exceptionally high in some capital-intensive industries; namely, basic chemicals, finished chemical products, non-ferrous metals, non-electrical machinery, and transport equipment[3]. This suggests that the industrialization during

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1. Contribution of export expansion was also exceptionally high for chemical fertilizers and electrical machinery. But, this contribution was completely dominated by those of the change in domestic demand and the techno-substitution effect.

2. See footnote 1 on page 37.

3. See footnote 2 on page 37.

the 1960's depended heavily on imported raw materials and machinery and, hence, the rate of employment creation was lower than would otherwise have been. Finally, the negative contribution of the techno-substitution effect (column (5)) was generally much higher for heavy industries (roughly from basic chemicals to transport equipment in Table G) than for light industries (roughly from processed food to printing and publishing, and miscellaneous manufacturing in Table G). Note that the positive contribution of the change in domestic demand (column (2)) was also substantially higher for heavy industries than for light industries, but was greatly cancelled out by the negative contribution of the techno-substitution effect. Consequently, except for a few industries, there was no significant difference in actual growth rates of employment (column (1)) between heavy and light industries. The implication of this evidence is as follows. Under the industrialization strategy of putting emphasis on heavy industries, domestic demand (both final and intermediate) for heavy industrial products increased tremendously. Consequently, there was a great increase in domestic production (as well as importation as shown in column (4)) of heavy industrial goods. But, this increase in domestic production was made possible through more reliance on capital-using techniques. As a result, the emphasis-on-heavy-industries strategy contributed more to raising labor productivity than to generating new employment in thses industries as shown by the high negative figures of the techno-substitution effect (column (5)).

Our discussion up to now has been on sectoral differences in the growth of employment. Our next discussion is on the class differences in employment growth. In Table H, column (1) represents the number of class e workers employed in 1960 and column (2) the increase in this number during 1960-1970. Consequently, column (3) indicates the growth rate of employment of class e workers during the same period. Here, M workers are broken down into 6 classes, each containing 3 brackets of those specified in Table D. Farmers in turn are grouped, as in Table D, into 4 classes according to their holdings of cultivable land. Summary statistics both for the M category and the A sector are the same as in Table F and presented here for reference.

Column (3) of Table H shows that, within the M category, the growth rate of employment during 1960-1970 was higher the closer the class in question was to either extreme. In other words, the change in employment patterns among M workers was characterized by bipolarization[1]. Obviously, this in itself tended to increase inequality among M workers. That is, the composition effect or the change in class composition of employment had a tendency to unequalize the distribution among M workers. For the A sector, the number of farmers in the very bottom class decreased by 7.7% during 1960-1970, while

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1. Primarily responsible for this bipolarization were three industries; finished textile products, processed food, and finished chemical products. Although not presented in this thesis, the first two had the largest fraction of the lowest three brackets of workers, while the last had the largest fraction of the highest three brackets of workers. And these three industries created the largest new employment as shown in column (2) of Table F.

Table H. Change in Employment Patterns by Class between 1960-1970

Classes	N_o^e (1)	dN^e (2)	dN^e/N_o^e (3)
Mining-manufacturing workers			
Brackets (1) - (3)	233,253	373,155	160.0%
Brackets (4) - (6)	104,249	149,641	143.5%
Brackets (7) - (9)	86,369	106,267	123.0%
Brackets (10) - (12)	43,311	51,118	118.0%
Brackets (13) - (15)	28,496	37,385	131.2%
Brackets (16) - (18)	3,918	5,527	141.1%
All brackets	499,596	723,093	144.7%
Farmers			
- .5 hectares	1,415,207	-109,111	-7.7%
.5 - 1.0 hectares	1,454,109	141,384	9.7%
1.0 - 2.0 hectares	1,396,393	70,139	5.0%
2.0 - hectares	416,134	2,221	.5%
All brackets	4,681,843	104,633	2.2%

Sources: See subsection (4.3).
Notes: N_o^e is the number of class e workers (farmers) in 1960 and dN^e is the change in this number between 1960-1970.

that in each of the remaining classes increased. Note further that, among the higher three classes, the rate of increase was lower for higher classes. The implication of this evidence is that the number of farmers increased relatively more for the middle two classes than for the two extreme ones. That is, unlike in the distribution among M workers, the composition effect tended to equalize the distribution among farmers.

In Table I, sources of the change in employment are shown. Column (1) is the same as column (3) of Table H, representing the growth rate of employment of each class of workers. Columns (2) through (6) represent the growth rates of employment attributable respectively to the change in domestic intermediate demand, the change in domestic final demand, export expansion, import substitution, and the techno-substitution effect. Column (7) indicates the growth rate of employment due solely to the composition effect or to the change in class composition of employment within individual industries (or within the whole A sector). Column (7) is zero for the M category because of condition (2) of subsection (3.2).

Notice that each of columns (2) through (6) shows virtually the same figure for different classes of farmers as well as for the whole A sector. This stems from the way the A sector is handled in this study. Specifically, all farmers in the whole A sector (rather than some farmers in individual agricultural subsectors) are broken down into 4 classes and, therefore, changes in weights among these subsectors affect only the total number of farmers, but not their class

Table I. Decomposition of the Change in Employment Patterns by Class

Classes	dN^e/N^e_o (1)	dN^e_{DI}/N^e_o (2)	dN^e_{DF}/N^e_o (3)	dN^e_X/N^e_o (4)	dN^e_M/N^e_o (5)	dN^e_T/N^e_o (6)	dN^e_C/N^e_o (7)
Mining-manufacturing workers							
Bkts (1)- (3)	160.0%	179.3%	128.1%	52.2%	-37.5%	-162.2%	---
Bkts (4)- (6)	143.5%	204.3%	109.3%	50.8%	-48.4%	-172.3%	---
Bkts (7)- (9)	123.0%	213.1%	104.8%	39.1%	-57.1%	-176.7%	---
Bkts (10)-(12)	118.0%	244.3%	117.2%	30.8%	-76.2%	-198.1%	---
Bkts (13)-(15)	131.2%	250.0%	119.6%	37.1%	-75.3%	-200.2%	---
Bkts (16)-(18)	141.1%	248.7%	98.4%	34.2%	-46.4%	-193.8%	---
All brackets	144.7%	200.6%	118.5%	46.7%	-48.7%	-172.3%	---
Farmers							
.5 h.a.	-7.7%	30.0%	60.6%	.5%	-6.9%	-82.1%	-9.8%
.5 - 1.0 h.a.	9.7%	32.7%	66.0%	.6%	-7.5%	-89.5%	7.4%
1.0 - 2.0 h.a.	5.0%	31.9%	64.6%	.5%	-7.3%	-87.5%	2.8%
2.0 - h.a.	.5%	31.3%	63.2%	.5%	-7.2%	-85.6%	-1.7%
All brackets	2.2%	31.5%	63.7%	.5%	-7.2%	-86.2%	---

Sources: See subsection (4.3).

Notes: N^e_o is the number of class e workers (farmers) in 1960 and dN^e is the change in this number between 1960-1970. dN^e_{DI}, dN^e_{DF}, dN^e_X, dN^e_M, dN^e_T, and dN^e_C are parts of dN^e due respectively to the change in domestic intermediate demand, the change in domestic final demand, export expansion, import substitution, techno-substitution effect, and industry composition effect.

composition, in the whole A sector. Although this way of handling the A sector is somewhat arbitrary, its results are not inconsistent with our expectation. That is, the A sector in Korea is characterized by a structure of very small owner-operated farms, which grow largely the same crop items with practically the same farming techniques. Therefore, say, a change in domestic demand is not likely to affect different classes of farmers to a significantly different extent. Accordingly, little is left in Table I for further discussion, except that column (7) indicates what has already been pointed out: Namely, the class composition of employment changed in such a way that the number of farmers relatively declined in the two extreme classes while it increased in the middle two classes.

For the M category, columns (2) and (3) show that, while the change in domestic final demand showed a mixed tendency, that in domestic intermediate demand contributed more favorably for the employment creation of upper-income groups. Underlying this latter aspect was the rapid expansion of heavy industries compared to light industries (Table B). Since heavy industries are expected to use as inputs relatively more of skill-intensive products, their faster growth 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 relatively in favor of skilled workers, as was the case shown in column (2)[1].

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1. It is implicitly assumed that, in the M category, workers of higher income bracket generally have skills of higher level.

According to column (4) of Table I, export expansion contributed more favorably to the employment creation of lower-income groups, reflecting that exportation during the 1960's centered relatively more on less skill-intensive products. Column (5) in turn shows that, with the exception of the very top class, contribution of import substitution was more unfavorable for the employment of upper-income groups, reflecting that importation during the 1960's concentrated primarily on skill-intensive products such as raw materials, machinery, and equipment. Overall, therefore, international trade during the 1960's contributed to employment creation of M workers relatively in favor of lower-income groups by exporting less skill-intensive products, and relatively against upper-income groups by importing more skill-intensive products.

Finally, contribution of the techno-substitution effect (column (6)) was also relatively more unfavorable for the employment generation of upper-income groups. As pointed out earlier in this subsection, under the emphasis-on-heavy-industries strategy, heavy industries expanded far more rapidly than light industries, thus creating a big potential of new employment of skilled workers. But, this potential was greatly cancelled out by heavy industries' resorting to more capital-using techniques. In other words, the big potential of new employment created by the emphasis-on-heavy-industries strategy was partly diverted to raising labor productivity, rather than actually creating new employment, of skilled workers.

The general direction of policy measures, namely industrial-

ization with emphasis on heavy industries and with the export promotion strategy, can now be evaluated in relation to the change in employment patterns. "Industrialization" created a big gap in growth rates of employment between farmers and M workers. Within the M category, employment of manufacturing workers grew faster than that of mining workers, since a large portion of mining products was imported rather than domestically produced.

Within the manufacturing, "emphasis on heavy industries" created patterns of domestic demand relatively in favor of skill-intensive products, thus providing a good potential to generate relatively more employment of skilled workers. This potential was greatly slowed down by the heavy industries' resorting to capital-using techniques on the one hand and, in this capital-deepening process, by their relying upon imported materials and machinery on the other. On balance, however, "emphasis on heavy industries" contributed more favorably to the employment generation of skilled workers. "Export promotion" in turn actually meant export promotion of products requiring low-skilled labor. Consequently, this strategy contributed more favorably to the employment generation of low-skilled workers. Overall, therefore, "emphasis on heavy industries" and "export promotion" of less skill-intensive products together resulted in the bipolarization of employment patterns among the manufacturing workers.

4.4 Sources of the Changes in Income Distribution

This subsection is the final step of the present analysis and

quantitatively identifies sources of the changes in income distribution. Basic sets of information used are those presented in Tables D and H. The analytical framework used is equations (4') and (5'). Estimations are done respectively for M workers alone, farmers alone, and M workers and farmers combined. The results are presented in Tables J, K, and L.

Table J shows sources of the change in income distribution among M workers. Column (1) represents the gross sum of incomes of all workers in each quintile in 1960. Column (2) indicates the growth rate of this gross sum during 1960-1970 and, hence, reflects relative improvement of workers' living standard among different quintiles[1]. Columns (3) through (8) show the growth rates of gross income of each quintile due respectively to the structural sources now familiar to us. Finally, columns (9) and (10) indicate the growth rates of gross income of each quintile due respectively to the change in labor income and to that in non-labor income[2]. At the bottom row of Table J, the difference between the top and the bottom quintiles is presented to show to what extent each source tended to equalize or unequalize the distribution among M workers.

According to column (3), the change in domestic intermediate

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1. The ordering of column (2) of Table J is the same as the ordering of column (4) (or improvement index) of the top panel of Table E.

2. dY_{y1}^{q} in column (9) is obtained as follows. First, $dY_{y1}^{e,q} = dw^{e}\overline{N}^{e,q}$ is estimated analogously to $dY_{y}^{e,q}$ in equation (5'). The results are then aggregated over all e within each quintile. dY_{y2}^{q} in column (10) is similarly obtained: $dY_{y2}^{e,q} = d(y - w)\overline{N}^{e,q}$ is first estimated and the results are then aggregated over all e.

Table J. Sources of the Change in Income Distribution among M Workers

Quintile	Gross Income in 1960 Y^q_o (1)	Growth Rate of Gross Income dY^q/Y^q_o (2)	Growth Rate of Gross Income of Quintile Attributable to: Change in Intermediate Demand dY^q_{DI}/Y^q_o (3)	Change in Final Demand dY^q_{DF}/Y^q_o (4)	Export Expansion dY^q_X/Y^q_o (5)	Import Substitution dY^q_M/Y^q_o (6)	Techno-Substitution Effect dY^q_T/Y^q_o (7)	Composition Effect dY^q_C/Y^q_o (8)	Change in Labor Income dY^q_{Y1}/Y^q_o (9)	Change in Non-Labor Income dY^q_{Y2}/Y^q_o (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%	52.2%	-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 (4.4).
Notes: Column (1) is in million won in 1970 prices.
Column (7) indicates effect of the change in labor productivity.
Column (8) indicates effect of the change in class composition of employment.

demand contributed consistently more favorably for higher quintiles. Again, this reflects that patterns of intermediate demand changed relatively in favor of skilled workers as a result of the emphasis-on-heavy-industries strategy. Furthermore, this source created the biggest gap (128 percentage points) in growth rates of gross income between the top and the bottom quintiles. Column (4) in turn shows that the change in domestic final demand showed a mixed tendency. Its contribution was most favorable for the bottom quintile but, among the remaining four quintiles, was more favorable for the higher two quintiles than for the lower two. In any case, the gaps created by this source were completely dominated by those created by the change in domestic intermediate demand. Consequently, the combined contribution of these two sources was more favorable for upper quintiles than for lower ones, creating still the biggest gap of 113 percentage points (= 128% - 15%) in growth rates of gross income between the top and the bottom quintiles. In other words, the change in domestic demand (both intermediate and final) was the most important source of widening the inequality among M workers.

Columns (5) and (6) show that both export expansion and import substitution tended to narrow the inequality. As pointed out earlier, exportation during the 1960's concentrated on less skill-intensive products, thus benefiting relatively more for low-skilled workers. Importation in turn centered on skill-intensive products under the emphasis-on-heavy-industries strategy, thus hurting skilled workers relatively more.

Contribution of the techno-substitution effect was also more unfavorable for the higher quintiles (column 7), tending to equalize the distribution among M workers. Again, this suggests that heavy industries tended to rely relatively more on capital-using techniques during the 1960's. 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, as shown in column (8). Underlying this tendency was the bipolarization of employment pattern shown in the top panel of Table H. That is, growth rates of employment were higher for workers closer to either extreme. As a result, 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 tended to increase the inequality.

Columns (9) and (10) indicate another notable aspect. The change in patterns of labor income tended to decrease the inequality during the 1960's (with a minor exception of the fourth quintile), as shown in column (9). But, the change in patterns of non-labor income not only tended to increase the inequality but created bigger gaps among different quintiles than the change in patterns of labor income. Consequently, the change in patterns of total income (that is, labor plus non-labor) tended to widen the inequality among M workers during the 1960's.

As mentioned above, the bottom row of Table J indicates the difference between the top and the bottom quintiles. A positive

(negative) figure in this row implies that its corresponding source tended to widen (narrow) the gap in shares between the two extreme quintiles. As shown, the change in domestic intermediate demand was the most gap-widening source, while the techno-substitution effect and import substitution were the most gap-narrowing sources. As pointed out earlier, however, these three sources were interrelated via the strategy of putting emphasis on heavy industries. Note that the gaps created by these three sources almost cancelled out one another. The evidence therefore indicates that the emphasis-on-heavy-industries strategy was distributionally neutral among M workers. Although this phenomenon actually happened during the 1960's, it is not expected to continue in the future under the same strategy. Specifically, as long as the emphasis-on-heavy-industries strategy is further pursued, domestic demand will inevitably change relatively in favor of skilled workers and, hence, the gap-increasing contribution of this source will inevitably continue to prevail. But, reliance on imported machinery and equipment is expected to reduce as industrialization proceeds. The capital-deepening process in heavy industries is also expected to slow down as technical know-hows are known and adjustments to domestic factor markets are made. In other words, the gap-decreasing contributions of import substitution and the techno-substitution effect are expected to weaken in the future. Overall, therefore, the emphasis-on-heavy-industries strategy, if further pursued in the future, is very likely to contribute to widening the inequality among M workers.

The bottom row of Table J also indicates that the change in non-labor income was the next important source of widening the inequality among M workers. Conceivably, there are two different aspects which may have contributed to widening the gaps in non-labor income among different income groups. 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 of returns to non-human assets actually decreased during the 1960's[1]. That is, the inequality-increasing contribution of the change in non-labor income was totally due to the increased concentration of non-human assets to upper-income groups.

The remaining sources were relatively minor compared to those already discussed. But, any of these sources was not insignificant in equalizing or unequalizing the distribution among M workers, since the actual gap in growth rates of gross income between the top and the bottom quintiles was only 29 percentage points. The importance of this aspect is that, other things being equal, a moderate change in the contribution of any of the "minor" sources may have a signifi-

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1. Economic Planning Board, Korea Statistical Yearbook, several volumes give the following information; "value added per employee (VA)", "personnel expense per employee (w)", and capital-lalor ratio (K/L), where capital in 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; $VA = wL + rK$ or $r = ((VA/L) - w)/(K/L)$. The resulting (r/w) shows a consistently decreasing tendency during the 1960's regardless of whatever definition of capital is used.

cant impact on the distribution among M workers. This being so, export expansion is probably the most appealing source to resort to in a policy point of view. Above all, a strategy to promote exports is expected to create least conflicts, if any, with other goals of the economy. Furthermore, concentrating on less skill-intensive exports is consistent with the economy's comparative advantage in abundant labor.

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

Column (2) shows that the growth rate of gross income was consistently higher for lower quintiles, indicating that income distribution among farmers moved toward more equality. The most equalizing source was the change in patterns of non-farming income, which alone created a gap by 52 percentage points between the top and the bottom quintiles in their growth rates of gross income (column (10)). The change in farming income in turn was the most unequalizing source, creating a gap by 27 percentage points between the two quintiles now in favor of the top one (column (9)). However, this inequality-increasing gap was completely dominated by the inequality-decreasing gap created by the change in non-farming income. Consequently, the change in total (that is, farming plus non-farming) income showed a tendency to decrease the inequality. Among the structural sources,

Table K. Sources of the Change in Income Distribution among Farmers

Quintile	Gross Income in 1960 Y^q_o (1)	Growth Rate of Gross Income dY^q/Y^q_o (2)	Growth Rate of Gross Income of Quintile Attributable to: Change in Intermediate Demand dY^q_{DI}/Y^q_o (3)	Change in Final Demand dY^q_{DF}/Y^q_o (4)	Export Expansion dY^q_X/Y^q_o (5)	Import Substitution dY^q_M/Y^q_o (6)	Techno-Substitution Effect dY^q_T/Y^q_o (7)	Composition Effect dY^q_C/Y^q_o (8)	Change in Farming Income dY^q_{Y1}/Y^q_o (9)	Change in Non-Farming Income dY^q_{Y2}/Y^q_o (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	102.4%	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 (4.4).
Notes: Column (1) is in million won in 1970 prices.
Column (7) indicates effect of the change in labor productivity.
Column (8) indicates effect of the change in class composition of employment.

both the change in domestic intermediate demand and the change in domestic final demand tended to equalize the distribution among farmers, while the techno-substitution effect tended to unequalize the distribution. But, contributions of these three sources almost cancelled out one another. Contributions of the remaining sources were negligibly small.

The most significant finding in Table K is the role of non-farming income in the distribution of income. It has already been pointed out in subsection (4.2) that what was responsible for the narrowing gap in income between farmers and M workers was the change in non-farming income. Now, what was crucially responsible for the decreasing inequality among farmers was again the change in non-farming income. The implication of this evidence is as follows. As industrialization proceeded, farmers had more opportunities to participate in non-agricultural activities. Furthermore, small farmers participated substantially more in these activities than large farmers. Consequently, small farmers derived relatively more of their income from non-agricultural activities than large farmers. And this caused the inequality among farmers to decrease during 1960-1970 despite the fact that the change in farming income contributed to widening the inequality. The evidence found in Korea suggests one important aspect in the general context of income distribution in developing countries: Industrialization at its earlier stage will inevitably increase the share of the very upper income groups of an economy by raising the relative weight of industrial workers who

usually have a substantially higher income than farmers. However, by providing non-agricultural opportunities to farmers, industrialization may as well reduce the inequality among farmers who usually constitute an incomparable majority of the economy even after the industrialization has proceeded to a substantial extent.

Table L finally presents similar 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 L, the growth rate of gross income was substantially higher for the top quintile than for the remaining ones. This is consistent with our expectation. Among the lower four quintiles, however, the same rate was higher for the middle two quintiles than the other two. And this contradicts our expectation. Specifically, since the lower four quintiles were occupied mostly by farmers and since the distribution among farmers moved toward more equality, the distribution among the lower four quintiles of all M workers and farmers combined must have moved toward more equality.

The contradiction in the above paragraph is a result of statistical hazard. When both M workers and farmers together are

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

Quintile	Gross Income in 1960 Y^q_o (1)	Growth Rate of Gross Income dY^q/Y^q_o (2)	Growth Rate of Gross Income of Quintile Attributable to: Change in Intermediate Demand dY^q_{DI}/Y^q_o (3)	Change in Final Demand dY^q_{DF}/Y^q_o (4)	Export Expansion dY^q_X/Y^q_o (5)	Import Substitution dY^q_M/Y^q_o (6)	Techno-Substitution Effect dY^q_T/Y^q_o (7)	Composition Effect dY^q_C/Y^q_o (8)	Change in Income dY^q_Y/Y^q_o (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 (4.4).
Notes: Column (1) is in million won in 1970 prices.
Avg. at the bottom row is average of lower four quintiles.

classified into quintiles based on the information in Table D, only the first and the third quintiles happen to include M workers[1]. The consequence of this aspect is notably reflected in columns (3) and (5) in Table L. Specifically, among the lower four quintiles, those which include M workers show significantly larger estimates in both columns than those which do not, since both the change in domestic intermediate demand and export expansion contributed more favorably for M workers than for farmers during the 1960's. During 1960-1970, employment of M workers increased far more rapidly than that of farmers. Consequently, the relative weight of M workers in the first (and the third) quintile increased substantially. Since average income of M workers was lower than that of farmers within the first quintile, the increased weight of M workers meant this quintile tended to be occupied by relatively more of lower-income workers. This obviously must have tended to decrease the share of the first quintile, as reflected in column (8) of Table L. Again, the phenomenon that some quintiles happen to include M workers while others do not affects the estimates significantly.

The phenomenon that only some (not all) of the quintiles happen to include M workers stems from the fact that, in the original sources of data, workers are classified into rather thick brackets. If they were more finely classified, each quintile would include some combination of both M workers and farmers reasonably close to the

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

real world and, hence, the bias contained in the resulting estimates would be less serious. Our estimates (Table L) for the lower four quintiles, however, do contain serious distortions caused by statistical arbitrariness of classifying workers into thick brackets. For this reason, our discussion in relation to Table L is confined to the comparison between the top and the remaining quintiles, which is roughly equivalent to the comparison between M workers and farmers. Accordingly, in the bottom row of Table L 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 L, the change in domestic demand (both intermediate and final) tended to unequalize the countrywide (that is, M workers plus farmers in this study) distribution. This is an obvious result of industrialization, which affected patterns of domestic demand relatively in favor of industrial products and against agricultural products. More significant is the evidence that the change in domestic intermediate demand was the dominant source of widening the inequality, 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 that, as long as industrialization is pursued as the prime goal, the most inequality-widening source is the one untouchable for egalitarian purposes, since industrialization inevitably creates patterns of domestic intermediate demand in favor of industrial pro-

ducts.

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

Another source which needs somewhat detailed discussion is the composition effect. According to column (8), this source tended to widen the inequality in the countrywide distribution. In other words, during the 1960's, the class composition of countrywide employment changed in the direction to unequalizing the distribution. What immediately strikes us is the phenomenon that the relative weight of M workers increased substantially during the 1960's. In general, however, this phenomenon does not necessarily raise the share of upper-income groups even though the average 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 continuously replaced by M

workers. Since the in-coming M workers have higher average income than the out-going farmers, the gross income of the top quintile will increase. But, the average income of the out-going (from the top quintile) farmers is also higher than that of the remaining quintiles. Therefore, the gross income of the lower quintiles will also increase. The resulting thesis is: It is only when the gap in average income between M workers and farmers is substantially big that the increase in relative weight of M workers raises the share of upper-income groups. And its antithesis is: If the gap is somehow reduced within a certain range, the increase in relative weight of M workers may well lower the share of upper-income groups.

The tendency shown by each of the remaining sources is consistent with our expectation. Import substitution (column (6)) tended to decrease the inequality by contributing more unfavorably for the top quintile than for the remaining ones. This indicates that, during 1960-1970, import dependency increased relatively more in the M category than in the A sector. The techno-substitution effect (column (7)) also showed a tendency to equalize the countrywide distribution, reflecting that labor productivity grew faster in the M category than in the A sector. Finally, column (9) shows that the change in income also contributed to decreasing the inequality. This is consistent with our previous finding that average income of farmers increased relatively more than that of M workers during the 1960's (Table D).

5. Summary and Concluding Remarks

This study has been motivated out of interests in the following series of queries: (1) Does inequality in income distribution really increase at the initial stage of growth as hypothesized by Kuznets? (2) If so, is structural change (or change in output structure as conceived in the present study) significantly responsible for the increasing inequality as suggested also by Kuznets? (3) If so again, to what extent and in what ways?

To find clues to the above queries, the performance of Korean economy during 1960-1970 has been analyzed. During this period, the government introduced various policy measures in efforts to encourage development of the economy. In this development strategy, the highest priority was always put on industrialization and, from the mid-1960's, emphasis was laid on heavy industries. The government also made a dramatic turn in its strategy of international trade from import substitution to export promotion.

As a result, the economy underwent tremendous changes both in its size and in its structure during the 1960's. GNP more than doubled between 1960-1970. The share in GNP of agriculture decreased from 41.3% to 28.0%, while that of mining and manufacturing increased from 12.1% to 22.8% during the same period. Exports jumped up even more from 33 million dollars to 835 million dollars between 1960-1970, and the ratio of manufactured to primary exports increased sharply from 14.2% vs. 85.8% to 77.4% vs. 22.6% during the same period. Sectoral changes in domestic production indicated the same character-

istics. Most of the industrial sectors expanded far more rapidly than non-industrial sectors and, among the former, heavy and chemical industries grew much faster than light industries.

In this process of industrialization, the decisive role was played by the change in domestic demand. Export expansion contributed positively, and import substitution negatively, to the growth of most industries, reflecting the economy's switch in strategy from import substitution to export promotion. Furthermore, the positive contribution of export expansion was most conspicuous in some labor-intensive industries such as finished textile products, sawmills and plywood, electrical machinery, and miscellaneous manufacturing in accordance with the economy's comparative advantage in abundant labor. The negative contribution of import substitution in turn was exceptionally high in some heavy industries such as minerals other than coal, most of the chemical products, non-ferrous metals, non-electrical machinery, and transport equipment, reflecting increased importation of materials, machinery and equipment needed for industrialization. All in all, however, the Korean economy during the 1960's was characterized by rapid industrialization with emphasis laid on heavy industries.

One obvious consequence of the rapid industrialization was a great increase in employment of industrial workers. While the number of farmers increased by merely 2.2%, that of manufacturing workers increased by some 169% between 1960-1970. Employment of mining workers, however, showed only a moderate growth (26%) during the same

period, reflecting that the industrialization during the 1960's relied rather heavily on imported raw materials. The change in domestic demand created the greatest potential of employment generation, although this potential was substantially cancelled out by the negative contribution of the techno-substitution effect (or the change in labor productivity). Export expansion contributed positively, and import substitution negatively, to the employment creation of most industries, although both sources played relatively minor roles compared to the change in domestic demand and the techno-substitution effect.

The degree of contribution of each of these sources was different among different income groups (skill levels), and generally reflects both the emphasis-on-heavy-industries strategy and the export promotion strategy. Specifically, within the mining-manufacturing category (M category), the change in domestic demand, especially domestic intermediate demand, contributed relatively more favorably to the employment generation of upper-income groups, since heavy industries, which expanded more rapidly than light industries during the 1960's, tended to use as inputs relatively more of skill-intensive products. Contribution of the techno-substitution effect in turn was more unfavorable for the upper-income groups, reflecting that heavy industries tended to meet the increased demand for their products by resorting to capital-using techniques. Import substitution also contributed more unfavorably to the employment creation of upper-income groups, since importation during the 1960's centered

primarily on skill-intensive products. On balance, however, the emphasis-on-heavy-industries strategy contributed relatively more favorably to the employment of upper-income groups. On the contrary, export expansion contributed more favorably to the employment of lower-income groups, since the export promotion strategy during the 1960's actually meant export promotion in products requiring low-skilled labor. Overall, therefore, the change in patterns of employment among M workers was characterized by bipolarization: Employment grew faster for workers closer to either extreme. Exactly the opposite phenomenon was found in the agricultural sector (A sector). That is, the number of farmers grew faster for the middle brackets than for either extreme.

The change in patterns of income distribution also showed contrasting patterns between the M category and the A sector. While the distribution among M workers became more unequal, that among farmers became more equal between 1960-1970. As for the sources of these changes, among M workers (Table J), the change in domestic demand was the dominant source of widening the inequality while the techno-substitution effect and import substitution were the most important sources of narrowing the inequality. However, contributions of these three sources almost cancelled out one another. Since these three sources were interrelated via the emphasis-on-heavy-industries strategy, the evidence indicates this strategy was approximately neutral with respect to the distribution among M workers. As pointed out in subsection (4.4), however, if the same strategy is further pursued in

the future, the inequality-increasing contribution of the change in domestic demand is expected to persist, whereas the inequality-decreasing contributions of the techno-substitution effect and import substitution are expected to weaken as adjustments to domestic factor markets are made and reliance on imported skill-intensive products is reduced. In other words, the emphasis-on-heavy-industries strategy, if pursued further in the future, is expected to create a stronger tendency to unequalize the distribution among M workers.

Export expansion tended to equalize the distribution among M workers as expected. The composition effect (or the change in class composition of employment) in turn tended to unequalize the distribution, reflecting the bipolarization of employment patterns among M workers. Finally, while the change in labor income showed a tendency to equalize the distribution among M workers, that in non-labor income tended to widen the inequality. And evidence shows that the latter aspect was due totally to the increased concentration of non-human assets to upper-income groups.

In the overall equalizing distribution among farmers (Table K), the change in non-farming income was the dominant source of equalization, whereas that in farming income showed a tendency to unequalize the distribution. That is, as industrialization proceeded, small farmers participated substantially more in non-agricultural activities (while maintaining their status as farmers) than large farmers. This evidence suggests one important aspect in the general context of income distribution in the developing world: Industrialization may

increase the inequality in the countrywide distribution by raising the relative weight of industrial workers, who usually have substantially higher income than farmers. However, by providing non-agricultural opportunities to farmers, industrialization may as well reduce the inequality among farmers, who still constitute an incomparable majority of the economy.

As for the countrywide distribution (Table L), the most notable feature was the marked rise in the share of the very top quintile. In this unequalizing process, the most important role was played by the change in domestic intermediate demand. Moreover, the change in domestic final demand, which showed a mixed tendency in the distribution among M workers, now clearly tended to unequalize the countrywide distribution. Both of these aspects are consistent with our expectation, since industrialization generally creates patterns of domestic demand, both intermediate and final, relatively in favor of industrial products. Export expansion also changed its role: Among M workers, this source tended to narrow the inequality. Now in the countrywide distribution, it contributed relatively more favorably for the top quintile than for the remaining ones. This is suggestive of the general possibility that measures to help lower-income M workers may turn out to be the ones helping upper-income groups in the countrywide context.

As in the distribution among M workers, both import substitution and the techno-substitution effect tended to equalize the countrywide distribution. Unlike in the distribution among M workers, however,

the equalizing contributions of these two sources were substantially smaller than the unequalizing contribution of the change in domestic demand in this countrywide distribution. Moreover, by the same reasoning as applied to the distribution among M workers, these two equalizing contributions are expected to weaken in the future as import dependency is reduced and adjustments to the domestic factor market are made in the M category. In other words as long as industrialization remains to be the prime goal of the economy, the already dominant source of unequalizing the countrywide distribution (that is, the change in patterns of domestic demand) is expected to persist, or even strengthen, in the future.

The composition effect or the change in class composition of employment also tended to widen the gap in shares between the top and the remaining quintiles. Underlying this was of course the rapid increase in M workers during the 1960's. But, as pointed out in subsection (4.4), this phenomenon alone does not necessarily raise the share of the top quintile. On the contrary, if the gap in average income between M workers and farmers is within a certain range, the increase in relative weight of M workers may even decrease the share of the top quintile. In this regard, there was one hopeful phenomenon shown in Table L (also in Table D): The change in income tended to equalize the countrywide distribution, indicating that the relative gap in income between M workers and farmers actually tended to decrease during the 1960's, though at a very slow pace.

Our final discussion is about the following question: If some

policy measures (other than outright tax reform) are to be designed for egalitarian purposes, what will be appropriate courses to take? Our goal is to decrease, or to slow down the increase in, inequality in the countrywide distribution. Looking back into Table L, we immediately focus on the widening gap between the top and the remaining quintiles, which may approximately be interpreted as the gap between M workers and farmers.

We naturally pay our first attention to those sources whose equalizing or unequalizing tendency was greater than the other sources; namely, the change in domestic demand, the techno-substitution effect, and import substitution. As pointed out earlier, however, the inequality-increasing contribution of the change in domestic demand is almost unavoidable, since industrialization inevitably creates patterns of domestic demand relatively in favor of upper-income groups. The equalizing contribution of the techno-substitution effect during the 1960's in turn was a consequence of rather an undesirable phenomenon. Also as pointed out earlier, the unequalizing tendency of this source stemmed largely from the phenomenon that heavy industries tended to resort to capital-using techniques, which in turn tended to relatively hurt skilled workers. This capital-deepening process, though probably inevitable at least in the short run because of the lack of technical know-hows, is not something to encourage in an economy with abundant labor. Finally, what was responsible for the inequality-decreasing contribution of import substitution was the M category's relatively heavier reliance on

imported materials, machinery, and equipment. Again, although this phenomenon may also be inevitable, it is obviously not something to promote in an economy whose lack of foreign exchange is one of the most serious constraints to achieving several other, and important, goals.

With the three main sources ruled out as inappropriate, there seems to be little left to do for a more equal distribution. Indeed, but not absolutely hopeless. As shown in Table L, the change in income already tended to decrease the inequality between the top and the remaining quintiles or, for that matter, between M workers and farmers. Furthermore, as pointed out in subsection (4.4), if the gap in income between these two groups is within a certain range, an increase in the relative weight of M workers may contribute to decreasing the inequality. In other words, the composition effect, which tended to unequalize the countrywide distribution during the 1960's, may well change its role toward equalizing the distribution if the gap in income between M workers and farmers is somehow reduced within a certain range. This suggests a strategy to help raise farmers' income. What immediately strikes us is some type of farm support program. Recall, however, that farming income alone tended to unequalize the distribution among farmers (Table K), who still constitute an incomparable majority of the economy. It was their non-farming income that tended to decrease the inequality among farmers. Therefore, some policy measure to help raise farmers' non-farming income is expected to reduce not only the inequality between

M workers and farmers but also the gap among farmers. Since farmers are expected to be low-skilled in non-agricultural activities, such a policy measure 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 (Table J), this strategy also tended to reduce the inequality among M workers.

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