E c o n o m i c s B u l l e t i n

Was agricultural protection reduced after the Uruguay Round?: Evidence from East Asia

Kuo I Chang
The University of Tokyo

Kazunobu Hayakawa
Keio University

Abstract

The purpose of this paper is to empirically investigate how agricultural protection has been reduced before/after the implementation of the Uruguay Round Agreement on 1995 in East Asian countries. Our empirical results show that the reduction on agricultural protection in the second half of the 1990s is not outstanding, compared with that in the first half of the 1990s. This result implies that the UR Agreement does not substantially succeed in reducing the protection for agricultural trade in East Asia.

Citation: Chang, Kuo I and Kazunobu Hayakawa, (2007) "Was agricultural protection reduced after the Uruguay Round?: Evidence from East Asia." *Economics Bulletin*, Vol. 14, No. 1 pp. 1-8
Submitted: January 14, 2007. **Accepted:** August 13, 2007.
URL: http://economicsbulletin.vanderbilt.edu/2007/volume14/EB-07N50001A.pdf

1. Introduction

Uruguay Round (UR) in 1995 was very successful in constituting the Agreement on Agriculture (AOA) and in promoting agricultural trade liberalization into force with the establishment of the World Trade Organization (WTO). The AOA incorporated new rules and commitments in three areas: market access (tariffication), domestic support, and export subsidies toward implementation of trade liberalization in agriculture. These commitments have been implemented over a 6 year period (10 years for developing countries). In the case of tariffication (i.e., tariff reduction) of the UR AOA, 36% (24%) average reduction by developed countries (developing countries), with a minimum per tariff line reduction of 15% (10%) was required.

The purpose of this paper is to empirically investigate how agricultural protection has been reduced before/after the implementation of the Uruguay Round Agreement on 1995 in East Asian countries. Honma *et al.* (2000) point out that the volume of agricultural trade has not substantially increased in East Asian countries after the implementation of the UR Agreement. Although the tariffication was introduced to improve market access, tariff equivalents remain prohibitively high for many commodities, limiting imports in a similar way to the previous import quotas. OECD (2001) reports that the agricultural tariffs remain very high in most OECD countries, with average agricultural tariffs higher than those for non-agricultural products and with tariff rates on some agricultural products exceeding 500 percent. In the following, we examine if the UR AOA has not accelerated the pace of reduction on agricultural protection in East Asian countries.

The rest of this paper is organized as follows. In section 2, we explain our empirical methodology and data sources. Section 3 presents our empirical results. In section 4, we conclude.

2. Empirical Methodology

This paper measures the level of agricultural protection by employing a log odds ratio method as in Head and Mayer (2000) and Hayakawa (2007). The method enables us to resolve the problem that data of agricultural price indices are unavailable.

Supposing finished goods distinguished by country of origin and a CES type utility function, utility maximization by the representative consumer gives the following expression for the demand in country *i* for the good produced in country *j*, $c_{i,j}$:

$$c_{i,j} = t_{i,j}^{1-\sigma} p_j^{-\sigma} P_i^{\sigma-1} E_i ,$$

where t, σ, p, P, and E denote trade costs formulated by iceberg, the elasticity of substitution between goods, the producer price, the price index, and the total expenditure, respectively. From this equation, we obtain a ratio of inter-national import values to intra-national import values $X_{i,j}$, as follows:

$$X_{i,j} \equiv p_j c_{i,j} \big/ p_i c_{i,i} = \left(t_{i,j} / t_{i,i}\right)^{1-\sigma} \left(p_j / p_i\right)^{1-\sigma} .$$

This formulation relates the decisions of the consumers in country *i* on how to allocate expenditure between finished goods produced in country *j* and the goods produced domestically.

The producer price is assumed to be a function of wage rates (*wage*) and technology (*tech*).

That is, the relative producer prices are specified as:

$$\ln(p_j/p_i) \equiv \eta_0 + \eta_1(\ln wage_j - \ln wage_i) + \eta_2(\ln tech_j - \ln tech_i).$$

In the empirical part, GDP per capita is used as a proxy for wage rates. Agricultural land per farm worker is used as a proxy for technology and is measured by agricultural land area, which is the sum of arable land area and the land area under permanent crops, meadows, and pastures, divided by the number of male farm workers.

We assume that trade costs consist of policy protection against foreign goods, transportation costs incurred by geographical distance, and the costs due to differences in preferences. In the empirical part, the policy protection is quantified by examining a coefficient for an importer dummy variable. The differences in preferences are partly controlled by a cultural dummy variable *language*, which is a binary variable taking unity if countries *i* and *j* share a common official language and zero otherwise. We also introduce a contingency dummy variable, which is a binary variable taking unity if the two countries share a common land border and zero otherwise.

Consequently, the equation to be estimated is given by:

$$\ln X_{i,j} = \beta_0 + \gamma'\mu + \beta_1(\ln wage_j - \ln wage_i) + \beta_2(\ln tech_j - \ln tech_i) + \beta_3(\ln d_{i,j} - \ln d_{i,i})$$

$$+ \beta_4 language_{i,j} + \beta_5 contingency_{i,j} + \varepsilon_{i,j}. \quad (1)$$

$d_{i,j}$ is geographical distance between country *i* and *j* and is measured by greater circle between their respective capital cities. $d_{i,i}$ is intra-national distance and is calculated as a radius of surface area in country *i*. μ and $\varepsilon_{i,j}$ are a vector of importer dummy variables and a normally distributed random error, respectively. The coefficients for the importer dummy variables are called "home bias" in Wei (1996), and a natural logarithm of protection in each country is represented by the respective dummy coefficient divided by 1-σ.

Data sources are as follows: the data on inter-national agricultural import values and intra-national consumption values are obtained from Asian International Input-Output Table published by the Institute of Developing Economics (IDE). We use the aggregated final private consumption values in agricultural, livestock, forestry, and fishery of finished goods to avoid zero import values. We have a total of nine East Asian countries (China, Indonesia, Japan, Malaysia, Republic of Korea, the Philippines, Singapore, Taiwan, and Thailand) and the U.S. in the year 1990, 1995, and 2000. Data on GDP per capita are obtained from World Development Indicator. The source of geographical distance and of the language and contingency variables is CEPII database. Data on agricultural land area and the number of male farm workers are obtained from FAOSTAT. To avoid the dummy trap in importer dummy variables, we select Singapore because of its little agricultural trade protection. Assuming that Singapore-specific protection is zero and that the Armington elasticity of substitution is constant during the period, we investigate the changes in country-specific protection in each country by examining the changes in coefficients for importer dummy variables.

3. Empirical Results

This section measures the protection to agricultural trade in East Asia by estimating the equation derived in section 2. The basic statistics are reported in Table 1. Table 2 reports the results in the estimation of equation (1) by the ordinary least squares (OLS) method.

Let us take a look at the result in relative wage and relative technology in Table 2. Coefficients for most of the variables have the expected signs and are statistically significant. Relative distance, language dummy, and contingency dummy variables have the expected signs but are not significant. The higher the relative technology of an exporter is, or the lower its relative factor price is, the more the relative imports are.

The results of policy protection are as follows: the insignificance in constant terms may indicate that policy protection in Singapore has been zero. Estimated coefficients for importer dummy variables are negatively significant. The columns between 1990 and 1995 and between 1995 and 2000 report the result of the Wald test with the null hypothesis that each coefficient is identical between the two years. The results of the Wald test indicate that there is not much statistical difference in coefficients for importer dummy variables especially between 1995 and 2000. That is, the UR AOA does not play a critical role in agricultural trade liberalization.

We can express the protection in each country in the *ad valorem* tariff equivalent, which is calculated by the coefficient for each importer dummy variable divided by 1-σ, i.e., (exp(dummy coef./(1-σ))-1). To this end, the value of the elasticity of substitution would be required. We choose 4 for σ according to Hertel *et al*. (2003) though choice of the value has little influence on changes in the protection as long as assuming that the elasticity is constant during the period.

The tariff equivalents are shown in Table 3. In the year 1990, China (3951%) dominated the highest protection, and Malaysia (92%) did the lowest protection. In the first half of the 1990s, developing countries remarkably reduced their protection. The tariff equivalent particularly in China declined drastically from 3951% to 489%. On the other hand, in the second half of the 1990s, after the UR AOA, the pace of its reduction is not accelerated in almost all countries. Particularly in the Philippines and Thailand, the tariff equivalent declined only slightly, compared with that in the first half of the 1990s.

4. Concluding Remarks

This paper quantifies the level of agricultural protection in East Asian countries before/after the UR AOA. Our empirical results show that the reduction on agricultural protection in the second half of the 1990s is not outstanding, compared with that in the first half of the 1990s. This result implies that the UR AOA does not substantially succeed in reducing the protection for agricultural trade in East Asia.

Table 1. Basic statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
relative imports	258	-7.04	2.82	-16.83	0.29
relative distance	258	8.20	0.88	5.76	9.70
relative wage	258	0	2.19	-3.96	3.96
relative technology	258	0	2.28	-5.92	5.92
language	258	0.19	0.39	0	1
contingency	258	0.07	0.26	0	1

Table 2. Regression results

	1990		1995		2000
relative distance	-0.44		-0.24		-0.25
	(0.39)		(0.32)		(0.33)
relative wage	0.08		-0.22**		-0.47***
	(0.12)		(0.10)		(0.10)
relative technology	0.68***		0.75***		0.96***
	(0.16)		(0.14)		(0.14)
language	-0.42		-0.23		0.27
	(0.50)		(0.41)		(0.41)
contingency	0.59		0.02		0.48
	(0.97)		(0.80)		(0.81)
Indonesia	-5.28***		-4.17***		-2.90***
	(1.02)		(0.83)		(0.84)
Malaysia	-1.96*		-1.41*		-0.33
	(1.02)		(0.84)		(0.85)
Philippines	-6.02***	**	-4.25***	*	-2.99***
	(0.91)		(0.74)		(0.75)
Thailand	-5.14***	**	-3.54***		-3.43***
	(0.95)		(0.78)		(0.77)
China	-11.10***	***	-5.32***		-4.34***
	(0.98)		(0.81)		(0.82)
Taiwan	-4.63***	*	-3.61***	**	-4.94***
	(0.80)		(0.65)		(0.66)
Korea	-4.37***		-4.37***		-3.35***
	(0.86)		(0.70)		(0.71)
Japan	-2.97***		-2.55***		-2.13***
	(0.88)		(0.72)		(0.72)
US	1.01		0.30		1.24
	(1.74)		(1.42)		(1.44)
constant	0.13		-1.97		-2.71
	(2.96)		(2.44)		(2.47)
Obs.	86		86		86
R-sq	0.7797		0.7252		0.7628

Notes: ***, ** and * shows 1%, 5% and 10% significant, respectively. In parentheses is a White consistent standard error. The columns between 1990 and 1995 and between 1995 and 2000 report the result of the Wald test with the null hypothesis that each coefficient is identical between the two years.

Table 3. The tariff equivalent of agricultural protection

	1990	1995	2000
Indonesia	482%	302%	163%
Malaysia	92%	60%	12%
Philippines	643%	312%	171%
Thailand	455%	225%	213%
China	3951%	489%	325%
Taiwan	369%	234%	420%
Korea	329%	330%	206%
Japan	169%	134%	103%

Notes: The *ad valorem* tariff equivalent is calculated by (exp(dummy coef./ (1-σ))-1). We choose 4 for σ.

References

Hayakawa, K. (2007) “Measuring Barriers to International Division of Labor in East Asia” forthcoming in *Asian Economic Journal*.

Head, K. and T. Mayer (2000) “Non-Europe: The Magnitude and Causes of Market Fragmentation in Europe” *Weltwirschaftliches Archiv* 136, 285-314.

Honma, M., Trewin R., Huang Y., Bosworth M., Holmes L., Stringer R., and Y. Godo (2000) “Some Key Issues for the East Asian Food Sector” Pacific Economic Paper 305, Australia-Japan Research Center.

OECD (2001) *The Uruguay Round Agreement on Agriculture: An Evaluation of its Implementation in OECD Countries*, Paris.

Hertel, T., Hummels, D., Ivanic, M., and K. Roman (2003) “How Confident Can We Be in CGE-Based Assessments of Free Trade Agreements?” GTAP working paper 26.

Wei, S-J. (1996) “Intra-National Versus International Trade: How Stubborn Are Nations in Global Integration?” NBER working paper 5531.