The Impacts of Trade Liberalization on Agricultural Productions and Farmer's Share in Taiwan

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I. Introduction

The objective of this paper is to evaluate the impacts of lowering trade barriar for agricultural commodities on production as well as on farm household economy in Taiwan.

Differences in natural conditions and economic structure lead to great differences in cost of production of agricultural commodities from country to country. Normally such differences would lead to international trade that would allow world consumers to reap the gains possible from obtaining supplies from the low-cost producers. In agriculture, however, a complex web of intervention has developed for decades in many countries that make such gain impossible. Agriculture has been treated differently from other industries in the roles developed by the member nations of the General Agreement on Tariffs and Trade (GATT), and many of the trade practices common in agriculture have never had effective rules applied to agriculture.

Following a period of unusual growth in world demand and trade, the 1980s has witnessed a decline in exports, plummeting agricultural prices, widespread economic distress

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in farming and associated industries, and rising trade tensions as nations have sought to protect their farmers. However, because of the powerful political influence of agricultural groups in major trading nations, the fundamental reforms have never addressed directly in a GATT negotiation.

The problems of agriculture have engaged the attention of world leaders and have become a major issue in the Uruguay Round of multilateral trade negotiations under the GATT. Key proposals for negotiating agriculture issues have been tabled in the GATT. Recent studies have made in quantifying the gains from liberalization with the aid of simulation model (World Bank, 1986).

The simulations indicate that the volume of world trade in the group of commodities studied would rise, although cross-price effects would entail small reductions for a few individual commodities.

Most of the projections indicate that world prices would rise with two exceptions: U.S. liberalization which would reduce world prices slightly because ending acreage control would increase of grains and rice; and developing country liberalization of rice and some livestock products, which would reduce world prices by ending the taxation of domestic producers, as shown in Table 1.

Developing countries face higher import prices when industrial countries liberalize. As a result, they import less and export more. Because imports exceed exports, the simulated higher prices yield a net loss to comsumers and producers, as shown in Table 2. The projections show that the main beneficiaries of unilateral liberalization are the liberalizers themselves, and each imposes losses on the other.

If both groups liberalizes, neither would gain quite as much individually, but the world would be even better off.

It will be argued in this paper that, although the value of world trade would rise, world prices would rise and the world would better off, Taiwan is grouped into as developing countries, and she imports substantial coarse grains, beef and daily products, which are those items that prices are expecting to rise, while what Taiwan has exported, such as pork, poultry and rice, the prices would expect to decline. Therefore, the impacts of trade liberalization for agricultural commodities on agricultural production and the farmer's welfare need further to investigate.

This paper will be organized as follows. Section II briefly reviews the balance of agricultural trade and the degree of agricultural protection in Taiwan. Section III presents a model for evaluating the impacts of trade liberalization on Taiwan agricultural sector. Several hypothetical impacts are derived in this Section. After a short decription of coefficient values in Section IV, the quantifying impacts are presented. Some concluding remarks are provided in Section V.

II. Situation and Environment of Agricultural Trade in Taiwan

As Taiwan is an island with limited resources, its economic development depends heavily on foreign trade. In the agricultural sector, the value and the structure of agricultural trade directly and indirectly affects the growth of agricultural production, supply and demand of agricultural output and inputs, and hence the relative prices of agricultural products.

In fact, the ratio of the value of agricultural trade (including import and export) to the total value of agricultural production was 99.5 percent in 1953, and it slightly declined to 88.7 percent in 1988. These figures demonstrate that Taiwan's agriculture relies heavily on foreign trade.

In the early stages of Taiwan's economic development, agricultural products were a major foreign exchange earner, greatly improving Taiwan's balance of payments situation. Agricultural products and their processed products accounted for 91.6 percent of total exports while industrial export products contributed only 8.4 percent in 1953. Prior to 1965, the share of agricultural product exports in total exports exceeded 50 percent. By 1988, industrial exports accounted for 93.9 percent of total exports. Agricultural and their processed products accounted for only 6.1 percent of total exports due to the rapid expansion of the industrial sector, as shown in Table 3. However, the annual growth rate of agricultural export was about 10 percent and the components of agricultural exports changed significantly.

In the 1950s and 1960s, sugar, rice, bananas, tea, citronella oil and canned pineapple were major export products. In the 1970s, the major agricultural exports were processed products, such as sugar, canned mushrooms, and canned asparagus. By the 1980s, the major agricultural exports included frozen pork and marine products. The change in export structure revealed that the comparative advantage of agricultural products shifted from labor intensive crops to high-value capital intensive products. This is attributed to the change of supply and demand for domestic resources.

Agricultural imports did not change as much as exports.

Table 1. International price and trade effects of liberalization of selected commodity markets, 1985

Country or country group in which liberalization takes place	Wheat	Coarse grain	Rice	Beef and lamb	Pork and poultry	Diary products	Sugar
	Percentage change in international price level following liberalization						
EC	1	0	1	10	2	12	3
Japan	0	0	4	4	1	3	1
United States	1	−3	0	0	−1	5	1
OECD	2	1	5	16	2	27	5
Developing	7	3	−12	0	−4	36	3
All market economies	9	4	−8	16	−2	67	8
	Percentage change in world trade volume following liberalization						
EC	0	4	0	107	3	34	−5
Japan	0	3	30	57	−8	28	1
United States	0	14	−2	14	7	50	3
OECD	−1	19	32	195	18	95	2
Developing	7	12	75	68	260	330	60
All market economies	6	30	97	235	295	190	60

Note: Date are basd on the removal of the rates of protection in effect in 1980-82. Data for the EC exclude Greece, Portgal, and spain.

Source: World Bank, 1986.

Table 2. Efficiency gains caused by liberalization of selected commodities, by country group, 1985

Country group	Industrial-country liberalization	Developing-country liberalization	Industrial- and developing - country liberalization
Developing countries	−11.8	28.2	18.3
Industrial market economies	48.5	−10.2	45.9
East European nonmarket economies	−11.1	−13.1	−23.1
Worldwide	25.6	4.9	41.1

Note: Data are based on the removal of the rates of protection n effect in 1980-82.
Source: World Bank, 1986.

Table 3. Agricultural trade in Taiwan

Year	Export		Import				Surplus(t) (Deficit, –)
	Value	Agri./Total	Value	Agri./Total	Raw Mater./Agri.	Consum./Agri.	
	US$ mil.	%	US$ mil.	%	%	%	US$ mil.
1952	114.2	95.5	66.5	32.1	73.4	26.6	47.7
1960	120.7	71.0	75.8	30.1	81.4	12.6	44.9
1970	310.2	21.7	376.5	24.7	93.5	6.5	–66.3
1980	1,876.5	9.5	3,090.0	15.7	89.4	10.6	–1,213.5
1988	3,696.4	6.1	5,844.3	11.4	89.1	10.9	–2,148.0
Annual Growth Rate (%)							
1952-60	0.6	–	1.5	–	6.9	–2.9	
1960-70	9.7	–	14.9	–	15.7	7.6	
1970-80	19.7	–	23.4	–	23.1	29.9	
1980-88	9.8	–	6.6	–	5.5	6.2	
1952-88	10.4	–	13.0	–	13.6	10.3	

Source: Council of Agriculture, Agricultural Statistics in ROC. 1980.

Raw materials, such as raw cotton, feed grains, logs and lumber, hides and leather, are always the major imports, and accounted for 90 percent of agricultural imports. Only 10 percent of agricultural imports were consumption goods, such as fruit, juice and beef. In other words, agricultural imports are a derived demand associated with the development of the textile, shoe, lumber and livestock industry.

The aggregate relationship between agricultural imports and domestic industrial development is complementary rather than competitive. However, the importation of consumption goods exceeded that of raw materials after 1970, which competed with Taiwan's already saturated domestic market. In other words, Taiwan is not short of final products but it does need raw material imports. In general, agricultural imports accounted for 32.1 percent of total imports in 1952 and dropped to 14.1 percent in 1988. The annual growth of agricultural imports, was 13.0 percent, which was greater than agricultural exports, as shown in Table 3. This has turned Taiwan's agricultural trade from a surplus to a deficit situation since 1970.

As in many other developed countries, agricultural price and income policies play an important role after reaching the turning point of economic development in Taiwan. The objectives of price and income policies are to stabilize price and support farm income at reasonable levels and to reduce production costs and the financial burdens associated with subsidies. The major instruments are price support programs for rice, sugar, price stabilization programs for wheat, vegetables and direct payment for sorghum & corn.

As to border measures, before the mid-1960s, a serious deficit existed in the balance of payment situation in Taiwan.

Agricultural policy was protectionist and it emphasized increasing domestic production through tariffs and import controls. Imports of several major products were prohibited and the tariff rates were over 100 percent. Since the government reformed the foreign exchange system in the late 1950s, and gradually relaxed control over foreign trade in the 1960s, foreign trade increased rapidly and envolved as the leading force in Taiwan's economic development.

Taiwan has reduced many barriers, including tariff and nontariff restriction, especially since the Sino-American bilateral trade negotiation started in 1978. Recently, the government has put great effort into further liberlizing imports in order to enhance a sizeable trade surplus. Tariff rates on hundreds of farm products have been lowered. The weighted average tariff on farm products decreased from 28 percent in 1978 to 8 percent in 1988 (Wang, 1988; Peng, 1988). Nontariff barriers are not used extensively in Taiwan, therefore, the policy of lowering on farm products brought a sizeable influx of foreign final products into Taiwan's already saturated markets. At the present time in Taiwan, politicians, farmer's groups, and consumer's groups agree that protection of the food supply, in the short-run, is justified considering national security. However, some border measures are only for important products so as to secure their stable domestic supply, though restricitive trade measures has been minimized.

In general, Taiwan's price and income policies and border measures can be summarized as follows:

(1) In Taiwan, each product or product group has its own specific price regime, reflecting the nature of the product and

its historical background. However, only the rice support and the rice field conversion program are financially supported by the government. The price scheme for fruits, vegetables, and livestock products are financially self-sufficient. These schemes, mainly operated by farmer's associations and cooperatives, have very weak financial membership. Because the free-rider problem of collective action is uncontrollable, the bargaining power of these organizations appears weak and the price schemes are ineffective.

(2) The level of agricultural subsidization in Taiwan is much lower than in other developed countries. Taiwan's agricultural budget in recent years accounts for 2-3 percent of total government expenditure. The budget allocates funds for the improvement of infrastructure and disaster restorations, agricultural research and extension, and the price supports for rice and paddy field conversion programs. The producer's subsidy equivalent (PSE) of Taiwanese major land-base crops, from 1982 to 1986, were 30 percent to 70 percent. The average PSE in Taiwan was 19.2 percent, much lower than Japan's 71.1 percent, Korea's 59.5 percent, EEC's 35.4 percent, Canada's 31.0 percent, New Zealand's 25.4 percent and USA's 24.6 percent (USDA, 1988), as shown in Table 4.

(3) The social cost of government policy in Taiwan is much less than that in other developed countries. Accordingly, the policy cost, in terms of the dollars of government and consumer's payments required to increase producer's surplus by $1, are lower in Taiwan than those of developed countries. The policy cost for rice in Taiwan was 1.29 in 1986 (Peng, 1988) which was lower than that of Japan's 2.58

Table 4. Producer's subsidy equivalent, 1982-86

Country	PSE
Pakistan	−19.8
India	−17.8
Thailand	1.3
Brazil	9.2
Australia	11.1
Indonesia	14.4
Taiwan	19.2
Argentina	22.1
US	24.6
New Zealand	25.4
South Africa	28.6
Canada	31.0
EC-10	35.4
South Korea	59.5
Japan	71.7

Source: USDA, Agriculture in the Uruguay Round, 1988

in 1976, EEC's 1.50 in 1980 and USA's 1.38 in 1985 (World Bank, 1986). The government and consumer shares for the cost increase in producer's surplus are 56 percent and 44 percent, respectively.

III. The Model

Consider a competitive open agricultural sector using two inputs of production, purchased agricultural factor (a) and marketing inputs (b) to produce food sold at retail (X). The aggregate food industry's production function is

(1) $X^s = f(a, b)$

It is assumed to yeild constant returns to scale. The retail food demand function is

(2) $X^d = D(Px, N)$

Where Px is the retail price of food and N is an arbitray exogenous demand shiftor which for purposes of specificity will be called income.

For input markets, on demand side, food industry's firms are assumed to want buy the profit-maximizing quantities of b and a, which implies that value of marginal product equals price for both

(3) $P_a = P_x \cdot f_a$

and

(4) $P_b = P_x \cdot f_b$

where f_a and f_b are the partial derivates of X with respect to a and b.

The input supply equations are

(5) $P_a = h(a, W)$

the supply function of a to the agricultural sector, and

(6) $P_b = g(b,t)$

the supply function of marketing factors. The exogenous shiftors of agricultural input and marketing input are represented by W and t. For purposes of specificity, t may be thought of as a specific tax on marketing inputs, for which higher values increase P_b, and W as weather variables for which higher values increase P_a (e.g. an index of Typhon).

The model is completed by equations representing the agricultural trade and quantity identity. Agricultural net import for a small trade economy is

(7) $M = m(P_x, T)$

where Px is domestic retail price and T is trade protection. For purposes of specificity, T is thought of as effective protection rate imposing on producing commodity X which higher values decrease M. The total quantity of domestic demand equals the sum of domestic productions and net import quantities,

(8) $X^d = X^s + M$

This system contains eight equations in eight endogenous variables (X^d, X^s, P_a, P_b, P_x, a,b,M). Under normal conditions (where demand function has negative and the supply functions have nonnegative slopes), there will be a unique equilibrium for given values of the exogenous variables. At this equilibrium, the values of the eight endogenous variables are determined. The impacts of a lower effective protection rate on the change of agricultural production, farm price, farmer's share can be measured through this model.

(I) Effect of Lowering Effective Protection on the Food Production

The effects of lowering effective protection on agricultural commodities import on market equilibrium are analyzed by differentiating equations (1) to (8) with respect to T, while W, t, N are held constant. The eight equations can be immediately reduced to 5 equatins by equating (3) and (5) to eliminate P_a, (4) and (6) to eliminate P_b, and by substituting (7) into (8) to eliminate M. Therefore, the new equations for (1) and (2) after total differentiation with respect to T are

(9) $dx^S = F_a da + f_b db$

(10) $dx^d = D_{px} dPx + D_N dN$

The market for a, equations (3) and (5), the new equation is

(11) $(P_x f_{aa} - h_a)\, da + P_x f_{ab}\, db + f_a dPx = h_w DW$

Next, analyze the b market by conbiming equations (4) and

(6) and differentiating:

(12) $P_x f_a b da + (P_x f_a b - g_h)\, db + f_b dP_x = g_t dt$

Finally, substituting equation (7) into equation (8) and differentiating. The result is the five equation system:

(14) $Ex^S - S_a E_a - S_b E_b = 0$

(15) $Ex^d - \eta\, Epx = \eta_N\ EN$

(16) $-(1/e_a + S_b/\sigma)\, E_a + S_b/\sigma\ E_b + E_{px} = 1/e_{aw}\ E\omega$

(17) $S_a/\sigma\ E_a - (S_a/\sigma + 1/e_b)\, E_b + E_{px} = 1/e_{bt} E_t$

and

(18) $-k_s E_x^s + E_x^d - k_M\ \eta_N\ E_{px} = k_M\ \eta_T\ E_T$

Where S_a and S_b are the relative shares of a and b, e.g. $Sa = aP_a/xP_x$; σ is the elasticity of substitution between a and b; η is the price elasticity of demand for X; e_a and e_b are the own price elasticities of supply of a and b; η_N " is the elasticity of demand for X with respect to N; k_s is the ratio of between the quantity of domestic supply to the quantity of demand, i.e, η_T/X^d, or called as self-sufficiency rate; k_M is the ratio between net improt to the quantity of demand, i.e. $k_M = M/X^d$; η_T is the elasticity of import with respect to T; e_{aw} is the elasticity of supply for a with repsect to W; e_{bt} is the elasticity of supply for b with respect to t; and η_M is the elasticity of import demand for X. E_a, E_b, E_{px}., E_x^d,

E_{x^s}, E_N, E_ω, E_t, E_T are the percentage change of a, b, P_x, X^d, X^S, N, W, t, and T, respectively.

The question to the investigated is how food supply, X^S, changes when effective protection rate, T, is lowered. The answer can be expressed as the elasticity of X^S with respect to T, $E_{X^S, T}$ The result is

$$(19)\quad Ex^S, _T = \frac{k_M \eta_T \{ e_a e_b + \sigma (e_a S_a + e_b S_b) \}}{D}$$

where D is a function of σ , η , η_M , k_M, k_s, S_a, S_b, e_a and e_b.(1) The D is ugly but is negative in all normal cases ($\eta < 0$, e_a and $e_b \geqq 0$, and $\eta_M > 0$). Therefore, the sign of equation (19) is normally determined by the numerator.

Equation (19) will be helpful in understanding how the change of T on commodity X affect food supply at the retail level, there may be an aggregation problem with the quantity of retail food, X, depending on the context in which the model is applied. If X is taken to be an aggregate of all food, it must be assumed that the relative prices of the various food products are held constant. Thus, the T is weighted effective protection rate for all forms of food. On the other hand, if the context in which the model is applied is a relatively narrowly defined product, say, rice, the aggregation problems for both X and b may be less serious.

Without surprising, under normal case ($\eta_T < 0$), domestic food production is expected to increase when effective protection increase. k_s, self-sufficiency ratio plays an accelerating role in that the large k_s, the greater a given

(1). $D = (e_b S_a + e_a S_b + \sigma)(\eta - k_M \eta_M) - k_s \{ e_a e_b + \sigma (e_a S_a + e_b S_b) \}$

in changes T will change X^s since k_s appears only in the dominator.

(II) Effect of a Effective Protection Change on Food Demand

Solving the system for elasticity of X^d with respect to T can investigate how a T change affecting food demand in the economy. That is

$$(20)\quad Ex^d,_T = \frac{k_M\ \eta_T\ \eta\ \{\sigma + e_b\ S_a + e_a\ S_b\}}{D}$$

Equation (20) differs from equation (19) in that for all normal cases, $E_X{}^d,_T$ is negative. Thus, a percentage increase in T will cause leftward shift in demand. Equation (20) helps in understanding the role of η_T, the elasticity of demand for X with respect of T. Since η_T appears only in the numerator and with a negative sign, the smaller η_T is the less voliatile the X^d.

(III) Effect of Effective Protection Change on Input Market

The question of how are input supplies affected by a change of effective protection can be investigated by solving the system for elasticities of a and b with respect to T. They are

$$(21)\quad E_{a,T} = \frac{k_M\ \eta_T\ \{\ e_a e_b + e_a\ \sigma\ \}}{D}$$

for the agricultural commodities (a) supply and the marketing services (b) supply is

$$(22) \quad E_{b,T} = \frac{k_M \ \eta_T \ \{ e_a e_b + e_b \ \sigma \}}{D}$$

The signs of both $E_{a,T}$ and $E_{b,T}$ are positive. The higher protection rate imposing on commodity X, the larger domestic supply for both agricultural products and marketing services. Therefore, equation (21) has the same form as equation (22) except $e_a \ \sigma$ and $e_b \ \sigma$. Therefore, given values of k_M, η_T and σ, the relative value between $E_{a,T}$ and $E_{b,T}$ depends on the relative value between e_a and e_b. Normally, $e_a \geqq e_b$, and the $E_{a,T}$ is smaller than or equal to $E_{b,T}$, which causes a substantial impact on farmers share inducing from a change of import tariff effective protection rate.

(IV) Effect of Effective Protection Change on the Retail-Farm Price Ratio

The answer for how P_x/P_a change when effective protection, T, change can be expresed as the elasticity of P_x/P_a with respect to T. This elasticity is equal to the difference between $E_{p_x,T}$ and $E_{p_a,T}$ [2], both of which can be obtained from the system. The result is

$$(23) \ E_{p_x/p_a,T} = \frac{k_M \ \eta_T \ S_b \ \{ e_a - e_b \}}{D}$$

Equation (23) will be helpful on understanding how effective

(2) $E_{p_x,T} = \frac{k_M \eta_T \{\sigma + e_b S_a e_b + e_a S_b e_b\}}{D}$ and $E_{p_a,T} = \frac{k_M \eta_T \{e_b + \sigma\}}{D}$

protection change on food importation affects agricultural product prices relative to all marketing inputs as a group. What is the probable sign of equation (23)? For a case the paddy rice as the farm products and polished rice as the retail product, since paddy rice is a specific factor to the X industry, while the components of b (labor, transportation, processing, etc.) generally are not, and since a is land intensive, it seems likely that $e_a < e_b$. In this case, when the effective protection rate on X changes to lower, P_x/P_a increases. Therefore, the retail-farm price ratio is expected to enlarge when effective protection rate lowers.

An interesting special case arise when $e_a = e_b$. In this case P_x/P_a is unchanged when the effective protection changes. However, in general, $e_a \neq e_b$, and a fixed percentage markup will not be viable in this sense.

Another extreme case would be (external) economies of scale in marketing activities, which owuld make $e_b < 0$ and could even reverse the sign of equation (23). In such a case, a lower of effective protection rate on commodity X could reduce P_a/P_b.

Equation (23) also helps in understanding the role of σ, the elasticity of substitution between a and b in the food supply industry. Suppose T increases, and $e_a < e_b$. Then the price of raw farm product relative to marketing inputs increases, creating an incentive to substitute the latter for the former. However, in many marketing contexts the opportunities for substitution appear limited. This would be reflected in equation (23) by a value of σ. Since σ appears only in the denominator and with a positive sign, the smaller σ is the more volatile the retail-farm price ratio.

As long as the two elasticities of supply are different ($e_a \neq e_b$), their relative prices must change. However, how much P_a/P_b will change depends on the degree to which a b can be substituted in the marketing process. The greater σ is, the less P_a/P_b will change when P_X is changing. In the extreme case when $\sigma \to \infty$, $E_{px/pa,\,T}$ approaches zero and P_X/P_a is constant.

(V) The impacts of Trade Liberalization on Farmer's Share of the Food Dollar

To answer the impact of trade liberalization on the farmer's share of the food dollar, can be analyzed by the elasticity of share ($aP_a/XP_x = S_a$) with respect to T. It turns out that

$$(24)\quad E_{s_a,\,T} = \frac{k_M\,\eta_T\,(\sigma-1)(e_a-e_b)}{D}$$

Since $D < 0$, the numerator determines the sign of equation (24). There are three interesting case. (a) If either $e_a = e_b$ or $\sigma = 1$ (the Cobb-Douglas case), then S_a is constant. The change in effective protection rate imposing on X will have no effect the farmer's share. (b) If $e_b > e_a$, and $\sigma < 1$ or if $e_b < e_a$, and $\sigma > 1$, then S_a increase with T. An increase in effective protection will increase the farmer's share. (c) If $e_b > e_a$ and $\sigma < 1$, or if $e_b < e_a$, and $\sigma < 1$, then an increase in effective protection will decrease farmer's share.

As mentioned before, for any particular food commodity

or for an aggregate of such commodities seems most likely that $e_b > e_a$ and $\sigma < 1$. These are case (b) conditions, suggesting that the farmer's share should increase in higher trade barrier under taking into account equilibrating adjustments in all markets simultaneously. Equation(24) and the negative of equation (23) are the same if only if $\sigma = 0$.

IV. Numerical Results

To examine the impacts of lowering effective protection rate on the economy of crop and livestock sectors, they can be evaluated at hypothetical and empirical parameter values, and fits into the equations derived in the previous section. First, we let $S_a = S_b = 0.5$, $\eta_M = 1$, $\eta_T = -1$, $e_b = 1$, $\sigma = 0.5$. The demand elasticities, $\eta = -0.2$ for crop, and $\eta = -0.4$ for livestock, $e_a = 0.98$ for crops and $e_a = 0.53$ for livestock (Peng and Lin, 1990). Self-sufficient rate, Ks, for crops is about 88 percent, due to heavily relied on importation for coarse grains and soybean to develop livestock sector. In terms of final products, ks for livestock sector is 110 percent which means that 10 percent of livestock products are exported. The resulting values of X^s, X^d, a, b, P_X/P_a and S_a from equations (19) to (24) are shown in Table 5.

The figures shown in the first line of Table 5 $E^d_{x,T}$ is 0.10, for instance, means that 10% increase in effective protection rate increases production of crop by approximately 1.0%. In general, a raising of effective protection rate for crops causes increasing in crop production, raw crop supply,

Table 5. Elasticities of supply, demand and prices with respect to shift in effective protection rate

Parameter values							Elasticities					
σ	S_a	η_M	η	e_b	e_a	η	E_x^s, T	E_x^d, T	E_a, T	E_b, T	$E_{px/pa}, T$	E_{sa}, T
						crops*						
0.5	0.5	1	−1	1	0.98	−0.2	0.10	−0.02	0.10	0.10	−0.00	0.00
0.5	0.5	1	−1	1.5	0.98	−0.2	0.11	−0.02	0.10	0.11	−0.01	0.01
0.5	0.5	1	−1	2	0.98	−0.2	0.11	−0.02	0.10	0.12	−0.02	0.01
0	0.5	1	−1	1	0.98	−0.2	0.10	−0.02	0.10	0.11	−0.00	0.00
0	0.5	1	−1	1.5	0.98	−0.2	0.10	−0.02	0.10	0.10	−0.02	0.02
0	0.5	1	−1	2	0.98	−0.2	0.11	−0.02	0.11	0.11	−0.03	0.03
						Livestock**						
0.5	0.5	1	−1	1	0.53	−0.4	−0.07	0.04	−0.06	−0.07	0.02	−0.01
0.5	0.5	1	−1	1.5	0.53	−0.4	−0.07	0.03	−0.06	−0.08	0.03	−0.01
0.5	0.5	1	−1	2	0.53	−0.4	−0.07	0.03	−0.06	−0.09	0.03	−0.02
0	0.5	1	−1	1	0.53	−0.4	−0.07	0.04	−0.07	−0.07	0.03	−0.03
0	0.5	1	−1	1.5	0.53	−0.4	−0.07	0.03	−0.07	−0.07	0.03	−0.04
0	0.5	1	−1	2	0.53	−0.4	−0.07	0.03	−0.07	−0.07	0.05	−0.05

* The self-sufficient rate is 88% in 1988.

** The self-sufficient rate is 110% in 1988.

marketing services supply and farmer's share, causes decreasing in demand for crops and falling in P_x/P_a. The value of elasticities, however, are small, implying that the impacts of trade liberalization on crop production and it's farm household economy are small.

As far as livestock sector is concerned, the sign of elasticities reverse from those of crop sector, as shown in Table 5. To lower effective protection rate for livestock products causes increasing in domestic meat production, animal supply, marketing services supply and farmer's share, decreasing in meat demand and widening price spread. The results should not be surprising. The livestock products are exportable use imported inputs which are subject to an import tariff in Taiwan, effectives protection rate is negative(3) (Peng, 1988). This simply indicates that value added for livestock product would be higher under free trade, individual farms may not be aware of the alternative. Therefore, the trade liberalization for agricultural products should not simply concentrate at final goods, but to the entire protective structure. Otherwise, the import substitution policy is paid for, at least in part, by the export sector, namely livestock farmers.

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(3) The products which emerge negative effective protection rate in Taiwan including paddy rice, polished rice, sugar cans, miscelleanous livestock and slaughtered meats in 1988.

V. Concluding Remarks

Agricultural development in countries with small farms without much cultivable land left for exploitation, face much more difficult adjustment problems than countries with large farms, when their economy goes through periods of rapid industrialization and urbanization.

A lag in the process of farm mechanization exists on small farms, particularly in dryland crops. The one hectare farms are individually too small to economically absorb investments in machines. The labor productivity in the 1970s increased significantly in Taiwan. However, labor productivity was still far behind the increasing wage rate. In terms of a revealed comparative advantage index, Taiwan's agricultural products had a small compararative advantage than either developing counties or developed countries as a whole (Anderson, 1983). With changes income, income distribution, relative prices, urbanization, and the opportunity cost of women's time, food consumption patterns have changed significantly during last two decades in Taiwan. Therefore, as per capital income growth in countries with small farms and without additional cultivable land, the economy has increased its dependence on food imports.

During the rapid, multi-phased structural adjustment, agricultural development and resource utilization in countries with small farms are extremely vulnerable. Most of developed countries adopted a high protection policy to ensure their consumers and taxpayers protected farms. The increasing

trade surplus, particularly with the United State, Taiwan reduced many trade barriers, including tariffs and nontariff restrictions. Agricultural production faces two pressures, to compete for resources with the domestic industrial sector, and to compete with foreign agricultural imports, especially for the crop sector. In order to strenghten agricultural competitiveness in international markets and compensate economic loss due to trade liberalization, the government in Taiwan designs a new program titled as "Comprehensive Agricultural Adjustment Program", starts to implement in 1991. The program emphasizes providing support to farmers in way that do not distort production, consumption or trade so as to contribute her ability achieving the liberalization of trade, thereby promorting a strong world economy.

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農產貿易自由化對台灣農業生產與農民分得比例的影響

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摘要

降低農產貿易障礙爲ＧＡＴＴ烏拉圭回合談判的主題。雖然貿易自由化可提高全球的經濟福祉，但依世界銀行的估計，對開發中卻有不利影響。本研究利用八條聯立方程式，包括農產品產地市場、運銷勞務市場及零售市場，探討降低農產品有效關稅保護率對作物部門及畜牧部門的影響。結果發現，降低有效關稅保護率對作物部門有不利的影響，但畜牧部門因有效關稅保護率爲負值，故全面關稅稅率的降低反能增加畜牧生產及農民的分得比例。

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