Effects of the WTO and Free Trade Agreements on Japonica Rice Markets

Hyunok Lee and Daniel A. Sumner

Department of Agricultural and Resource Economics
University of California, Davis
Davis, CA 95616

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Three trade policy changes underway and on the horizon have the prospect to alter global markets for japonica rice. This paper considers likely global market effects of expansion of access into the market in Japan and Korea, and reduced subsidy for japonica rice (among other crops) in the United States. We consider these policy changes in the context of a proposed Doha Development Agenda WTO agreement and one potential outcome of the proposed Free Trade Agreement between Korea and the United States (KUS-FTA). We use an equilibrium displacement model to ask how market prices, quantities and other aggregates change as a result of policy changes. The global model includes six aggregates in the world market, China, Korea, Japan, the United States, other exporters and other importers. Under the WTO scenario that U.S. subsidies decrease by 25 percent in addition to the full implementation of quota expansion in Korea and Japan, our results indicate that: 1) U.S. production falls by about 16 percent, and U.S. exports fall by about 51 percent, 2) the world price rises by about 1 percent, and 3) China's exports increase about 43 percent. If no WTO agreement occurs, there would be no expansion of Japan's imports and no reduction in U.S. rice subsidy even though Korea must still expand its WTO-multilateral quota. A KUS-FTA is likely to add a country-specific U.S. quota of another 4 percent of domestic consumption. In this case, world prices rise by only 0.3 percent. In general, world price effects are small and this is mainly due to the strong Chinese supply response. However, it is important to note that the associated changes in Chinese japonica rice production are at most about one percent of the Chinese baseline production. This implies the dominant role of China in the world japonica rice market.

Key words: Japonica rice, WTO, import access, FTA, domestic subsidies, policy simulation.
JEL Codes: Q17, Q18, F13

Rice is a major staple for more than a billion people. It is also less traded internationally than other major grains. About 400 million tons of rice are produced and consumed globally each year. About 60 percent of that is produced and consumed within India and China, and Indonesia and Bangladesh produce and consume another 15 percent of global rice supply. Thus, 75 percent of world rice is grown and consumed in places where it evolved as the staple food. The amount of rice that trades across national borders, currently about 25 million metric tons is only about six percent of world rice production. Rice production and trade is of two major types—japonica rice and indica rice. Japonica rice is comprised of short and medium grain rice varieties that are relatively glutinous and are the traditional staples in Japan, Korea and parts of Northern China. Indica rice varieties tend to have longer kernel lengths, are less glutinous and are the traditional staples in the more southern parts of Asia.

Global developments in the market for japonica rice have played a central role in the WTO. In 1995, Korea and Japan were allowed to use quotas rather than tariffication to implement World Trade Organization (WTO) commitments under the Uruguay Round agreement. Taiwan also began to open its market in 2002, its first year in the WTO. The amount of market access into these countries currently ranges about 1 million metric tons a year. This represents significant additional access in the relatively thin market for japonica rice. Even though imports into these countries continue to be restricted, the significance of global development in the market for japonica rice is obvious. (China also pledged to allow imports of japonica rice specifically and separately in its WTO accession agreement in 2002, but China has been a net exporter of japonica rice.)

This paper explores some important relationships in that market and considers the likely impacts of some policy adjustments that are underway or may be likely in coming years, including final implementation of the Korean quota expansion under its Uruguay round commitments, a new WTO agreement and the proposed Korea and United States Free Trade Agreement (KUS-FTA). In order to evaluate these potential policy changes, we first review the market and international trade policy for japonica rice on a global basis. We then examine alternative policy scenarios against a status quo baseline. In particular, we consider likely global market effects of expansion of access into the market in Japan and Korea and reduced subsidy for japonica rice in the United States.

I. Trade liberalization and global market for japonica rice

Now that China and Taiwan are members of the World Trade Organization, policies of all the major participants in the market for japonica rice are governed by WTO agreements and rules. Japan is committed to provide access for about 0.68 million metric tons under a "low" tariff. Japan applies a prohibitively high tariff to any potential imports above this quantity. Japan imports from a variety of sources, but traditionally has imported almost half of its total from California. South Korea is committed to provide access for import about 0.2 million metric tons under its WTO rice quota. Korea has also imported from a variety of sources in recent years including from the United

States and China. Little, if any, imported rice has entered the normal marketing channels for table rice in either Japan or Korea.

Under their WTO accession agreements China and Taiwan provided TRQ access to their domestic markets and agree that some portion of the potential imports would be handled outside the state trading enterprise system. As a part of its accession commitment, Taiwan agreed to low-tariff import access of about 127 million metric tons. Even though the percentage rate of import is higher than Korea and Japan, this total is small relative to imports of Japan or Korean. The access agreement for China included separate commitments for japonica rice in the form of a tariff rate quota, but the quantities specified have not been binding and are not expected to be binding while China remains a net exporter of japonica rice.

The global WTO negotiations, the Doha Development Agenda (DDA), remain under way. The major issues include reduction of trade barriers and agricultural subsidies (WTO, 2004). The interim agreements and current negotiating positions of important negotiating coalitions suggest that the highest tariff rates will be reduced most with the highest bound tariff rates declining by 50 percent or more (a so-called Swiss formula approach). This approach will be applied in "bands" rather than as a single formula. Tariff rate quota (TRQ) quantities will also be expanded. Smaller tariff cuts and slower expansion of the quota quantities for tariff rate quotas will be allowed for sensitive products. There is no doubt that japonica rice will be proposed for the "sensitive" or "special" categories by major importers such as Japan and Korea. Doubling of the access quantities under TRQs are likely outcomes, with tariff continuing to be prohibitive. (As noted below Korea is likely to maintain its absolute quota.)

Debate over domestic support programs has raised many complex issues. The bottom line is likely to be some tightening of what payments can be considered exempt from reform (green box) and some allowance for programs that are more than minimally trade distorting, but yet do not contribute to production distortion as much as full production subsidies (blue box). With those

changes, there will likely be limits on overall subsidies in the less distorting category (blue box) and substantial cuts in the category of subsidies that are considered most trade distorting (amber box).

For the major importers who restrict imports quantitatively (as long as import quotas remain binding as in Japan and Korea), their domestic subsidy programs have little impacts on international trade. Further, among significant exporters of japonica rice, China, Australia and Egypt have no significant domestic subsidies for rice. However, the United States does have major subsidies for rice that are similar to those for other major field crops such as cotton, corn, barley, sorghum, wheat and soybeans (Sumner, 2003). For japonica rice, the subsidy reductions in the United States are particularly important. The United States does not provide significant production subsidy for fruits, tree nuts, vegetables, seed crops, wild rice, irrigated pasture or hay. This is important because some of these are significant alternative crops in the japonica rice-growing region of California. The U.S. subsidy programs are complex and include a number of features that were renewed and adjusted in 2002 (Sumner, 2003). The recent WTO dispute over cotton also suggests that substantial reductions in trade distorting subsidies will result from the negotiations (Sumner 2005; WTO, 2005). Cuts in the aggregate measure of support by 50 percent or more are likely. In addition, there will be shift of some subsidy programs into less production distorting forms. The bottom line is likely to be 25 percent cut in the effective price-distorting effects of subsidy for japonica rice.

II. A simulation model: potential policy adjustments in japonica rice

To represent the essential features of world japonica markets, while keeping the model simple, each country or group of countries trading japonica rice in the world market is set as either a net importer or net exporter. For each market participant, the input markets and the output markets are specified with a series of supply and demand functions, and then the market adjustments in response to the introduction of an alternative policy are described. In modeling these adjustments, we use a partial equilibrium displacement model specified in log linear form (Alston, Norton and Pardey,

1995; Hertel, 1989).[1] In the context of world japonica rice, trade liberalization on importing countries mainly centers on relaxing restrictive border policies, and the policy instruments used to represent trade liberalization include minimum access quotas and ad valorem tariffs. To conform to the important trade distorting policies noted above, our model allows the possibility of domestic subsidies for rice production for exporters.

We use the following notational convention. Superscript i denotes a country or a group of countries with i=1,…,I. Of these, there are i_q net importers and (I-i_q) net exporters. Importers are differentiated into those, i=1,…,i_t, that impose tariffs on imported rice, and the rest, i= i_t+1,…,i_q, that import rice according to the binding quotas. (Note that importers with no import restrictions are included in the group with a zero tariff.) In the context of a single output, rice, we consider three inputs—labor, material input, and land—denoted as L, M, and K, respectively.

The basic structure of the model is given in equations (1)-(10).

1) $D^i = f^i(p^i; \boldsymbol{z}_{\boldsymbol{D}}^{\boldsymbol{i}}) \quad \forall i = 1,..., I$

2) $p^i + \mathrm{m}^i = \dfrac{\partial C^i(\boldsymbol{w}^{\boldsymbol{i}}, Y^i)}{\partial Y^i} \quad \forall i =,..., I$

3) $x_j^i = \dfrac{\partial C^i(\boldsymbol{w}^{\boldsymbol{i}}, Y^i)}{\partial w_j^i} \quad \forall i = 1,..., I, and\ j = L, M, K$

4) $w_L^i = h^i(x_L^i; \boldsymbol{z}_{\boldsymbol{L}}^{\boldsymbol{i}}) \quad \forall i = 1,..., I$

5) $w_K^i = h^i(x_K^i; \boldsymbol{z}_{\boldsymbol{K}}^{\boldsymbol{i}}) \quad \forall i = 1,..., I$

6) $Y^i + IM^i - EX^i = D^i \quad \forall i = 1,..., I$

7) $p^i = p^w(1 + \mathrm{t}^i), \quad \forall i = 1,..., i_t$

8) $IM^i = Q^i, \quad \forall i = i_t + 1,..., i_q$

[1] The basic framework is due to Muth (1964). Citations are numerous, and we do not provide additional cites here due to space limitation.

9) $p^i = p^w, \quad \forall i = i_q+1,..., I$

10) $\sum_i IM^i = \sum_i EX^i$

Equation (1) represents domestic consumer demand for rice, where D^i is the demand for rice in country i, p^i is the domestic price for rice, and $\boldsymbol{z}_D^i$ is a vector of demand shifters. Equation (2) determines the level of rice production in country i by equating the marginal cost to the farmers' effective price under the assumption of perfect competition. The effective price is the sum of the domestic price and effective per unit subsidy rate, μ^i.[2] The total cost is a function of a vector of input prices, $\boldsymbol{w}^i$, and the level of output, Y^i. Equation (3) represents derived input demand where x_j^i is derived demand for input j devoted to rice production in country i. Equations (4) and (5) represent the supply sides of labor and land inputs in country i, with $\boldsymbol{z}_L^i$ and $\boldsymbol{z}_K^i$ denoting the vectors of supply shifters for the supply of L and K, respectively. The supply function for material input is simply given by its exogenous price, guided by an economic principle that, over an intermediate or long time horizon, changes in quasi-rent are captured by labor and land, not material input, which is supplied elastically to a single agricultural industry.

Equation (6) represents the equilibrium condition in the domestic rice market, where domestic demand for rice equals total domestic production of rice plus net imports, IM^i, minus net exports, EX^i. Since we employ the net amount for each county's trade figure, either IM^i or EX^i is zero for each i. Equation (7) determines the domestic price of rice for the rice importing countries under the tariff policy, where p^w is the world price and τ^i is the ad valorem tariff on imported rice. Equation (8) applies to the countries that import rice under a binding quota, and defines imports for those countries. Equation (9) defines the domestic rice price for the exporting countries. In these countries, no trade distortion means that the domestic price facing consumers equals the world

[2] This formulation of effective price in equation (2) intends to describe the policy of a county such as the United States, where substantial domestic subsidies are provided to rice farmers (when no subsidies are provided, μ^i equals zero).

price. Finally, equation (10) represents the equilibrium condition for the world market, that is, the total rice export equals the total rice import.

Totally differentiating equations (1)-(10) and using log differentials to convert to elasticity form yields the following linear elasticity model. With the exception of the carets that denote proportional changes, all previous notation applies to equations (1') through (10').

1') $\hat{D}^i = \eta^i \hat{p}^i + \sum_j \varepsilon_j^i \hat{z}_j^i$

2') $a_p^i \hat{p}^i + a_m^i \hat{m}^i = \sum_{n=L,M,K} v_n^i \hat{w}_n^i$

3') $\hat{x}_j^i = \sum_{n=L,M,K} v_n^i \sigma_{jn}^i \hat{w}_n^i + \hat{Y}^i, \quad j = L, M, K$

4') $\hat{w}_L^i = \rho_L^i \hat{x}_L^i + \sum_j \theta_{Lj}^i \hat{z}_j^i$

5') $\hat{w}_K^i = \rho_K^i \hat{x}_K^i + \sum_j \theta_{Kj}^i \hat{z}_j^i$

6') $\hat{D}^i = b_Y^i \hat{Y}^i + b_{IM}^i I\hat{M}^i - b_{EX}^i E\hat{X}^i$

7') $\hat{p}^i = \hat{p}^w + \hat{m}^i \quad \forall i = 1,..., i_t$

8') $I\hat{M}^i = \hat{Q}^i \quad \forall i = i_t + 1,..., i_q$

9') $\hat{p}^i = \hat{p}^w, \quad \forall i = i_q + 1,..., I$

10') $\sum_i g^i I\hat{M}^i = \sum_i h^i E\hat{X}^i$

Throughout the equations (1')-(10'), the following notation is used; η^i and ε_j^i are country i's demand elasticities with respect to the own price and each of demand shifting variables; a_p^i and a_m^i are the shares of the market price and subsidy in the effective price ($p^i + m^i$); v_n^i is the cost share of input n; σ_{jn}^i is the Allen elasticity of substitution between inputs j and n; θ_{Lj}^i (θ_{Kj}^i) and ρ_L^i (ρ_K^i) are the elasticities representing the changes in the wage (land rental rates) with respect to

each of shifting factors and own quantity; b_Y^i , b_{IM}^i , and b_{EX}^i are the shares of domestic production, net imports, and net exports, respectively, in country i's domestic consumption of rice. That is, for the net importing countries, the sum of b_Y^i and b_{IM}^i is one (with b_{EX}^i =0) and for the net exporting countries, the sum of b_Y^i and $-b_{EX}^i$ (with b_{IM}^i =0) is one; $w^i = 1+t^i$; g^i and h^i are the i-th country's import and export shares in the world market.

Finally, bilateral agreements such as the KUS-FTA involve specific countries and thus, the KUS-FTA was not incorporated in the general model. However, Korea's country specific quota can be easily incorporated in the model as quantity q added to the equations representing relevant countries. Those equations are eq. (6) for i=US, eq. (8) for i=Korea, and eq. (10) representing the world market equilibrium. The corresponding log differential equations also have additional terms in the right side of the equation. Those additional terms are: $-b_q^{us}\hat{q}^{us}$ in (6'), $\hat{q}^k$ in (8') and $-h^{us}\hat{q}^{us}$ in (10'), where b_q^{us} is the share of q based on US consumption, $\hat{q}^{us}$ is the ratio of q based on US exports, $\hat{q}^k$ is the ratio of q based on total Korean imports, and h^{us} is the share of US exports in the world market.

III. Empirical implementation

We assume six players in the world japonica rice market, three net exporters including China, the U.S., and an aggregate of the rest of the world exporters (ROWX) and three net importers including Korea, Japan and an aggregate of the ROW importers (ROWI).[3] Our simulation uses 2014 as a base period, which represent the end period of the 10-year policy implementation period. The projections to 2014 are based on the FAPRI preliminary baseline for 2005.[4] However, FAPRI does not provide figures for japonica rice separately. Thus, in countries

[3] Among the significant world market players, Australia and Egypt are included in the aggregate export group and Taiwan is included in the aggregate importer group.
[4] Source: http://www.fapri.missouri.edu/BaselineReview2004

and groups of countries that produce both japonica and other rice, we adjust for various japonica shares to arrive at the numbers presented in Table 1.[5]

In assigning the elasticity values, we relied on previous empirical investigations and when previous studies are not available, we relied on our interpretations on the most relevant empirical evidence. In the specification of own Marshallian price elasticities of rice demand, one consideration important is the substitution possibility in consumption between japonica and indica rice. A higher substitution possibility implies a greater demand response to a price change in the japonica rice market. This implies that the price elasticities are less elastic for Korea and Japan where little substitution between japonica and indica rice exists than those for the rest of the countries. Guided by this and other existing studies, we specified the own demand elasticities to be -0.7 for China, -0.2 for Korea, -0.2 for Japan, -0.5 for the United States, -0.6 for ROWI, and -0.6 for ROWX (Song and Carter; Cramer et al.).

The model also requires estimates for the Allen elasticities of input substitution. These are not available from the econometric literature. Based on common observations that substitution between land and labor or between land and material input tends to be more limited than substitution between labor and material input, we set the elasticity of input substitution to be one between labor and material input but 0.5 for other input pairs.[6] Finally, we specified supply elasticities for labor and land inputs. Our partial equilibrium model implies a relatively elastic input supply curves facing individual crop industries. On the other hand, there exists considerable fixity in rice labor and land because there are considerable adjustment costs in shifting from rice to other crops and japonica rice tends to be grown in separate locations from indica rice. We use land and labor supply elasticities of 0.6 for all countries. The implied supply elasticities for output depend

[5] Space limitations preclude providing detail on parameter construction. This information is available in an appendix from the authors.

[6] We conducted the sensitivity tests using alternative elasticity values. Results were not sensitive to small variations in this parameter.

on the input supply elasticities, the substitution elasticities and the input shares, especially the share of manufactured inputs, which have a horizontal supply function facing the japonica rice industry.

Along with trade policy, another policy consideration in the model is the domestic production subsidies, represented by μ in the model. Of the three exporters, the Unite States is the only country that provides a substantial amount of production subsidy for japonica rice in a way that affects trade. In our framework a_m's are zero (i.e., a_p=1) for all countries except for the United States. On average, government transfer payments represent about 40 percent of the U.S. rice farmers' revenue. However, given that a substantial portion of these payments are not tied directly to current rice production, we adopt 0.25 for the value of a_m for the United States.

In light of our discussion on the earlier global policy section, two WTO policy scenarios are considered: (1) rice import quotas for both Korea and Japan increase from 2004 levels by 100 percent in 2014 and; (2) rice import quotas for both Korea and Japan increase by 100 percent in 2014 and U.S. domestic subsidies for japonica rice decreases by 25 percent in 2014. Korea maintains an absolute quota for rice and has already agreed to expand that quota by 100 percent by 2014. Japan imports conform to its quota quantity with a prohibitive tariff on the quantity over the minimum access. We impose no tariff change on ROWI because these countries have low applied tariffs in the baseline and many are less developed countries that will make little if any effective cuts in applied tariffs following a WTO agreement.

The other major policy effort that is likely to affect japonica rice markets is the proposed free trade agreement between Korea and the United States (USTR, 2006). Rice trade has extreme political sensitivity in Korea as indicated by the maintenance of a quota system and refusal to adopt tariffication for rice in the WTO. At the same time the United States has maintained that the FTA must be comprehensive, including rice. In the face of this seeming impasse we anticipate that by

2014 Korea will be required to expand a country specific quota for the United States under the FTA. We specify that quota expansion as 200,000 tons.

To assess the impacts of the KUS-FTA, we examine three additional policy scenarios. First, a KUS-FTA added to the two WTO agreement scenarios specified above and finally a KUS-FTA with no WTO agreement.

IV. Simulated Effects of the WTO and KUS-FTA for Japonica Rice Markets

Table 2 presents our simulation results for the five policy scenarios as specified above. In scenario A, Korea and Japan both increase their quota amounts (for Japan, the increase in quota in 2014 amounts to additional 0.5 million tons and for Korea the additional increase in 2014 is about 0.2 million tons). The price in Korea falls by 2.9 percent, the price in Japan falls by 2.5 percent and the world price increases by 0.7 percent. The relatively small price effects are due to the small share of increase in access relative to global production and the strong supply response. Production increases by a bit more than one percent in the markets not protected by quotas. The relatively high implied output supply elasticities are due to moderate supply elasticities of land and labor to japonica rice production and the fact that materials supply function is infinitely elastic. Exports are more responsive. China increases its exports by 30 percent and the United States increases exports by six percent. In the second WTO scenario, the United States cuts its domestic support at the same time that Korea and Japan improve market access. U.S. production falls by about 16 percent and U.S. exports fall by about 50 percent. In this case, world price rises by one percent and China increases production by 1.7 percent and exports by about 43 percent. Note that Korean and Japanese markets are affected only by the change in their import regime so the effects of scenarios A and B are identical for them.

Adding the KUS-FTA scenario with additional country-specific import quota to the WTO shows that the global trade results are not much different from the case of a WTO quota expansion. That is, the country-specific nature of the quota is irrelevant to trade flows or prices. Except for

Korea who are affected by the expanded quota, the only impact is on who receives the quota rent from Korean sales, if the institutional arrangement allows quota rent. Comparing the scenarios A to C and B to D, the added imports by Korea cause world price to rise by 0.1 percent more than the analogous WTO scenario, and the higher price implies slightly larger more production and exports. Finally, the FTA-alone scenario (scenario E in Table 2) shows that the expanding only the Korean import access provides much smaller gains than expanding Korean and Japan as in scenario A. This is simply because the FTA increases access by 200,000 tons and the Japanese access gain is more than 400,000 tons. Note further that U.S. exports increase by much less than 200,000 tons even though the KUS-FTA quota is specifically allocated to the United States. The 2.6 percent increase in U.S. exports is less than 12,000 tons. This means that the United States diverts exports from other markets to Korea to take advantage or potential quota rents. It also implies that China and ROW exporters expand to take advantage of the other markets that are made available by the diversion of the destination of U.S. exports.

V. Conclusions

We investigate market effects due to policy changes in world japonica rice markets. Our simulation results represent the market effects due only to potential policy changes, holding all other conditions to their baseline projected values. Our simulations indicate that modest increases in import access imply small declines in market price in importing countries and quite small increase in world prices. Our simulation results with respect to China, however, deserve some attention. In each scenario, Chinese exports respond by a huge margin (up to 47 percent). This indicates that the world market sustains relatively a small price shock mainly due to flexibility of Chinese supply response to the export market. Nevertheless, it is also important to notice that the associated changes in Chinese japonica rice production are small (at most 1.9 percent). This again indicates the possibility that a small production shock in China may imply a potentially large shock in the world market for japonica rice market.

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Table 1. Baseline Quantities for 2014 and Parameters Used in Simulation

A. Baseline Quantities

	China	Korea	Japan	US	ROWX	ROWI
rough to milled rice conversion ratio	0.6	0.7	0.7	0.7	0.65	0.65
YEAR 2014 (Million metric tons)						
Production (Y)	32.82	4.66	7.20	1.50	5.50	
Consumption (C)	31.02	4.86	7.70	1.04	4.40	
Exports (EX)	1.80	0.00	0.00	0.46	1.10	
Imports (IM)	0.00	0.20	0.50	0.00	0.00	2.66

B. Parameter specification

	China	Korea	Japan	US	ROWX	ROWI
Own output demand elasticity						
	-0.7	-0.2	-0.2	-0.5	-0.6	-0.6
Various shares (Consumption based shares and world market shares)						
Shares based on domestic consumption						
Domestic production (Y/C)	1.06	0.96	0.94	1.44	1.25	0.43
Export (EX/C)	0.06	0.00	0.00	0.44	0.25	0.00
Imports (IM/C)	0.00	0.04	0.06	0.00	0.00	0.57
Share in the world market						
Imports	0.00	0.06	0.15	0.00	0.00	0.79
Exports	0.54	0.00	0.00	0.14	0.33	0.00
Elasticities of input substitution						
Labor/material	1.0	1.0	1.0	1.0	1.0	1.0
Labor/land	0.5	0.5	0.5	0.5	0.5	0.5
Material/land	0.5	0.5	0.5	0.5	0.5	0.5
Factor expenditure shares						
L (labor)	0.43	0.21	0.31	0.11	0.30	0.30
M (material)	0.43	0.33	0.55	0.65	0.40	0.40
K (land)	0.14	0.46	0.14	0.24	0.30	0.30
Input supply elasticity						
	0.6	0.6	0.6	0.4	0.6	0.6
Policy parameters						
Rate of income subsidy	0	0	0	0.25	0	0

Source: For baseline and share information, sources are Korean Ministry of Agriculture and Forestry (*Statistical Yearbook, 2004)*, Food and Agricultural Policy Research Institute (FAPRI), International Rice Research Institute (IRRI), and Economic Research Service (USDA/ERS) (Rice Yearbook 2003). For elasticities, sources are the previous literature. For additional information on parameter construction, contact the corresponding author.

Table 2. Effects of WTO deal and Korea-US FTA

	China	Korea	Japan	US	ROWI	ROWX
Scenario A: Expand import access in Korea and Japan by 100%						
Consumption	-0.5%	0.6%	0.5%	-0.4%	-0.4%	-0.4%
Domestic price	0.7%	-2.9%	-2.5%	0.7%	0.7%	0.7%
Production	1.2%	-3.6%	-5.8%	1.6%	1.1%	1.1%
Imports	--	100.0%	100.0%	--	-1.6%	--
Exports	30.6%	--	--	6.0%	--	7.2%
Scenario B: Expand import access in Korea and Japan by 100% and cut US subsidies by 25%						
Consumption	-0.7%	0.6%	0.5%	-0.5%	-0.6%	-0.6%
Domestic price	1.0%	-2.9%	-2.5%	1.0%	1.0%	1.0%
Production	1.7%	-3.6%	-5.8%	-15.8%	1.5%	1.5%
Imports	--	100.0%	100.0%	--	-2.2%	--
Exports	42.6%	--	--	-50.6%	--	10.0%
Scenario C: Expand import access in Korea and Japan by 100% and Korea expands country specific quota to US by 200,000 tons under FTA						
Consumption	-0.6%	0.9%	0.5%	-0.4%	-0.5%	-0.5%
Domestic price	0.8%	-4.4%	-2.5%	0.8%	0.8%	0.8%
Production	1.4%	-5.3%	-5.8%	1.8%	1.2%	1.2%
Imports	--	150.0%	100.0%	--	-1.8%	--
Exports	35.0%	--	--	6.9%	--	8.2%
Scenario D: Expand import access in Korea and Japan by 100%, cut US subsidies by 25%, and Korea expands country specific quota to US by 200,000 tons under FTA						
Consumption	-0.8%	0.9%	0.5%	-0.6%	-0.7%	-0.7%
Domestic price	1.1%	-4.4%	-2.5%	1.1%	1.1%	1.1%
Production	1.9%	-5.3%	-5.8%	-15.6%	1.7%	1.7%
Imports	--	150.0%	100.0%	--	-2.4%	--
Exports	47.0%	--	--	-49.7%	--	11.1%
Scenario E: Expand import access in Korea by 100% and Korea expands country specific quota to US by 200,000 tons under FTA						
Consumption	-0.2%	0.9%	0.0%	-0.2%	-0.2%	-0.2%
Domestic price	0.3%	-4.4%	0.0%	0.3%	0.3%	0.3%
Production	0.5%	-5.3%	0.0%	0.7%	0.5%	0.5%
Imports	--	150.0%	0.0%	--	-0.7%	--
Exports	13.1%	--	--	2.6%	--	3.1%

Source: Author simulations