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SOME EXPLANATIONS OF THE RISING AGRICULTURAL PROTECTIONS IN KOREA

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I. Introduction

Agriculture and agricultural market in Korea have been in general under government's intervention in the form of laws, regulations and sometimes government orders. The intervention can be classified into two groups; direct intervention and indirect intervention. The general form of direct intervention includes a price support program in output market, input subsidy program, restriction on imports of foreign agricultural products, and so on. The indirect intervention includes overall measures affecting agricultural sector such as regulation on agricultural input industries and undervaluation of domestic currency, etc. These interventions may bring a distortion in the structure of agricultural prices, which cause a significant effect on the structure of agricultural production and food consumption. The degree of government intervention are commonly noted in the agricultural protection level. It is apparent that agricultural protection is not unique in Korea, but common in most of the developed and developing countries. The difference is the protection level and the way of protection. Even if Korea was one time a grain exporter, its agricultural policy moved toward protectionism. Why did Korean economy protect domestic agriculture even if its development policy is based on an export-oriented strategy? In this paper an attempt will be made to answer the growing level of agricultural protection in Korea.

II. Growing Agricultural Protection

There are two common measures in evaluating the level of agricultural protection; nominal protection rate(*NPR*) and effective protection rate(*EPR*). The nominal protection rate is the ratio of difference between domestic and border prices over border price, That is,

$$(1) \quad NPR = \frac{p^d - p^b}{p^b} \times 100$$

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where p^d and p^b are domestic and border prices expressed in domestic currency or in foreign currency, respectively, by use of official exchange rate. The *NPR* is commonly used in many empirical studies because of its properties of easy calculation.

Agricultural production process is not simple as it is seen, but rather complex. For example, various kind of inputs such as fertilizer, pesticide, machinery and equipment with energy resource, etc, are required at each stage of rice production. Most of the inputs required in rice production, except land and labor, are internationally tradable and their domestic markets are frequently intervened by government. In this case *EPR* is more comprehensive in evaluating the degree of protection, because *EPR* is defined as the difference between values added evaluated at the domestic and border prices divided by value added at border price. That is,

$$(2) \quad EPR = \frac{V^d - V^b}{V^b} \times 100$$

where V^d and V^b are values added in rice production evaluated at the domestic and border prices, respectively. A simple example of *EPR* in rice production with a single input which is internationally tradable can be shown as follows;

Let p^d = domestic price of rice per unit,
 p^b = border price of rice per unit, and
 t_r = tariff rate on rice import.

Then, the relation between domestic and border prices are;

$$(3) \quad p^d = p^b(1 + t_r)$$

Let w^d = domestic price of input used in rice production,
 w^b = border price of the input, and
 t_i = tariff rate on import of the input.

Then,

$$(4) \quad w^d = w^b(1 + t_i)$$

The values added in rice production evaluated at the domestic and border prices, v^d and v^b , respectively, are,

$$(5) \quad v^d = p^d - a_i w^d$$

$$(6) \quad v^b = p^b - a_i w^b$$

where a_i is the production coefficient of the input used in rice production. By combining equations (2) to (6), *EPR* becomes,

$$(7) \quad EPR = \frac{t_r - t_i s_i}{1 - s_i} \times 100$$

where $s_i (= a_i w^b / p^b)$ is share of the input used in per-unit rice production

TABLE 1. Protection Level by Crop by Period

	Rice	Barley	Wheat	Corn	Soybean	Beef	Pork	Chicken
1955-60	0.85	0.87	0.80	0.79 ¹⁾	0.84	1.04	0.91	1.00 ¹⁾
61-65	0.94	1.06	0.97	1.14	1.08	1.04	1.04	1.22
66-70	1.13	0.98	1.14	1.22	1.64	1.69	1.95	2.47
71-75	1.53	1.32	0.96	1.39	1.46	2.04	2.04	1.98
76-80	2.66	1.99	1.66	1.85	2.30	2.23	2.23	2.58
80-82	2.53	2.08	2.32	2.01	3.49	3.58	3.58	2.45

Note 1) average of 1959-60

Source : Anderson & Hayami

evaluated at border price. For numerical example, suppose that the tariff rate on import of rice and input used in rice production are 50 percent and 30 percent, respectively, and the share of input used in rice production at border price is 0.2. In this case *EPR* is 0.55, while *NPR* is 0.50

The official exchange rates in some countries are frequently misvalued due to a government's intervention in foreign exchange market, causing that *NPR* and *EPR* are also misvalued. Therefore, another set of *NPR* and *EPR* is obtained by adjusting a bias of official exchange rate and employing the adjusted exchange rate. However, in this analysis a focus is given to *NPR*, because this study will try to explain a general trend of growing agricultural protection.

The nominal protection coefficients for major agricultural products in Korea, which are expressed as a ratio of domestic price over border price, have been increasing as is shown in Table 1. The protection level of rice was in the negative until early 1960s, implying that domestic price was lower than border price. However, the level was in an increasing trend after that. That is, the protection level was slightly bigger than 1 in late 60s, but rose sharply from early 1970s together with a strong price support program.

Barley was in the negative protection in late 50s and not protected in 1960s. But the protection level was increasing from 1970s, going up to around 2.0. Even if the growing protection trend of barley is almost same as that of rice, the protection level of barley was generally lower than that of rice. This is due in part to the fact that foodgrain policy for late 60s and 70s was designed to reduce rice consumption by increasing consumption of non-rice grain such as barley. That is, relative price of barley in terms of rice was 0.69 on the average in 1960s, but was lowered to 0.59 in 1970s. Another policy designed to reduce rice consumption was noted in 1967 when all commercial restaurants were asked to mix more than 25 percent of non-rice grain, mainly barley, in every meal.

Wheat was not generally protected until late 70s, compared to the protection level of rice and barley. This is an indication that foodgrain policy was designed to expand wheat consumption in order to reduce rice consumption. The relative price of wheat in terms of rice and barley was 0.48 and 0.71 on the average in 60s, but was lowered to 0.34 and 0.60 in 70s, causing

a relatively lower protection level. With a restriction to mix non-rice grain in commercial meal, another restriction was made that no rice-made luncheon were sold on Wednesday and Saturday. This forced people to taste wheat-made products such as noodles and bread, because barley cannot be used for luncheon without rice. This has been possible because of relatively lower price of wheat in terms of rice and barley.

Corn had been modestly protected among grains during 60s and 70s, and least protected in early 80s. The reasons for generally lower protection, compared to other grains, include followings; 1) Corn is the least important grain in term of per capita consumption and agricultural policy has been focused on an achievement of self-sufficiency of main-food crop such as rice, 2) Corn is used generally as an intermediate input for livestock production. The share of feed demand over total corn consumption has been increasing since early 1960s together with an increase in its absolute volume. Therefore, lower price is necessary to boost livestock production, and 3) Corn is grown by a relatively small number of farmers, say less than 15 percent of total farm.

Soybean is still one of the main source of proteins in Korean diets, and therefore, is called "meat produced at upland". Soybean is used not only for food consumption directly as it is, but also for processing of tofu, soysauce, and soybean-made milk. That is, the use of soybean for food has been diversified with a development of soybean processing technology and expansion of processing industry, causing a steadily increasing trend of soybean demand since 1970s. With an increasing volume of soybean demand, protection level has been growing rapidly since 1970s.

Generally, the diet pattern in Korea has been biased to grain consumption. However, it is also true that a change in food consumption pattern toward a balanced intake of various food has been noted along with an improvement in standard of living. That is, an increase in income brings more consumption trend of nongrain food such as livestock products. Per capita consumption of beef has increased from 0.9 kilograms in 1962 to 3.25 kilograms in 1986. The consumption of pork has increased from 2.1 kilograms to 7.7 kilograms over the same period, peaking at 8.4 kilograms in 1985. Chicken consumption increased from 0.6 kilograms to 3.1 kilograms during the period. Along with an increase in per-capita consumption of these products, an increasing trend of their portection level has been also noted. That is, it can be said that beef industry was not protected until early 1960s, but its protection level increased from late 1960s, showing about 3.5 of NPC in early 1980s. Same as noted in beef industry, pork industry was not protected until early 1960s, but began to be protected from late 60s. The same explanation can be made for chicken industry.

The growing trend of NPC can be decompositioned into 3 parts, because nominal protection coefficient is the ratio of domestic price over border price. That is.

$$(8) \quad NPC = \frac{p^d/e}{p^b}$$

where p^d , p^b and e are domestic price, border price and exchange rate, respectively. Therefore, following equation can be obtained by differentiating equation(8) with respect to time and dividing both sides by NPC .

$$(9) \quad g^{NPC} = g^d - g^b - g^e$$

where g^{NPC} , g^d , g^b and g^e are annual growth rates of NPC , domestic price, border price and exchange rate, respectively. The growth rates of each component by crop for equation(9) based on the data in Anderson and Hayami are summarized in Table 2. There exists a discrepancy in the value of growth rate of NPC between a calculation from the NPC trend and a calculation from equation(9). For the period of 1955 to 82, the growth rate of NPC of soybean is highest among grains, followed by rice, and highest in beef among livestock products. The increasing rate of domestic prices of beef and pork is generally higher than that of grains. Exchange rate has been devaluated over the sample period, indicating that the change tended to lower the protection level.

TABLE 2. Annual Growth Rate of NPC , P^d , P^b , e for 1955–82 in Korea

(Unit:%)

	NPC	$P^d(1)$	$P^b(2)$	$e(3)$	(1)-(2)-(3)
Rice	5.37	17.26	4.05	6.95	6.26
Wheat	3.63	15.58	4.28	∥	4.35
Barley	3.97	16.31	4.59	∥	4.77
Corn	4.07	15.91	4.43	∥	4.53
Soybean	5.51	18.36	4.89	∥	6.52
Beef	6.95	20.18	5.07	∥	8.16
Pork	5.45	19.70	5.57	∥	6.55
Chicken	4.48	15.71	3.85	∥	4.91

III. Cause of Growing Protection

The nominal protection level for major grains was generally low until late 1960s. Followings can be responsible for lower protection for that period. The number of people in farm sector was larger than that in non-farm sector. That is, the number of farm population was more than half of total population until 1968, and the number of farm household over total household was more than half until 1965. Therefore, protecting farmers by maintaining higher domestic price of farm products would cost more than protecting consumers by maintaining lower price. Secondly, the economic development strategy in 1960s was placed on an expansion of labor-intensive industry which was based on a lower wage rate. It can be, therefore, said that

a lower price of major grains such as rice and barley must be maintained for lower wage rate in order to depress a pressure of increase in wage rate.

However, the protection level began to rise rapidly in 1970s, even under conditions of growing trend of border price and successive devaluation of domestic currency. It will be helpful, here, to refer to Johnson's summary about agricultural protection.

That is, agricultural protection level is;

- 1) positively related to the level of per capita income,
- 2) negatively related to the percentage of employment in agriculture over total employment, or the percentage of GNP produced by agriculture,
- 3) negatively related to the amount of agricultural land per capita,
- 4) negatively related to the value of agricultural exports per capita,
- 5) negatively related for a product that is a tropical beverage, and
- 6) positively related to commodities produced on the larger or more specialized farms.

The five provisions of the above proposal, except provision 5), are generally applicable to explain a growing trend of agricultural protection. That is, agricultural protection has grown with an increase in income, decrease in percentage of labor force employed in agriculture, and decrease in share of agricultural contribution to GNP, etc. However, more attempt can be made to explain more of an growing protection level, even if the above summary are generally applicable. For example, the protection level of barley can be said to be lower than that of wheat and soybean, even if barley is produced more popularly.

An attempt will be made here to explain why domestic price relative to border price have gone up, causing a growing protection level. The answer can be made by trying to find reasons of a growing trend of domestic price together with an import restriction of foreign food. Traditional economic theory tells that a country with a comparative disadvantage in agriculture can be benefitted by allocating its resources to non-farm sector in which it has a comparative advantage, and trading them for foreign food. However, there is an argument against the above theory. That is, it is sometimes believed that resources employed in agriculture such as land and labor are hardly transferable to non-farm sector in Korea. This argument is based on the fact that farmland has actually no alternative use except farming, and farmers have a very limited job opportunity in both of rural and urban areas. Even if number of farm household has been declining since early 1960s, there are still about 1.9 million households in farm sector in 1986, who cannot generally compete with foreign food in domestic market, over about 9.6 million households in total. It is, therefore, argued that if imports of foreign food is made based on the comparative advantage theory, then there should be a guarantee that all farmers can be employed in nonfarm sector. The

argument continues such that a comparative advantage in agriculture can be improved through a development of farming technology including an introduction of new variety, more use of chemicals such as fertilizer and pesticide, improvement of production base such as an improved irrigation system and land consolidation program, etc. This argument adds that more public investment on agricultural research and development should be made to improve a farming efficiency, and that rural infrastructure should be improved to facilitate marketing and rural life.

Second, it is widely believed that a heavy dependence of food supply system on the import of foreign food is risky from the view of food security. This is based on the fact that world market is rather small in terms of trading volume over world production. For example, the volume of rice traded internationally has been less than 5 percent of world production since 1950s. This can be a good indication that world rice market may be sensitively affected by a small change in production of a rice-exporting country because of a relatively small volume of trade. It can also be severely affected by a sharp increase in import demand by a specific country. Therefore, there is no guarantee that an international price of rice will always be lower than domestic price. This situation actually happened in early 1970s when world grain price went up rapidly, even though it was unusual. For example, domestic price of rice per ton at wholesale stage in 1974 was US\$ 306, while border price was US \$426. Moreover, there may exist a possibility that the amount of rice needed may not be easily purchased at a proper time even at a higher price, because of an unreliability of world rice market. This situation can also be happened because no country can play the role of a supplier of last resort in the world rice market. Therefore, it is generally believed that rice economy(or food economy in a larger sense) should be self-supported because an instability of world market can be a source of instability of domestic market under a growing dependence of foreign rice(or food). That is, it is said that food is too strategic to be heavily dependent on the uncertainties of world production and international grain market.

Third factor responsible for a restriction on the import of foreign food is a shortage of foreign exchange holdings. As is well known, Korean economy has achieved a remarkable growth since 1962, based on an export-oriented development strategy. On the other hand, the economy has to experience a rapid increase in import of capital goods, raw materials and even food. More imports of foreign foods has been always necessary to export more, because of poor endowment of natural resources and low level of technology. Trade balance of the economy has always been in deficit for the period of 1962 to 85, ranging from US\$ 241 million in 1965 to US\$ 4,396 million in 1976. Of course, the accumulation of successive trade deficit has been responsible for an increasing trend of foreign debt over that period. Under the successive trade deficit and, therefore, increasing foreign debt, agricultural sector has

been asked to play a role of import substitution industry by producing more even at a higher price.

Another important factor responsible for an increasing trend of domestic price with an import restriction must be an income disparity between farm and nonfarm sector. Of course, absolute income level for both sectors has significantly increased since 1962. Farm household income increased from 67,885 in Korean Won(KW) in 1962 to KW 5,736,246 in 1985, showing about 84.5 times increase, while urban household income increased from KW96,600 to 6,046,428 over the same period. The comparison of nominal household income for both sectors apparently shows that income gap between two sectors has been narrowed since late 1960s, but that relative income position of farm household which can be represented by the ratio of farm household income over urban household income is still less than unity. In addition, there has been an argument that a direct and simple comparison of the income for both sectors has some difficulties because of a difference in sampling method. For example, small farms with farmland holdings less than 0.1 hectare, landless farmers and farm laborers, which are accounted about 4.0 percent of total farms, are excluded in the farm household economy survey. And the percentage of small farms with farmland holdings less than 1.0 hectare in the sample survey is smaller than the percentage noted in the Agricultural Census. Since farm income is positively related to the size of farmland, these facts lead to a result of overestimation of farm household income, and of course, may be responsible for farm household income exceeding urban household income for 1974–77. Aside from the sampling problem, Table 4 shows that per-person income in farm sector has been always smaller than that in urban household income. This supports the fact that income disparity problem is not solved yet. In other words, continuous price increase through price support program under a restrictive import system is not good enough to achieve an income parity between farm

TABLE 3. **Income Comparison for Farm and Nonfarm Household**

Unit:1,000KW

Year	Household			Per–Person		
	Farm(1)	Nonfarm(2)	(1)/(2)	Farm(3)	Nonfarm(4)	(3)/(4)
1965	112.2	112.6	0.997	17.8	20.3	0.877
67	149.5	248.6	0.601	24.4	45.5	0.536
70	255.8	318.2	0.671	43.2	71.4	0.605
73	674.5	644.5	1.046	119.2	123.7	0.964
75	872.9	859.3	1.016	155.0	166.9	0.929
80	2693.1	3205.2	0.840	527.0	706.0	0.746
85	5736.2	6046.4	0.949	1220.5	1439.6	0.848

Source: Report on the *Results of Farm Household Economy Survey*, MAF, Various Year
 Annual Report on the *Family Income & Expenditure Survey*, EPB, Various year
 Major Statistics of Korean Economy. EPB. 1986

TABLE 4. Explanation of Protection Level by Commodity by Variable¹⁾

	(A)	(B)	(C)	(D)	(E)
Rice	0.6986	0.4831	0.6649	0.5310	0.5326
Wheat	0.6920	0.3755	0.5861	0.5927	0.7483
Corn	0.5408	0.1954	0.4029	0.4362	0.4706
Soybean	0.7353	0.4555	0.6379	0.5731	0.8137
Beef	0.7986	0.6013	0.8057	0.3602	0.6913
Pork	0.4837	0.5342	0.5621	0.3453	0.6372

Note 1) the values in the table are R^2

$Y_i = a_0 + a_1 X_i$ is estimated for 1964–82

Where Y_i is Protection level of i th Commodity

X_i are (A), (B), (C), (D), and (E);

(A) is per capita GNP,

(B) is share of agriculture over GNP,

(C) is share of agricultural employment over total employment,

(D) is difference in per person income between farm and non-farm household, and

(E) is an accumulation of (D) from 1964

and nonfarm sectors. Therefore, relatively poor position of farm people, which can be represented by an accumulation of difference in per person income between farm and nonfarm households, can be responsible for a growing protection of domestic agriculture.

Based on this argument, a simple linear regression by regressing the *NPC* on several single variable is attempted in order to compare the degree of explanation power for growing protection by crop by variable. Generally, the growing protection for period of 1964 to 82 is explained well by per capita *GNP* or accumulation of difference in per person income between farm and nonfarm sectors. That is, the degree of explanation power is biggest in rice and corn when *NPC* is regressed on per capita *GNP*. On the other hand, the growing protection level is best explained by an accumulation of difference in per person income between two sectors in case of wheat, soybean and pork.

In addition, following equations are estimated to explain the growing protection level of beef for 1964–82;

$$(8) \quad NPC = a_0 + a_1 SSR + a_2 CDI$$

$$(9) \quad NPC = a_0 + a_1 SSR + a_2 CDI + a_3 CTD$$

where *SSR*, *CDI*, and *CTD* are self-sufficiency ratio of beef, accumulation of per person income difference between farm and nonfarm sectors from 1964, and accumulation of trade deficit of whole economy from 1964, respectively. Beef is chosen on the ground that beef consumption has been increasing very rapidly, and that beef production has been one of main source of agricultural income. The result of estimations is as follows;

$$(10) \quad NPC = 6.409 - 0.0473 SSR + 0.00265 CDI$$

$$(3.095) (-2.354) (2.393)$$

$$R^2 = 0.7707. \quad DW = 0.80$$

$$(11) \quad NPC = 5.702 - 0.0452 SSR - 0.105 CDI + 0.000392 DTD$$

$$(3.577) (-2.948) \quad (-2.748) \quad (3.526)$$

$$R^2 = 0.8747, \quad DW = 1.45$$

The sign of *SSR* is negative in all cases, implying that the lower the *SSR*, the higher the protection level. In other words, the protection level tends to go up in order to boost domestic production when the *SSR* is low. The *SSR* variable is statistically significant in both equations. The positive sign of *CDI* variable in equations (10) indicates that the protection level is strengthened when the relative position of farm sector over urban sector is worsened. The *CTD* variable has positive sign in equation (11), indicating that the protection level goes up with an increase in trade deficit. The inclusion of *CTD* variable does contribute to explain more of a growing protection level, but change the sign of *CDI* variable, compared to equation (10). Based on this result, it seems to be reasonable that the growing protection level can be largely explained by a decrease in self-sufficiency ratio and relative poor position of farm household over urban household which is represented by an accumulation of per-person income difference between two sectors in Korea.

IV. Summary and Conclusion

Korean agriculture has been intervened directly and indirectly by government, causing a distortion of price structure and resource use. The degree of intervention is commonly noted in the level of protection. The protection of domestic agriculture is not unique phenomena in Korea, but common in most of countries. The difference is the degree of protection level and the way of protecting domestic agriculture. Korean agriculture was not protected until 1960s, but its protection level began to rise rapidly from the beginning of 1970s. Several factors may be responsible for the rising protection. First, it is believed that heavy dependence on imports of foreign food is too risky from the view of food security. That is, it is commonly said that food is too strategic to be dependent on the changing situation of world production and international grain market. Therefore, it is believed that more production should be domestically made to secure a stable supply of food. Second, Korean economy has experienced a successive trade deficit ranging from US\$ 0.2 billion to US\$ 4.4 billion for the period 1962 to 85. The accumulation of successive trade deficit was responsible for the increasing trend of foreign debt, which was resulted in lowering the purchasing power of foreign agricultural products. Therefore, agricultural sector was asked to play a role of import substitution. Third, even though farm household income increased greatly due to an increased production and price support program, there still exists a problem of relative poverty in rural area, compared with the standard of living of urban household. The relatively poor position of farm people can be responsible for a growing protection of domestic agriculture.

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