Interrelationship between Agricultural Stagnation and Industrial Growth: with Special Regard to the Korean Economy

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1. Foreword

There are several important roles that an agricultural stagnation plays in retarding the process of industrialization not only in the Korean economy but also in other developing economies. It must be pointed out that agricultural stagnation could restrain industrial growth in two ways.

First, stagnant agricultural income means a limited market for industrial products in a major sector of the national economy. Second, an increase in the supply of industrial products with a decreasing or constant level of agricultural products would mean a declining price level of manufactures relative to food price, since industrial wages in the most of the developing countries are likely to remain proportionate to food prices. This would make industrial production less profitable.

On the other hand, it must be examined as to whether the influence of agricultural stagnation is strong enough to keep industrial growth down to a slow pace in

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spite of possible factors favoring industrial growth. The supply of labor seems to be one of the most obvious favorable factors, since it is generally known that the developing economy has a large amount of unemployment as well as underemployed labor. Another favorable factor seems to be an abundant supply of capital.

However, it will be argued that, under conditions of agricultural stagnation, an increase in industrial investment is likely to yield a sharply diminishing rate of return. Therefore, the potential supply of capital will not be invested and, in return, industrial growth will be restrained. Thus this paper attempts to examine the interrelationship between agricultural stagnation and industrial growth in the process of economic development.

2. Production - Consumption Mechanism between Agricultural and Industrial Outputs.

The discussion deals mainly with the case of closed economy. However, it is applicable with some modification to the case of an open economy, since the Korean economy is to a large extent an open economy due to the substantial imports of agricultural products and exports of industrial products.

The full account of the relationship between agricultural and industrial growth must take into account the nature of consumer demand and its reaction to changes in real income and relative prices. It attempts to examine the net effect on consumption by two tendencies.

The first tendency is the change in demand associated with the increase in national income due to the industrial growth. The second is the tendency toward substitution by consumers between agricultural and industrial products as a result of change in relative prices. These two tendencies are illustrated in Figure 1.

I0, I1and I2 represent community indifference curves. A represents the initial production and consumption point: OF of food and OM1 of manufactures are produced and consumed. The manufactures / food price ratio in this situation is represented by the slope P0 of the price line through A. Suppose that industrial production increases from OM1 to OM2, with agricultural production unchanged. Then, C is the new production point. To obtain a new equilibrium between supply

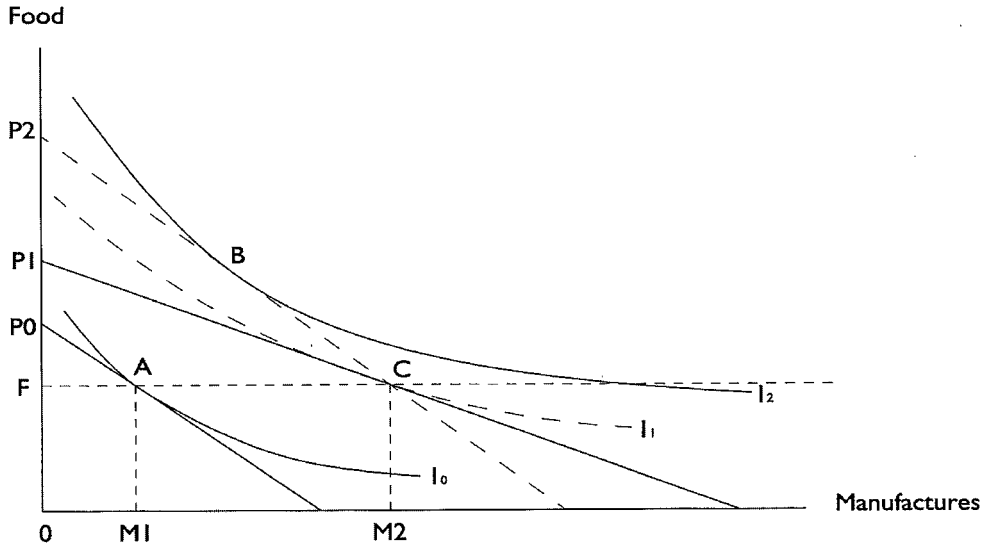


Figure I: Production-Consumption Mechanism between Agricultural and Industrial Outputs.

and demand, C must also be the new consumption point.

If relative prices remained unchanged in the new situation, the new income-price line would be the dotted line through C with slope P1. In this case consumption is only subject to the income effect.

The normal income effect that is to be expected is an increase in consumption both of agricultural and industrial products. Hence, the new (hypothetical) consumption point B will be above and to the right of A. (note 1)

Now consider what will be happening of the price level of industrial products declines relative to the price of agricultural products, while production continues at the level indicated by the point C. In Figure I this means that the price line through C is rotated in a counter clockwise direction. Since production is unchanged, it seems reasonable to consider national real income as remaining unchanged.

Thus, the only effect of the change in relative prices is the substitution effect, which means that consumers are induced to increase their consumption of industrial products and to decrease their consumption of agricultural products. As the relative price of industrial products declines further, this tendency continues until eventually consumption reaches the point C - i.e., a new equilibrium

between supply and demand is established.

This reasoning indicates that an increase in industrial products, without an increase in the supply of agricultural products, will be absorbed by consumers if and only if there is an adequate decline in the relative price of industrial products.

This presumption rests on the important qualification that a consumption point B was being compared with a consumption point C in which national supply and demand are balanced in respect to both agricultural and industrial products. In other words, point C represented a closed economy. Therefore, it is plausible to believe that the purchasing power lost by one sector in the movement from C to B is gained by other sector.

In this case, since the changes in purchasing power of the two sectors roughly offset one another, it seems reasonable to conclude that the distribution of national consumption expenditure between agricultural and industrial products will not be affected by the transfer of income.

This conclusion rests on the further assumption that the marginal propensities to consume both agricultural and industrial products (at unchanged relative prices) are equal between two sectors. With this assumption and the assumption of starting from the closed economy, it can be said that a decline in the manufactures/food price ratio must cause a decline in the demand for agricultural products and an increase in the demand for industrial products. (note 2)

However, it has been found in Korea, that the percentage of incremental income spent on food consumption of the total cash and non-cash income in 2000 is larger in rural areas (63.4 percent) than in urban areas (44.1 percent). (note 3) This is due partly to the effect of the rural-urban income disparity of which the income per rural household is 62.6 percent of that of per urban household in the same year. (note 4)

Hence, the income transfer tends to offset the substitution effect. If the effect of the income transfer is sufficiently strong, one would get the peculiar case when a rise in the relative price of industrial products induces an increase in the relative consumption of industrial products. One is, however, not inclined to believe that above analysis is realistic case in the Korean economy (note 5), because the low rural income most likely fails to provide an efficient market for

industrial products as well as low purchasing power due to the growing urban poverty that also (likely) fails to absorb industrial products sufficiently.

Year	Farm Population (1000)	As % of Total Population	Agriculture Forestry Fisheries Share in GDP	Grain Production (1000 M/T)	Foreign Trade in Food and Live Animals (Million US$)		Grain (1000M/T)
					Exports	Imports	Imports
1994	5,617	11.5	7.0	5,745	2,294.6	4,761.3	13,172
1993	5,407	12.3	7.9	5,574	2,060.3	4,001.5	12,352
1990	6,661	15.5	8.7	6,635	2,037.3	3,246.6	10,070
1985	8,521	20.9	12.5	6,990	1,136.4	1,397.6	7,337
1980	10,827	28.4	14.7	5,323	1,157.7	1,797.0	5,051
1975	13,244	37.5	24.9	7,672	602.3	946.6	3,147
1970	14,422	44.7	26.6	6,943	65.5	319.4	2,115
1965	15,812	55.1	38.0	6,527	41.3	63.5	634
1961	14,509	56.3	39.1	5,933	8.9	40.1	603

Table 1: Agricultural Population, Output and Trade

Source: Korea National Statistical Office, Major Statistics of Korean Economy, 1985.2 and 1993, and Economic Planning Board, Major Statistics of Korean Economy 1997, Seoul, 1997.

In this situation, the problem could be partly solved, if some other factors were introduced in the open economy, such as exports of domestic industrial products, imports of foreign capital and foreign agricultural products as determining factors.

In fact, exports rose at an annual average growth rate of 40 percent in 1960s and 1970s and approximately 25 to 30 percent in 1980s and 1990s and even in 2000 Korea's exports reached US $ 172.268 billion, an increase of 19.9 percent from the previous year, while imports increased 34.0 percent, which totaled US $ 160.481 billion. (note 6)

In addition, as table 1 shows, imports of food and live animals rose from 40.1 M/T in 1961 to 4,761.3 M/T in 1994 (119 times more than 1961) and imports of grain rose from 603 M/T to 13172 M/T (almost 22 times) in the same period, respectively.

In this case, the situation would however, easily create a number of difficult problems in the balance of payment, economic efficiency of small and medium

versus large firms, and in certain cases also in the field of capital and labor supply, which would in turn prevent further growth of industrial sector.

3. Relative Position of Medium versus Large Enterprises

During the rapid industrialization of the Korean economy in last four decades, there has been experienced a significant decline in the relative importance of small and medium industries (SMEs) mainly due to following three reasons.

First, like most less developed economies entering a period of intensive industrialization as well as modernization at the present time, Korea economy does not have to establish manufacturing industry through gradual improvement process.

Secondly, under the pressure of so-called forced export, newly established industry in Korea has modified highly sophisticated production technique of advanced economies in order to compete in the international market.

Thirdly, the low purchasing power, due to stagnant agriculture in rural areas as well as growing poverty in urban areas, has contributed to a striking decline of already established SMEs which have been supplied their products mostly in the domestic market.

For example, in 1961, 120 manufacturing enterprises including SMEs produced industrial products that are supplied to both the domestic and foreign markets. In 2001, however, only 30 large enterprises, of which 5 are dominating so-called Chabols are producing most of the manufactures in the form of monopolization. (note 7).

In a dynamic setting, there are numerous localized and international markets that are best served by SMEs with a capacity for adaptability in the following situation:

(1) When the market is limited, however, effectively established by local demand and income level;

(2) Due to dispersed location of raw materials, manufacturing establishments are widely scattered.

(3) Products require light equipments and simple operations to achieve the principles of multiples at a low volume of output;

(4) Specific requirements and rapid delivery of multiples at a low volume of output are a key element to sustain production facilities of its own.

Thus, under-utilization of these advantages and failure to explore their contribution of SMEs means a loss in efficiency of the entire economy.

4. Supply of Labor

By many economists such as Todaro, Fei and Ranis among others, it has been pointed out that the supply of labor appears to be very favorable to industrial growth in over-populated agricultural country. (note 8). The most plausible assumption is that labor supply from the traditional sector to the modern sector is available at a subsistence wage. This in fact was the assumption of the classical economists as pointed out by Arthur Lewis in applying the classical analysis (Karl Marx, etc.) to the problem of present-day developing economies. (note 9)

However, Lewis provides a new justification for the assumption of a conventional subsistence wage, by arguing that rural labor migrating to seek industrial employment in the city will lose their share of the income from family farm. Hence, they demand a wage that is at least equal to the average per capita income in agriculture. In addition, they will demand a small differential as compensation for the cost of moving and for sacrificing the family and social ties to village life. But Lewis seems to regard the differential as insignificant in size; and only introduces it for the sake of a rigorous treatment.

Fei-Ranis and Todaro attempted to expand Lewis' model by incorporating his ideas with other prevalent ideas found in the literature on economic development. They used Lewis' formulation of the industrial sector but explicitly related it to the agricultural sector. According to Fei-Ranis, the industrial wage does not increase as more agricultural labor is drawn into industrial employment because there is a redundant supply of labor in the agricultural sector.

The stage at which all labor is located in agriculture is phase one for Fei-Ranis term. Labor has been drawn into industry - until the break point enough to make the marginal product of those who remain in agriculture greater than zero. Phase two, beginning at the end of phase one, continues are more labor leaves agriculture until the marginal product rises to the institutional wage. During

this phase the industrial wage rises, for, as more labor with a positive marginal product is drawn from agriculture, the supply of agricultural products is reduced. This turns the terms of trade in favor of agriculture, and industry must pay a higher wage in order to maintain the same purchasing power. During phase three, the institutional wage is no longer applicable. Agricultural labor is paid its marginal product that throughout phase three is greater than the institutional wage.

Thus, the wage of the industrial sector must pay to entice agricultural labor into industrial employment will depend on the change in the terms of trade between two sectors. This is the same point reached by the Lewis' model. Hence, the classical assumption of Lewis and the modified assumption of Fei-Ranis and Todaro all point out a similar conclusion that a redundant supply of labor from agricultural sector is available for industrial growth at a subsistence wage or a fixed wage in developing and newly industrializing countries.

However, among total not-economically active population of 14,189,000 persons in 2000, farm household contains only approximately 6% (857,000 persons) as compared with 94% (13,331,000 persons) of the non-farm household in the Korean economy. (note 10) This means that on the contrary to the assumption of Fei-Ranis and many other developing economists, Korean economy contains majority of unemployed and underemployed labor forces in the non-agricultural sector. This situation is more or less similar in many developing and newly industrializing countries.

Thus, the labor force in both sectors contains a large number of unemployed and underemployed labors that can be involved in the effort of industrial growth. Hence, there is a need to examine the reasons, if any, why agricultural industry is likely to prevent supply of labor to the urban industry under such favorable conditions.

First, if the agricultural economy is primarily made up of small owner-operator farm households, it is to be estimated that the marginal product of an individual member of the farm household is not zero but positive (as compared with the non-farm households in urban area) even in the situation of labor surplus in the agricultural sector.

Indeed, the Korean agricultural economy has been made up of small owner-

operators, since the Land Reform Act was carried out in 1949 to limit "the arable land ownership per household to 3 hectares, with all in excess of this limit purchased by the government for distribution among unlanded or underlanded farmers." (note 11)

Then, the next question is : at what subsistence wage is this labor available? First, the meaning of subsistence wage must be defined. It is well known fact that in many (developing) countries a large part of income per household is spent on food consumption.

Hence, subsistence wage or any real wage is essentially a wage that remains roughly proportionate to the level of food prices. Therefore, as mentioned before, it follows that the ratio between industrial wage and price of manufactures can be only changed in the proportion to the ratio between food and manufactures.

Thus, despite the favorable labor conditions, the supply of abundant labor to the industrial sector is not unlimited in the Korean economy even in a state of stagnant agriculture because it is simply not available below a minimum wage rate in terms of food prices.

5. Supply of Capital

The prevailing opinions of economists with regard to the role of capital in developing countries can be distinguished in two aspects as to whether they represent a positive or negative view. The positive aspect emphasizes an adequate supply of capital that will enable rapid industrial growth. The negative aspect stresses the shortage of capital as the main retarding factor to industrial growth.

This analysis is concerned with the positive aspect of the supply of capital. However, it attempts to show the reasons why an apparently favorable supply of capital is likely to have only limited affect on industrial growth, so long as agriculture is stagnant.

Some developing economists have stressed the positive aspect of capital to the extent of stating that an abundant supply of capital is all that is needed to ensure rapid industrial growth. It is this reasoning that seems to account for the widespread view that any desired rate of growth can be achieved if enough (foreign) capital is available. This approach can easily overlook the possibility

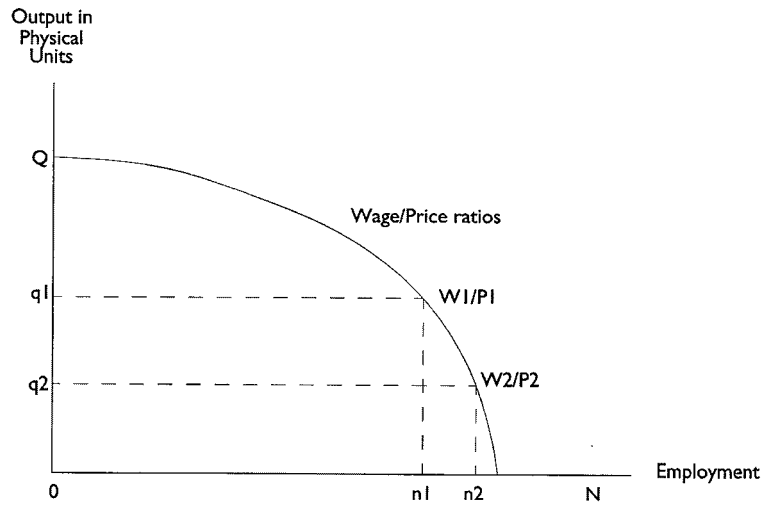
that the supply of capital may outrun other limiting factors. (note 12) Another point that needs to be analyzed is the possibility that a stagnant agriculture can limit industrial growth even with an abundant supply of capital.

Suppose there is a heavy investment in industry, resulting in a large increase of industrial production. In a closed economy where agriculture is a dominant factor, if the food supply remains stagnant, the relative price of manufactures must decline in order to absorb the additional industrial output, as mentioned before. On the other hand, if a subsistence wage is necessary, the wage in the paid sector of industry cannot decline below the minimum level relative to food prices even in a state of agricultural stagnation with surplus labor, as described before.

Hence, despite the above situation, if the wage / price ratio in the paid sector is raised to and / or beyond the minimum level of food prices to maintain industrial growth, it is likely to mean a low rate of profits on industrial capital.

Thus, the conclusion is that, in a closed economy, heavy investment in industry could be likely to induce a rapid fall in the rate of return on these investments, if the food supply remains constant due to the agricultural stagnation. Eventually, this tendency would play a role as a brake on further industrial investment and it would, in turn, be an impending factor to industrial growth. (note 13)

Figure 2: Mechanism between Output and Employment



This tendency can be illustrated in Figure 2, showing the curve of marginal productivity of labor.

Assuming that there is a large available supply of capital, let us now interpret Figure 2 as relating to the output of labor associated with each unit of capital.

When w2 / p2 is the wage / price ratio, the area enclosed by three points Q, q2 and w2 / p2 represent the profit per unit of capital, expressed in physical units of output. Now industrial growth implies a rise in food / manufactures price ratio, and therefore a rise in the wage / price ratio in industry, say to the level of w1 / p1. Hence, profit per unit of capital is reduced to the area enclosed by the three points, Q, q1 and w1 / p1. Thus, the profit rate, expressed in physical units of capital, has declined. Since a unit of output is worth less in terms of labor at the point w1 / p1, the profit rate has also declined in terms of purchasing power over labor.

Now, the price of physical unit of capital is likely to be proportionate either to the wage rate or to the price of a unit of consumer goods output. In either case, it follows that the rate in industrial capital, as a percentage of the unit of capital, must decline when industry grows but agriculture stagnates. (note 14)

Furthermore, it seems likely that if the rate of return on capital declines, the willingness to invest will also be reduced. This tendency may, in turn, create capital depreciation in two aspects: (1) the physical deterioration of capital, and (2) financial provision for there replacement.

This seems provable even if the potential supply of capital is virtually unlimited, because in the above case in Figure 2, the potential investors will reduce their rate of saving or investment in government bonds but increase their saving in unproductive forms in terms of hording or real-estate speculation or deposit their capital in foreign currency in foreign banks.

Therefore, according to this analysis, so long as agriculture is stagnated, it can be said that an abundant supply of capital is not a complete solution for increasing the profit rate on the invested capital in the industrial sector and thereby stimulating industrial growth.

6. Concluding Remarks

In advanced economies, there exists a long tradition of industrialization and urbanization. In the Korean economy (and many other LDCs and NICs) the arbitrarily growing urban population is not the same phenomenon of labor transfer from traditional to modern sector, as it can be found in highly industrialized economies.

The growing annual inflow of migrants to the city is due mainly to the result of neglecting the primary sector in the economic development planning, which has created stagnant agriculture with severe rural-urban income disparity.

However, the dilemma of urban industry in the context of the contemporary world economy with its sophisticated technological and communicative basis together with shortage of demanded high-level manpower, the goals of rapid industrial expansion and technological efficacy in terms of productivity does not allow for compromise with labor-intensive methods of production merely for the sake of labor absorption.

Even if such industries could operate profitably on a highly labor intensive basis as assumed by many economists, it by no means follows that the poverty and unemployment rate in urban areas would be reduced. On the contrary, it would only increase the annual inflow of rural migrants to the city due to attraction of job possibilities at the newly established (labor-intensive) industry in urban areas. In such a case, neither the objective of rapid growth rate nor that of low urban unemployment is likely to be achieved satisfactorily. Rather, it would only create a so-called transitional sector in the urban area with unacceptable levels of poverty and unemployment.

Therefore, balanced investment is desirable in the Korean economy not only to increase the food supply by domestic agricultural products but also to induce higher profit rate on capital investment in the industrial sector by raising the purchasing power of manufactures through increased income level in both rural and urban areas.

Notes

1. Hirshleifer, Jack, The Price Theory and Applications, Third Edition, Prentice-Hall, Inc., Englewood Cliffs, N.J. 1984. pp. 114-15 and 144.
2. In other words, the net effect of the transfer of income from the urban to rural sector, if not zero, is anyhow not large enough to reverse the direction of the shift in distribution of national consumption expenditure due to the substitution effect.
3. Korea, Government of, Korea National statistical office, Korea Statistical Yearbook 2001. December 2001. p. 512
4. Ibid.; p. 542.
5. But if it were a real case, it would be the one case where the conditions required to induce increased consumption of industrial products harmonize with those required to encourage industrial production.
6. Korea Statistical Yearbook 2001. Ibid. p. 76. See also: Krueger, Anne O., "Korean Industry and Trade over Fifty Years". In: Dong-Se Cha, Kwang Suk Kim and Dwight H. Perkins (eds.) The Korean Economy 1945-1995, Korea Development Institute, April, 1997. pp. 293-331.
7. Korea National Statistical Office, Statistical Handbook of Korea 2001, pp. 43-54. and 2002 Korea in Figures, pp. 19-24.
8. Todaro, M., Economic Development in the Third World, 4th ed, Harlow: Longman , 1989.
   Fei, John C.H. and Ranis, Gustav, Development of Labor Surplus Economy, Second Printing, Richard D. Irwin, Inc. Homewood, Illinois 1967.
9. Lewis, Arthur W., "Economic Development with Unlimited Supplies of Labor", Manchester School of Economics and Social Studies, Vol. XX11, No.2, May, 1954, pp. 148-151.
10. Korea Statistical Yearbook 2001, Ibid. p. 153.
11. Hapdong News Agency, Korea Annual 1970, Seoul, 1970. p. 180.
12. Lewis seems to share this view too. Arthur W. Lewis, "Economic Development with Unlimited Supplies of Labor", Ibid. pp. 146 and 152-155.
    An excellent discussion of the ideas of leading economists of classical and neoclassical periods on this points is given by Thomas Robert Malthus (1766-1834), Karl Marx (1818-1883), David Ricardo (1772-1823) and Alfred Marshall (1842-1924).
    Malthus and Marx point out that the rate of return on capital will decline if capital increases faster than consumer demand. Ricardo lays stress on the increase in capital relative to natural resources as the cause of a declining rate of return. Marshall points out that an increase in capital per head will tend to lower the rate of return but technical progress will tend to raise it. Ibid. pp. 153-154 and 180. See also: Baumol, William J., Economic Theory and Operation Analysis, Second Edition, Prentice-Hall, Inc., Englewood Cliffs, N.J. 1965. pp. 407-433.
13. This is merely a different view of the same phenomenon analyzed in the previous section of the supply of capital.
14. Essentially, the same idea can be expressed by saying that the size of the market restricts the inducement to invest. This view is strongly advocated by many economists. They consider that

the size of the market is dependent on the possibility of achieving simultaneous growth of various industries. In this analysis, it is agricultural stagnation that limits the size of market for industrial growth.

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