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Andrew Schmitz, David Zilberman, and Manhong Zhu

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Andrew Schmitz*
Professor and Ben Hill Griffin Eminent Scholar Chair
Food and Resource Economics Department
University of Florida
Email: aschmitz@ufl.edu

David Zilberman
Professor and Robinson Chair
Department of Agricultural and Resource Economics
University of California Berkeley
Email: Zilber11@berkeley.edu

Manhong Zhu
Ph.D. Candidate
Food and Resource Economics Department
University of Florida
Email: zhumanhong@ufl.edu

Abstract:

Japan's resistance to open its agricultural market access, especially for the five politically sensitive (sensitive) agricultural categories consisting of rice, wheat and barley, beef and pork, sugar, and dairy products, has largely contributed to the lengthy negotiation of the Trans-Pacific Partnership (TPP) which was finally concluded on October 5, 2015. All commodities in these five categories are not genetically modified (GM) varieties, and we found the TPP agreement between the United States and Japan was not impeded by genetically modified organisms (GMOs). Special interest groups of the five categories have pressured the Japanese government to create trade distortions concerning domestic support programs and border measures. To better understand the difficulties in liberalizing Japan's five sensitive agricultural categories, we empirically estimate Japanese welfare gains and losses from trade liberalization over seven commodities within these categories: rice, wheat, barley, beef, pork, raw sugar, and butter. Consumers of these commodities would gain from free trade. The first and second largest gains would be obtained by rice consumers ($15.8 billion to $42.4 billion) and raw sugar consumers ($6.02 billion to 16.0 billion), respectively. For all these commodities, except butter, the welfare changes of the Japanese government would all be negative due to tariff revenue losses and resale revenue losses. Even though the net welfare gains would be positive for all commodity sectors, with the largest net gain being in the rice sector, all producers would lose, especially with rice producers being confronted with the largest annual loss ranging from $6.37 billion to $7.69 billion. Detailed provisions of the TPP regarding Japan's agricultural trade policy show that Japan made certain concessions regarding its agricultural market access. However, Japan's ratification of the TPP would very likely be contingent upon its compensation countermeasures to the losers from free trade.

Keywords: Trans-Pacific Partnership, Japan, agricultural trade, trade barriers, welfare impact

JEL codes: F13, F14, Q17, Q18

1. Introduction

The Trans-Pacific Partnership (TPP) trade agreement between the United States and Japan has led to a number of studies concerning Japan's high protection of producers in agriculture (Dyck and Arita, 2014; Harada, 2013; Rogowsky and Horlick, 2014). While opening up Japan's agricultural market access may be in the public interest, significant losses could occur for these protected interest groups if they are not compensated. Little empirical work has been done on Japan's degree of protection for these interest groups. In addition, existing research considers labeling requirements on imports of genetically modified organisms (GMOs), especially for food uses, as nontariff trade barriers. Nevertheless, there is a lack of clarity on whether or not trade barriers (tariff or non-tariff barriers) on imports of GMOs are causing trade distortions in Japan.

To explore these questions, this paper empirically estimates the impact of trade liberalization for the following seven commodities within the sensitive categories that are imported by Japan: rice, wheat, barley, beef, pork, raw sugar, and butter. We first outline the aggregate level of protection afforded the Japanese agricultural sector and identify the major food exporters to Japan. Next, we discuss Japanese consumers' attitudes towards GMOs and the extent to which GMOs act as nontariff trade barriers in the context of Japanese food imports. We then discuss Japan's domestic agricultural policies and the present distortions in agricultural trade. Based on the examination of trade barriers in major protected agricultural industries, we empirically estimate the free trade welfare impact on Japan's agricultural sectors of the seven commodities listed above which comprises both losers and gainers.

2. Japan's aggregate protection and major food exporters to Japan

Even though Japan's agricultural sector accounts for less than one percent of Japan's total GDP and less than five percent of its national population, farmers in Japan have been the most highly protected, compared with those in six of the other TPP countries and the European Union (EU), by the Producer Support Estimate (PSE)[1] as calculated by the Organization for Economic Co-operation and Development (OECD) (Figure 1). Honma and Hayami (2009) calculate the

[1] PSE is the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policies that support agriculture, regardless of their nature, objectives, or impacts on farm production or income; Percentage PSE (%PSE) is the ratio of PSE to gross farm receipts (source: www.oecd.org).

nominal rate of assistance[2] (NRA) for most of Japan's import-competing products from 1955 to 2007, and conclude that high agricultural distortions exist in Japan as indicated by the average NRA which has been above 100 percent since 1975. The TPP free trade agreement would inevitably incur strong opposition from Japanese farmers, since more than 50 percent of Japan's gross farm value comes from government supports and trade protections.

[Insert Figure 1]

Japan's imports for each of the sensitive categories are not diverse in terms of trading partners. In Table 1, the top three exporters have the majority share of Japan's total imports for all these commodities. For example, the United States and Thailand account for over 80 percent of the rice imports to Japan. For wheat, the United States and Canada account for over 80 percent. This is also true for Australia and Canada's share of barley imports to Japan. For beef, Australia and the United States dominate with close to 90 percent of Japanese beef imports. This is a cost savings to Japanese importers in terms of lower transaction costs and quality monitoring costs since imports to Japan are controlled by the Japanese government. Imports of rice, wheat, and barley within the Tariff Rate Quotas (TRQs) are exclusively decided by the Food Department of the Ministry of Agriculture, Forestry, and Fisheries (MAFF) of Japan. Also, the Agriculture and Livestock Industries Corporation (ALIC), a state trading enterprise, has exclusive importing rights to two of the largest dairy TRQs (Rogowsky and Horlick, 2014). The Japanese government, through ALIC, closely monitors imports of beef and cattle, pork and hogs, broilers, milk and dairy products, vegetables, sugar, and starch. Japan's reliance on a relatively few exporters can be attributed to the high degree of protection afforded Japanese agriculture. Protection lessens the need to diversify sources of imports (Schmitz, 1988; Feder, Just, and Schmitz, 1977).

[Insert Table 1]

3. Japanese consumer attitudes on GM foods and agricultural trade of GMOs

In Japan, GM foods received broad opposition from consumers. In 2002, the Japanese Ministry of Public Management, Home Affairs, Posts and Telecommunications (MPHPT) conducted a public opinion poll on GM labeling of food; the results showed that 80 percent of Japanese

[2] The nominal rate of assistance for each farm product is computed as the percentage by which government policies have raised gross returns to farmers above what they would be without the government's intervention.

consumers demanded stricter labeling (Blue, 2010). McCluskey et al. (2003) studied Japanese consumers' willingness to pay for GM noodles and GM tofu, and the results showed that Japanese consumers demand a discount of GM labeled foods over non-GM equivalents: 60 percent discount for GM noodles and 62 percent discount for GM tofu. In 2003, the Japanese MAFF conducted an internet survey of 600 consumers who chose to respond, and the survey results showed that 60 percent of these respondents indicated that they would not purchase GM foods even if they were priced cheaper than non-GM equivalents.

Consequently, much of the controversy over distortions in Japan's agricultural trade centers on GMOs. While this is certainly the case for trade between the United States and the European Union, this is not so for Japanese agricultural trade. In terms of the sensitive commodities listed in Table 1, none of them contain GM ingredients or proteins, nor are they subject to GM labeling requirements. It should be noticed that Japan imports GM sugar beets only as processed foods which are exempt from labeling requirements. In contrast, Japan does import GM and non-GM varieties of corn, soybean, and canola. Japan imports almost 100 percent of its corn supply and 95 percent of its total soybean supply. From a segregated marketing channel, non-GM corn and soybean imports are merely for food purpose; GM corn and soybean imports are mainly for animal feed and further processing purpose. Japan is the world's second largest importer of canola—the vast majority of which comes from Canada. Unlike corn and soybean producers, Canadian canola farmers do not generally segregate GM and non-GM canola seeds. One of the reasons is that Japan imports canola seeds merely for further processing purpose and the two processed products, canola oil and meal, are not subject to labeling requirements (canola oil does not contain GM ingredients and canola meal is only for feed uses). Also, to avoid labeling requirements, Japan's imports of GM varieties of corn and soybean are largely processed into vegetable oils or sweeteners which do not contain GM ingredients. These commodities are also processed into animal feed meals which are exempt from labeling requirements. To protect domestic vegetable oil and sweetener processors (who rely on imported raw crops), Japan imposes significant tariffs on imports of most processed oils and sweeteners. However, tariffs on these products have little to do with whether or not they contain GM ingredients. Rather, they are largely the outcome of rent-seeking activities (Schmitz et al., 2010) by Japan's processing industries which heavily rely on imported materials.

4. Overview of Japan's agricultural food sector and policies

Within the TPP trade zone, Japan's agricultural food sector is second in size only to that of the United States .Japan's farms are small in terms of land size, but the supply and marketing chain are highly concentrated through Japan Agriculture (JA). JA is a single cooperative federation that centralizes the procurement of inputs and marketing of outputs (Dyck and Arita, 2014). Even though the majority of Japan's agricultural food production goes to the domestic market, agricultural imports account for a large share of Japan's total food demand—61 percent on a calorie basis and 33 percent on a (Japanese yen) value basis (as calculated by Japan's government).

Concerning Japan's situation of low-level food self-sufficiency, relatively scarce land resources, and historically small-scale farmers, the Basic Law on Food, Agriculture, and Rural Areas requires the government to draft a Basic Plan for agricultural policy directions, approaches, and targets every five years (Honma and Hayami, 2009; Martini and Kimura, 2009). At the present high-income stage of economic development, the main objectives of Japan's agricultural policies include reducing the farm–nonfarm income gap and securing food supplies through Japan's various agricultural support and trade protection programs.

Japan's government intervenes heavily in the domestic market, especially for the sensitive categories: rice, wheat and barley, beef and pork, sugar, and dairy products. Rice, a staple food in Japan, has been called the essence of the Japanese culture, and rice farming is fundamental to Japan's food security especially after the food shortage period in World War II. In the postwar period, rice was lined to politics as a disproportionate amount of power went to farmers (Wojtan, 1993). Japanese rice farms have used voting power to command government support policies since early 1970s. Another staple food in Japan is wheat. Japan imports more than 90 percent of its total wheat consumption, and most wheat imports are strictly controlled by the government in order to protect domestic wheat producers because the survival of 99 percent of domestic wheat producers depends on government policies. Japan's domestic sugar production can only meet 40 percent of its total consumption due to insufficient production and relatively small number of sugar farmers. 80 percent of domestic sugar production comes from beet sugar grown in Hokkaido, and the rest from cane sugar in Okinawa, the largest U.S. military base in Japan. Sugar farming is especially important to sugar farmers in Okinawa since the poor oil quality in most parts of the prefecture means cane sugar is the only commodity that farmers can grow (Rogowsky and Horlick, 2014). As partial compensation for allowing the military base

in Okinawa, the Japanese government has historically supported sugar farmers. Japanese cattle and pig farmers are very uncompetitive in the world market due to their higher production costs. For example, Japanese beef is the most expensive beef in the world due to cattle farmers' unique breeds and production methods. Studies suggest, if current protection measures are eliminated, imports of beef could jump by 40 percent and imports of pork could displace 70 percent of domestic annual pork production. Due to the rapidly aging population, dairy farms are also quickly shrinking. The dairy farms reduced from 27,700 to 17,700 in just a decade according to agriculture ministry data. To protect dairy farmers, Japan only imports processed dairy products but not raw milk.

Facing the inefficiency of rice production and an aging farm population, Japan spends $2.3 billion (all currency in U.S. dollars) annually on the gentan system which pays rice farmers to reduce rice production. Wheat and barley farmers are compensated by the income stabilization program as well as rice diversion subsidies. The Japanese cattle industry is protected by a deficiency payment system, while the pork industry is protected by the gate price system which keeps pig prices within a price band (Dyck and Arita, 2014). To protect domestic raw sugar producers and dairy farmers, the ALIC exercises monopsony power in the Japanese importing markets of these two categories. Consequently, sugar mills are effectively required to purchase domestic cane sugar and beet sugar, even though inefficient sugar production has kept the prices of domestic cane sugar and beet sugar 680 percent and 220 percent, respectively, higher than imported prices. For dairy products, the prices are stabilized through ALIC's monopsony arrangement for the purchase or sale of either domestic production or imports. Besides ALIC's interventions, sugarcane and sugar-beet farmers also receive guaranteed minimum prices, while dairy farmers obtain support from a system of domestic policies, including production subsidies, insurance subsidies, and strict labeling of milk requirements.[3]

Moreover, tariffs and tariff-rate quotas (TRQs) also create a high level of protection for these special products. As shown in Table 2, Japan imposes a 341 yen/kg tariff (equivalent to a 778% tariff) outside the TRQs on rice, a 55 yen/kg tariff (equivalent to a 252% tariff) outside the TRQs on wheat, a 39 yen/kg tariff outside the TRQs on barley, a 21.5 yen/kg simple or in-quota

[3] In July 2002, the new government regulations took effect to prevent products containing powdered milk from being labeled simply as 'milk'. Consequently, imports of powdered milk have been depressed, and dairy farmers have less to fear from imports (Obara, Dyck, and Stout, 2005).

tariffs on refined sugar, a 38.5 percent simple tariff on beef, a 4.3 percent tariff on pork, and about a 93 percent average tariff on dairy products.

[Insert Table 2]

In addition to these special categories, fruit and vegetable producers as well as many processing industries are also protected by various domestic support programs and border measures. For fruit producers, Japan applies supply-management programs to maintain higher market prices and imposes 0 to 32 percent tariffs and phytosanitary measures to limit imports. For vegetable producers, Japan applies vegetable price stabilization programs; rice diversion subsidies; insurance programs; and border measures, including tariffs (under 13%, except on dried bean imports outside the TRQs) and phytosanitary requirements. For fruits and vegetables, phytosanitary requirements create greater barriers to imports than tariffs in many cases. The present tariff rate on crude canola oil and soybean oil is 10.9 yen/kg if acid value exceeds 0.6, and it is 13.2 yen/kg otherwise. Tariff rates are 21.5 yen/kg (in-quota) on refined sugar, and the greater of 50 percent and 25 yen/kg (in-quota) on High Fructose Corn Syrup (HFCS).

5. The welfare impact of TPP trade liberalization

Japan's opposition to move forward the trade liberalization in agriculture primarily comes from the special interest groups of the five sensitive categories consisting of rice, wheat and barley, beef and pork, sugar, and dairy products. To understand why these special interest groups oppose free agricultural trade, we empirically estimate the welfare impact of trade liberalization in these five sensitive categories. For simplicity, butter and raw sugar are taken as the representative commodities in their corresponding categories. We do not attempt to econometrically test Japan's import market power of these different commodities. We assume, for a specific commodity, that the foreign supply is perfectly elastic so that changes in demand quantities from Japan do not affect the world price.

Domestic support programs and border measures generally vary across commodities; thus one general model may not accurately capture the total welfare change from trade liberalization. For this reason, we classify the aforementioned industries into two scenarios based on their similarities, especially in terms of border protection measures. The welfare impact of trade liberalization for beef, pork, and butter are analyzed in the scenario of case I where border measures are (or can be considered as) simple or in-quota tariffs. Japanese beef production is

supported by a 38.5 percent import tariff and various domestic programs, such as the deficiency payment scheme for beef calf producers, the beef price stabilization program by ALIC, loan and insurance subsidies, etc. Japan's border protections on pork production include a non-prohibitive simple tariff of 4.3 percent[4] on fresh, chilled, or frozen meat, and the gate price system which is the main barrier to pork imports. If the imported pork price is below the gate price, importers must pay the difference between these two prices as a duty in addition to the tariff applied at the gate price value. In practice, to avoid extra levies, importers usually mix different-priced pork cuts until the average value of the shipment equals the gate price. Thus the standard import price (SIP) for pork is calculated as the gate price multiplied by 1.043. Essentially, the difference between the SIP and the CIF[5] price over the CIF price would be the simple or in-quota tariffs on pork imports. Also, similar to beef, hog farmers are protected by a deficiency payment scheme run at the prefectural level with voluntary participation (Obara, Dyck, and Stout, 2003).

To control dairy product imports, the Japanese government applies border measures, including tariffs and tariff-rate quotas (TRQs). Within quotas, the tariff rate on butter is 35 percent. Outside the TRQs, extremely high tariffs (29.8% ad valorem plus 985 yen/kg) are applied to discourage butter imports, but the TRQs are usually set large enough so that they are normally not filled. Domestic supports on butter include insurance and subsidies, price stabilization through markups, supply control through subsidies to farmers for milk produced within their quota, etc. It should be noted that the supply control program switched from the deficiency payment system to the direct payment system in April 2001. Based on the above discussion, butter can be modeled in the same scenarios as beef and pork because tariffs on butter are mostly in-quota tariffs.

Rice, wheat, barley, and raw sugar are analyzed in the scenario of case II due to their own specialties. Japan controls the trade of rice, wheat, and barley within TRQs, and imposes prohibitively high tariffs on imports outside the TRQs. Within the quota, imports of rice, wheat, and barley are duty free but exclusively managed by the Japanese Food Agency or MAFF. The Japanese government purchases rice, wheat, and barley at the international price and then resells

[4] The tariff on offals is 8.5 percent, and on pork preparations, it ranges from 0 to 21.3 percent. Source: Japan Tariff Association, Customs Tariff Schedules of Japan (2002).

[5] CIF is the abbreviation for cost, insurance, and freight. CIF is a trade term requiring the seller to arrange for the carriage of goods by sea to a port of destination, and provides the buyer with the documents necessary to obtain the goods from the carrier. Source: http://www.investopedia.com/

the imported rice and wheat to the domestic market by applying certain markups.[6] The proceeds are generally funneled into compensations to domestic producers. We include raw sugar in this scenario since there is no tariff imposed on raw sugar imports. All raw sugar imports can only be purchased at the average import price by the Japanese ALIC, which then sells the sugar back to importing companies at a predetermined resale price. Therefore, similarities of these four products lie in the fact that they are imported at the world price but resold to the domestic market by certain markups.

5.1 Case I. Beef, pork, and butter (Figure 2)

Japan's policy for beef, pork, and butter are described in Figure 2. For simplicity, we assume demand and supply are scheduled at a wholesale level. Using beef as an example, suppose Japan's domestic supply is maintained at Q_1 and the domestic beef producer price is currently supported at P_d by government payments (e.g., deficiency payments) valued at $P_d P_t ac$. The domestic consumer price which equilibrates total demand and supply is P_t, which is higher than the border price P_w by the tariff rate t ($t = (P_t - P_w)/P_w$). Under the present system, the government collects the tariff revenue which is the area of $aged$. Now suppose producers receive no compensation, the domestic price for both producers and consumers would be reduced to P_w after free trade. Domestic production would be reduced to Q_4 while total imports would expand to $(Q_3 - Q_4)$. Thus, producer surplus would decrease by $P_d P_w hc$, consumer surplus would increase by $P_t P_w fg$, and the government would lose tariff revenue by $aged$ but would gain $P_d P_t ac$ in the form of deficiency payment savings. Therefore, the net welfare gain could be represented by the area $(chd + gef)$. It should be noted that the domestic price (P_t) for pork is the SIP.

[Insert Figure 2]

The own price supply elasticities of beef, pork, and butter (selected dairy product) in Japan are relatively inelastic and are assumed to be 0.5, 0.75, and 1, respectively. Considering that the beef market is highly differentiated in Japan, the demand price elasticity might vary

[6] In practice, the Food Department in Japan does not assess a high markup on imports of feed wheat or barley. The markup ratio for food use wheat is usually between 1.3 and 1.6 (Fukuda, Dyck, and Stout, 2004).

significantly among different beef types, and even between domestic and imported beef. Thus in this study, we provide welfare estimates for the aggregate beef category using price elasticity of total demand ranging from –1 to –3, with –1 being relatively less elastic and –3 being highly elastic.[7] Less market differentiation exists for pork and butter, so the price elasticities of total demand for these products used in the welfare impact estimation are –0.5, –1, and –1.5, respectively.

5.2 Case II: Rice, wheat, barley, and raw sugar (Figure 3)

In this case, out-of-quota imports of rice, wheat, and barley are almost negligible due to the prohibitively high tariffs, so imports of these commodities are basically duty free as raw sugar imports. An analysis for these four crops can be based on the model in Figure 3. Suppose imports are currently restricted at $(Q_2 - Q_1)$ and the domestic production is supported at Q_1. The difference between the prevailing domestic price P_1 and the world price P_w is no longer the tariff, but rather the markup assessed by the government. Before trade liberalization, the government collects resale revenue which is the area of $abfe$. Assume trade liberalization is reached, the producer surplus loss would be P_1P_wda, the consumer surplus gain would be P_1P_wcb, and the government revenue loss would be $abfe$. Thus net welfare change would be a gain of $(ade + bfc)$. The domestic price elasticities of supply for rice, wheat, barley, and raw sugar in the estimation are assumed to be 0.25, 0.5, and 0.75. Total demand price elasticities are assumed to be –0.1, –0.3, and –0.5 for rice; –0.5, –1, and –1.5 for wheat and barley; and –0.5 and –1 for raw sugar.[8]

[Insert Figure 3]

The welfare impacts of trade liberalization of the commodities analyzed are provided in Table 3. Consumers of the listed commodities would gain from free trade even though the magnitude of surplus increases varies across commodities. Consumers of rice and raw sugar gain the most with estimates being $15.8 billion (when the price elasticity of total rice demand is assumed at –0.1) to $42.4 billion (when this elasticity is assumed at –0.5) for rice, and $6.02

[7] The price elasticity of demand for beef in Japan was estimated as –1.32 by Obara, McConnell, and Dyck (2010) during the period from 1981 to 2007. The estimate by Thompson (2004) was –1.28 during the period from 1981 to 2000. Estimates used by Hayami (1979) were –1 and –1.5, and those by Anderson (1983) were –1, –1.25, and –1.5. It is reasonable to assume price elasticity of demand for beef to vary between –1 and –3.

[8] Elasticity assumptions are based on various research documentations.

billion (when the price elasticity of raw sugar supply is assumed at –0.5) to $16.0 billion (when this elasticity is assumed at –1) for raw sugar. However, all producers would become losers after free trade. In total, the producer surplus loss would range from $11.7 billion to $13.2 billion depending on different price elasticities of domestic supply of these commodities. Japanese rice producers would suffer the most after free trade, with the annual loss ranging from $6.37 billion (when the price elasticity of domestic supply is assumed at 0.5) to $7.69 billion (when this elasticity is assumed at 0.25). Japanese beef producers would be confronted with the second largest annual loss, followed by pork producers. The annual loss for beef producers is estimated at $2.22 billion (when the price elasticity of domestic beef supply is assumed at 1) to $2.27 billion (when this elasticity is assumed at 0.5). Pork producers' annual loss is estimated to be around $1.9 billon.

Annual estimated losses to producers of butter, wheat, barley, and raw sugar are much smaller than those to producers of rice, beef, and pork. One of the reasons is that the sectors of butter, wheat, barley, and raw sugar are smaller than those of rice, beef, and pork. Another reason is that import ratios of total consumption vary largely across commodities. For example, Japan produces almost 100 percent rice for its own consumption, but heavily relies on wheat imports since it only produces 9 percent of the total wheat demand. The government welfare changes are all negative except for butter. The net gain from free trade can be considered as a protection cost or a measure of the degree of trade distortion. In this regard, barley is the least distorted commodity, while beef, rice, and raw sugar are the most distorted commodities.

[Insert Table 3]

As shown in Table 3, net gains result from free trade since consumer surpluses would be greatly expanded. Losers of free trade are producers who have powerful agricultural interests in Japan. Unfortunately, for free trade to be achieved in Japan, these losers will have to be compensated, or they will try to block free trade. However, without the tariff revenue or resale revenue, it would be highly difficult for the government to support domestic producers at the same level before free trade.

5.3 Sensitivity tests

The estimates of the welfare impact from trade liberalization on protected commodities will be affected not only by the assumed price elasticities of domestic supply and total demand, but also by the their world market prices. The domestic price would generally stay relatively stable due to

the protection requests of special agricultural interests, but world market prices may fluctuate greatly. For instance, in Figure 4, the world sugar price has been decreasing since 2011. If the world sugar price continues to decrease in 2015, a larger markup would be needed to keep Japan's domestic price stable, which means the Japanese government resale revenue would be higher in 2015. In Figure 6a, if sugar trade liberalization is reached at a lower international price, P', in 2015 with imports still being restricted at $(Q_2 - Q_1)$, the government revenue loss after trade liberalization would be $abih$, the producer surplus loss would be $P_1P'ga$, and the consumer gain would be $P_1P'jb$. In other words, the changes in the government revenue loss, the producer surplus loss, and the consumer surplus gain would increase by $efih$, $P_wP'gd$, and $P_wP'jc$, respectively. Therefore, the net welfare impact will be a gain of $(agh + bij)$ which is larger than that under the relatively higher price used in estimations of free trade welfare impact for 2014.

[Insert Figure 4]

Another case could be that the world market price keeps rising, such as the world market price of beef over the ten-year period from 2005 to 2014 (Figure 5). In Figure 6b, suppose the average beef price of 2015 in the world market increases from P_w to P'. Even though the domestic beef production and beef price are maintained at Q_1 and P_d, respectively, total demand and thus imports would decrease due to a higher international price. Imports would decrease from $(Q_2 - Q_1)$ to $(Q_7 - Q_1)$ so the government tariff revenue would be reduced due to less imports. This means that the government revenue loss would be smaller after free trade. At the same time, the consumer surplus gain would also be smaller because of less total demand which would be Q_7 in 2015. The net welfare gain from trade liberalization would become $(cij + nkl)$, which is smaller than that under a lower international price used in estimations for 2014.

[Insert Figure 5]

If the assumption of Japan being a small country facing a perfect elastic foreign supply curve is relaxed, the Japanese government would be able to collect optimal tariff or resale revenue from imports (Schmitz et al., 2010). As shown in Figure 6c, the free trade world price is P_w when the excess demand is equal to the excess supply. By imposing tariff or tariff rate quota to support domestic price at P_1, the optimal tariff or resale revenue collected by the Japanese

government would be $P_1P'ab$ (Figure 6c). After trade liberalization, the net welfare change would be a gain of ($agh + bij$), which is greater than that under the small country assumption (Figure 6a). Thus the welfare impact of free trade would be underestimated in Table 3 if it is assumed that Japan is a large importing country.

[Insert Figure 6]

6. Japan's concessions under the concluded TPP

Japan's concessions on non-sensitive agricultural products are the most obvious. Japan will eliminate tariffs for virtually all vegetables and fruits (USDA/FAS, 2015a). For the five sensitive categories, Japan made comparatively less but still unprecedented concessions. The least concessions that Japan has made are in the rice sector. The original tariff system for rice imports remains in place, but Japan will establish a new country-specific-quota (SCQ) for the U.S. rice of 50,000 tons, which is a quarter of what the United States demanded. Tariff elimination is also not possible for the other four categories, but tariff rates will be lowered as documented in the United States Department of Agriculture, Foreign Agricultural Service (USDA/FAS, 2015b):

> *Japan's 38.5-percent tariff on fresh, chilled, and frozen beef will be cut by 77 percent over 15 years. Japan will eliminate almost 60 percent of its pork and pork product tariffs within 11 years and on nearly 80 percent within 16 years. Japan will eliminate many of its tariffs on cheese in 16 years and all tariffs on whey in 20 years. Other farm products will receive preferential access within new tariff-rate quotas (TRQs), which provide access for a specified quantity of imports at a preferential tariff rate, generally zero. Products exported to Japan that will benefit from these new TRQs include: barley, wheat products, dairy products, sugar-containing products, whey, butter and milk powder.*

Conclusions

This study investigates Japan's specially protected agricultural products and identifies trade distortions in the related agricultural industries. Specifically, domestic support programs and border measures, including tariffs and TRQs, are discussed for the seven commodities in the five sensitive categories. With regard to the concern that GMOs delayed the TPP trade agreement

between the United States and Japan, we find that trade barriers from GMOs do not exist in the five sensitive categories. Also, Japan's high tariff rates on processed sweeteners and oils derived from GM varieties of corn, soybean, and canola are not due to their GM traits, but rather to the outcome of rent-seeking activities from domestic processing industries.

This paper recognizes that the welfare impact analysis of free trade is critical to explain why Japan has been tough against increasing its agricultural imports from the United States. Our estimates of the welfare impact of free trade show that, for the seven sensitive commodities in Japan, all consumers would gain between $30.6 billion and $71.8 billion, with rice consumers gaining the most ($15.8 billion to $42.4 billion). All producers would loss from $11.7 billion to $13.2 billion. Japanese rice producers would lose the most from free trade with the annual loss ranging from $6.37 billion to $7.69 billion. Japanese beef and pork producers face the second and third largest annual losses, respectively: the annual losses range from $2.22 billion to $2.27 billion for beef producers and around $1.90 billion for pork producers. The government welfare changes are negative for all commodities, except butter; and the government welfare loss is $5.41 billion. Due to the large consumer welfare gains, the net gains of free trade are positive and range from $11.9 billion to $54.0 billion.

As indicated in the TPP trade agreement which was concluded on October 5, 2015, Japan made unprecedented concessions regarding its agricultural market access. These concessions inevitably undermine the economic welfare of the special interest groups, who will in all likelihood impede the ratification of the TPP agreement unless they are compensated for their losses. Realizing this fact, the Japanese government intends to have an overall outline for countermeasures by year-end[9].

Certainly, the TPP involves not only the United States and Japan, but also the other ten TPP countries (Australia, Brunei, Canada, Chile, Malaysia, Mexico, New Zealand, Peru, Singapore, and Vietnam). Mexico and Canada, for instance, delayed the TPP deal at the ministerial meeting in Maui, Hawaii, in July 2015, because of a dispute with Japan over automotive market access rules. However, this is beyond the scope of this research. We focus only on Japan's agricultural sector and provide empirical evidence on Japan's high protection regarding its agricultural sector.

[9] Japan in Depth / TPP farm measures: offensive or defensive? http://the-japan-news.com/news/article/0002484728

There are limitations in this study. First, the accuracy of the empirical estimates of the free trade impact on Japan's agricultural sector is subject to the accuracy of price elasticities of both demand and supply. Second, we do not account for the market differentiation that may exist for some commodities. For instance, Japan's beef market is highly differentiated. Also, Japan's wheat and barley markets are differentiated based on different usages of these two crops: food uses or feed uses. Thus the lower and upper bounds of the final welfare estimates could be biased. Finally, in the categories of dairy products and sugar, we use butter and raw sugar as the representative commodities, respectively. Future extensions could take into account more food items in each category to better identify trade distortions in these categories.

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Table 1. Top Three Agricultural Exporters and Their Market Shares in Japan

	Top three exporters and their market shares in Japan			ROW shares
Rice	United States (56.9%)	Thailand (26.1%)	China (9.9%)	7.10%
Wheat*	United States (57.2%)	Canada (23.1%)	Australia (18.8%)	0.90%
Barley*	Australia (54.5%)	Canada (26.6%)	United States (14.2)	4.7%
Beef	Australia (69.0%)	United States (18.7%)	New Zealand (6.7%)	5.60%
Pork	United States (42.1%)	Canada (19.5%)	Denmark (15.9%)	22.50%
Sugar	Thailand (51.7%)	Australia (27.7%)	South Africa (7.2%)	13.40%
Dairy products	Australia (27.5%)	United States (23.4)	New Zealand (23.3%)	25.80%

*Total imports of wheat and barley for both food and feed uses.

Shares of each exporter are calculated based on ten-year average quantity imports from 2005 to 2014, except for barley. Barley exporters' shares are for the 2013/2014 market year. Data Source for barley: Japan Grain and Feed Annual, 2015; for others: United Nations Commodity Trade Statistics, United Nations Statistics Division

Table 2. Japan's Protections and Supports for Major Agricultural Commodities

	Tariff (simple or in-quota)	TRQ (illustrative over-quota tariff)	Safeguard (Japan-specific)[1]	Mark-up[2]	Special issue	Domestic support[3]	Japan's share of TPP supply quantity
	Percent unless otherwise indicated	*Percent unless otherwise indicated*					*Percent*
Beef	38.5		X			X	2.7
Pork	4.3		X		Gate price	X	7.3
Poultry meat	3–11.9						5.2
Rice, short/ medium	0	341 yen/kg		X		X	74.6
Wheat	0	55 yen/kg		X		X	0.6
Barley	0	39 yen/kg		X		X	0.8
Sugar, refined	21.5 yen/kg				Surcharge (62.4 yen/kg)		n/a
Sugar, raw	0			X	State trader control	X	3.8
HFCS	Greater of 50% or 25 yen/kg			X	State trader control		n/a
Butter	35	29.8 + 985 yen/kg		X		X	2.7
NFDM	0–35	21.3 + 396 yen/kg		X		X	8.3
WMP	30	25.5 + 612 yen/kg		X		X	1
Whey	0–35	29.8 + 425 yen/kg		X			n/a
Cheese	0–40	29.8				X	0.8
Yogurt	21.3–35	29.8 + 915 yen/kg		X			n/a
Soybean	0					X	0.2
soy processed food	7.2–10.6						n/a
Corn	0						0
Corn for starch	0	Greater of 50% or 12 yen/kg					0
Canola seed	0						n/a
Potato, fresh	4.3					X	7.7

kg =kilogram; n/a= not available; TRQ= tariff-rate quota; TPP= Trans-Pacific Partnership; NFDM= nonfat dried milk powder; WMP= whole milk powder; HFCS= high fructose corn syrup.
[1]Safeguard agreed upon in a side agreement to the World Trade Organization, Uruguay Round Agreement, 1995. [2]Markup is the maximum amount in yen that state trading enterprises may add to commodities purchased within a tariff-rate quota according to Japan's schedule submitted as part of the Uruguay Round Agreement, except for raw sugar, for which the markup is determined by Japan's Law on Sugar Products. [3]For domestic support descriptions, see text.
Sources: Dyck and Arita. Japan's Agri-Food Sector and the Trans-Pacific Partnership, EIB-129, USDA, Economic Research Service, October 2014.

Table 3. Annual welfare impact of trade liberalization, 2014 (U.S. dollars)

	Producer surplus loss	Consumer surplus gain	Government welfare change	Net gain
Beef	2.22bn (Es=1) ~ 2.27bn (Es=0.5)	4.09bn (Ed=–1)~ 8.18bn (Ed=–3)	–868m	954m (Es=0.5, Ed=–1) ~ 5.09bn (Es=1, Ed=–3)
Pork	1.88bn (Es=1) ~ 1.89bn (Es=0.5)	3.31bn (Ed=–0.5) ~ 3.33bn (Ed=–1.5)	–1.42bn	7.98m (Es=0.5, Ed=–0.5) ~ 26.4m (Es=1, Ed=–1.5)
Butter	491m (Es=1) ~ 492m (Es=0.5)	124m (Ed=–0.5)~ 159m (Ed=–1.5)	384m	16.2m (Es=0.5, Ed=–0.5) ~ 51.9m (Es=1, Ed=–1.5)
Rice	6.37bn (Es=0.5) ~ 7.69bn (Es=0.25)	15.8bn (Ed=–0.1) ~ 42.4bn (Ed=–0.5)	–1.05bn	7.08bn (Es=0.25, Ed=–0.1) ~ 34.3bn (Es=0.75, Ed=–0.5)
Wheat*	104m (Es=0.75) ~ 114m (Es=0.25)	1.09bn (Ed=–0.5) ~ 1.59bn (Ed=–1.5)	–822m	151m (Es=0.25, Ed=–0.5) ~ 666m (Es=0.75, Ed=–1.5)
Barley*	10.6m (Es=0.75) ~ 11.6m (Es=0.25)	123m (Ed=–0.5) ~ 180m (Ed=–1.5)	–94.3m	17.0m (Es=0.25, Ed=–0.5) ~75.2m (Es=0.75, Ed=–1.5)
Raw sugar	632m (Es=0.75) ~ 770m (Es=0.25)	6.02bn (Ed=–0.5) ~ 16.0bn (Ed=–1)	–1.54bn	3.71bn (Es=0.25, Ed=–0.5) ~ 13.8bn (Es=0.75, Ed=–1.5)
Total	11.7 bn ~ 13.2 bn	30.6bn ~ 71.8bn	–5.41bn	11.9bn ~ 54.0bn

Es denotes the rice elasticity of domestic supply; Ed denotes the price elasticity of total demand. Estimation results are rounded to three significant digits. The annual average exchange rate is 106 yen per U.S. dollar in 2014. The producer surplus loss are reported in absolute values. The government welfare change is negative if it is a loss; positive, if it is a gain.

*Both food and feed wheat and barley are included; the average markup ratio in 2014 is assumed at 1.5 for wheat and barley, 5 for rice, and 3.8 for sugar based on their domestic prices and international reference prices in 2014.

Data source: Japan Livestock and Products Annual, 2014, GAIN Report Number: JA4023; Japan Dairy and Products Annual, 2015, GAIN Report Number: JA4034; Japan Grain and Feed Annual 2015, GAIN Report Number: JA5009

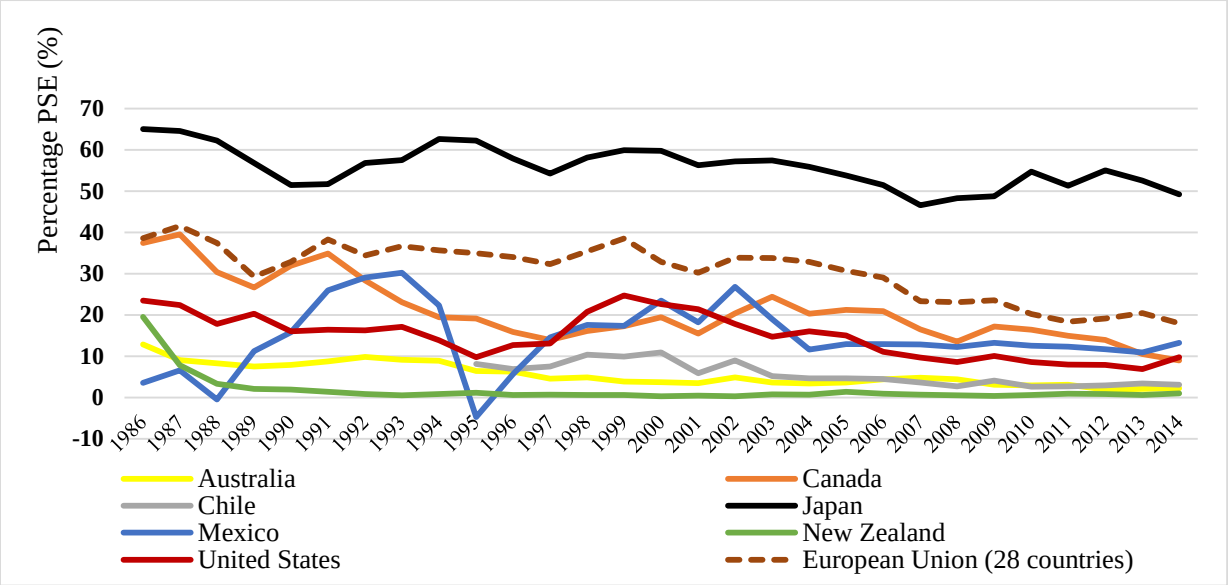


Figure 1. Producer support estimates for selected TPP markets and the EU, 1986–2014

Data source: OECD (2015).

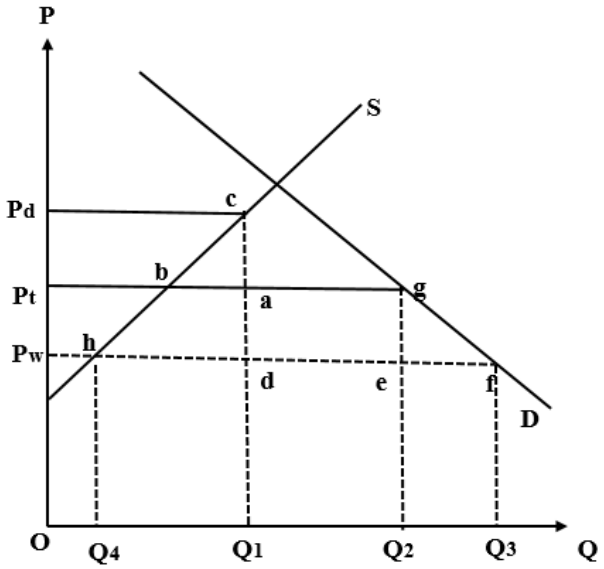


Figure 2. Effects of the TPP in beef, pork, and butter imports

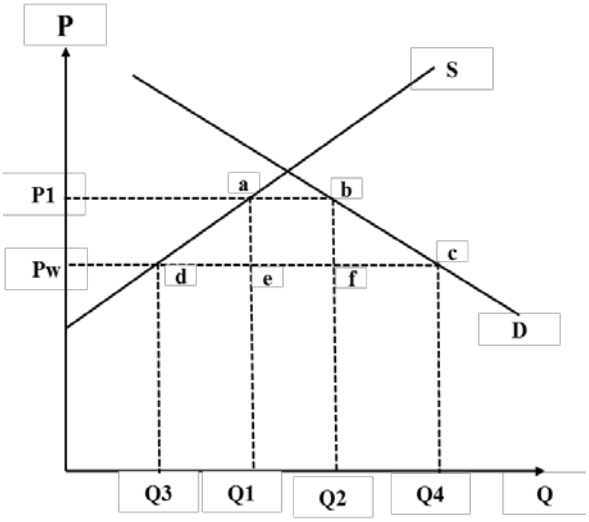


Figure 3. Effects of the TPP in rice, wheat, barley, and raw sugar imports

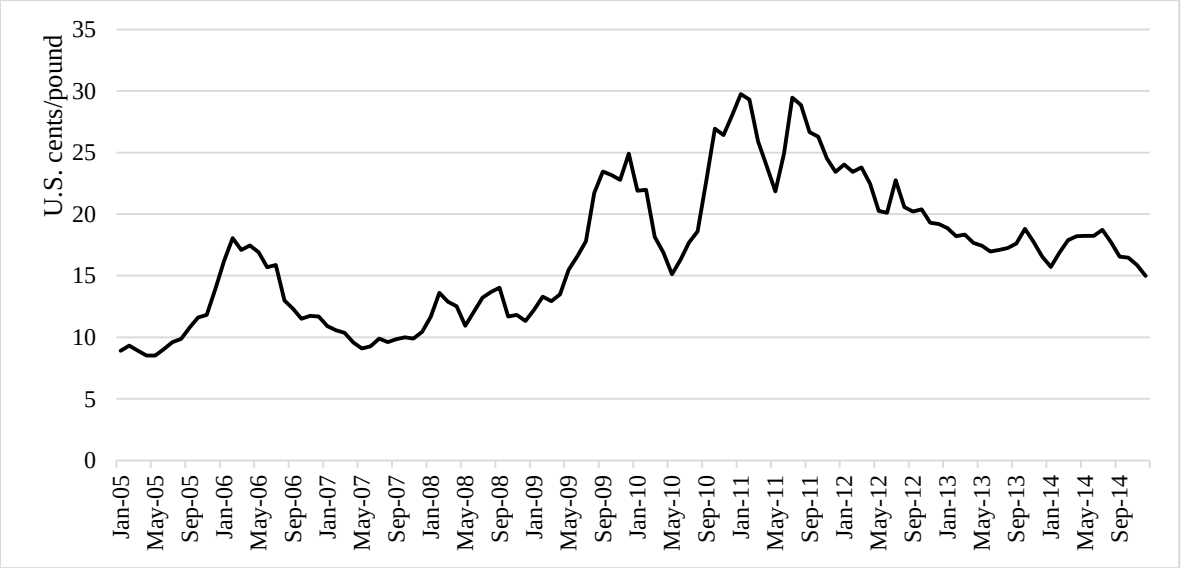


Figure 4. World market sugar price

Data source: Sugar, Free Market, Coffee Sugar and Cocoa Exchange (CSCE) contract no.11 nearest future position. www.indexmuni.com

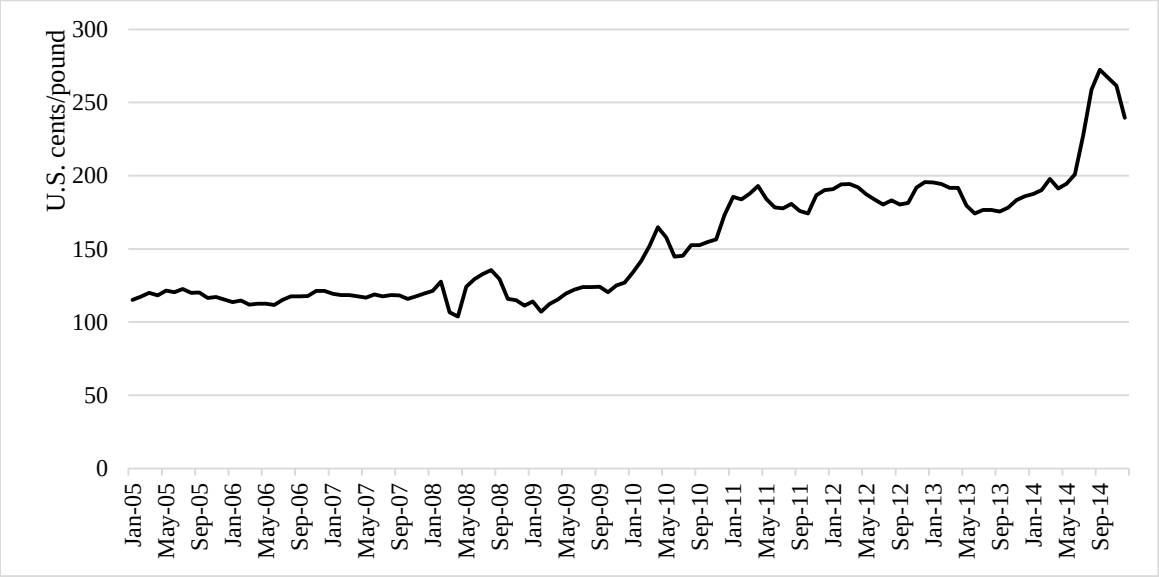


Figure 5. World market beef price

Data source: USDA Market News (2014).

Figure 6a

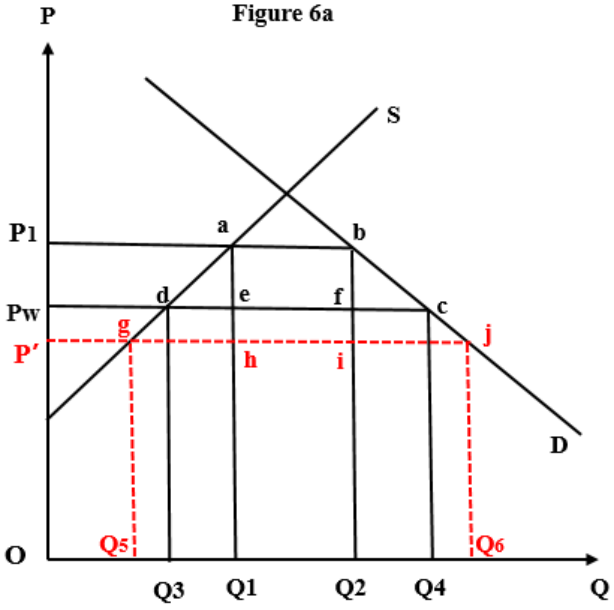
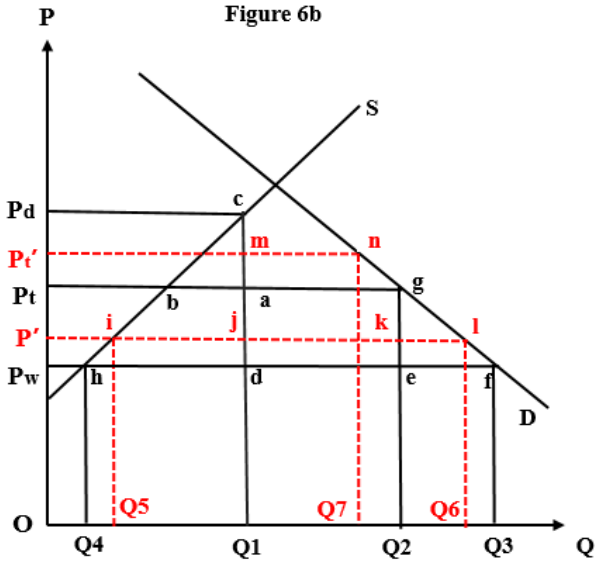


Figure 6b



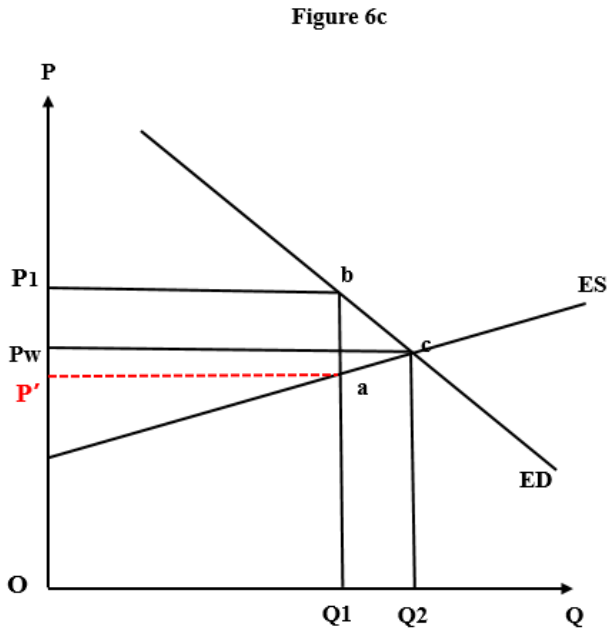


Figure 6. Sensitivity test of welfare impact of trade liberalization