Food Policy 36 (2011) 368–377

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Does agricultural trade liberalization increase risks of supply-side uncertainty?: Effects of productivity shocks and export restrictions on welfare and food supply in Japan

Tetsuji Tanaka [a], Nobuhiro Hosoe [b,*]

[a] School of Oriental and African Studies, University of London, Thornhaugh Street, Russell Square, London WC1H 0XG, United Kingdom
[b] National Graduate Institute for Policy Studies, 7-22-1 Roppongi, Minato, Tokyo 106-8677, Japan

ARTICLE INFO

Article history:
Received 3 March 2010
Received in revised form 7 December 2010
Accepted 19 January 2011
Available online 22 February 2011

Keywords:
Agricultural trade protection
Food security
Productivity shocks
Food self-sufficiency rate
Emergency stocks

ABSTRACT

Agriculture is the focus of much contention in free trade negotiations. The Japanese government is against liberalizing the rice trade on the grounds that it would threaten "national food security" in the events of such shocks as crop failure and embargoes. Trade liberalization is expected to make the Japanese economy more dependent upon food imports and, thus, more susceptible to these risks. Using a computable general equilibrium model with a Monte Carlo simulation, we quantify the welfare impacts of productivity shocks and export quotas by major rice exporters to Japan and found little evidence of Japan suffering from such shocks.

Introduction

The agricultural sector in developed countries has been the central target of reform in multilateral trade negotiations led by the World Trade Organization (WTO) and bilateral free trade arrangements. Japan did not have an active role in those negotiations, although the benefits of free trade were immense as suggested by, for example, Anderson et al. (2006). The interested parties in Japan—farmers, politicians, and the Japanese Government, more specifically the Ministry of Agriculture, Forestry, and Fisheries (MAFF)—have called for protection and exceptional treatment for this sector, particularly for rice farming, every time new trade negotiations have been launched. Their reasons are twofold. One is the "multifunctionality" of the agricultural sector, which appreciates the (positive) externalities of agricultural activities such as protection of natural environments, rural scenery, culture, and so on, studied by the Science Council of Japan (2001). The other reason, discussed here, is "national food security"—concerning uncertainty in the food supply, which can be jeopardized by unforeseen supply-side shocks such as bad crops, war, and embargoes.[1] MAFF stresses the promotion of domestic production to secure food supply, which is often subject to these risk factors, while considering importation as a secondary source, as the Basic Law on Food, Agriculture and Rural Areas (the Basic Law, hereinafter) states.

The concern about food supply sounds like a reasonable justification for protection in an age of uncertainty, considering the fact that Japan's food self-sufficiency rate is a mere 40%, measured on the basis of calories, which is a significantly lower rate than those of other major developed countries. While this low food self-sufficiency rate is a result of the outstanding comparative advantage of Japan's industrial sectors, it can make the Japanese economy susceptible to food shortages caused by the aforementioned shocks. In fact, bad weather in 1993 reduced the country's rice harvest by 26% compared with the average yield, the second worst year on record since 1926.[2] There was a soybean embargo because of a serious crop failure in the US in 1973 and a grain embargo in response to the USSR's invasion of Afghanistan in 1980.

[1] The focus of Japan's national food security is slightly different from that of the popular concept of food security. The former is set on food security in contingency in the developed economy of Japan, the latter on food security in developing economies, which are vulnerable to shocks because of their continuing poverty in the short run and poor capability of feeding rapidly growing populations in the long run. Hayami (2000) discussed their difference in detail.

[2] The worst decline of 33% occurred in 1945.

* Corresponding author. Tel.: +81 3 6439 6129, fax: +81 3 6439 6010.
E-mail addresses: 227009@soas.ac.jp (T. Tanaka), nhosoe@grips.ac.jp (N. Hosoe).

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doi:10.1016/j.foodpol.2011.01.002

National food security and Japan's agricultural policy

Excessive dependency on imports for food supply is considered a risk factor for Japan's national food security. MAFF (2006) established a contingency plan to secure food supplies for domestic consumption in emergencies. This plan was put into place to achieve national food security as defined in the Basic Law, which had been revised the year before. MAFF defined 2000 kcal/person/day (about 20% less than usual) as the minimum calorie intake. The plan included several measures to secure the calorie intake, such as promoting domestic production, managing emergency stocks, and controlling food markets. Among the crops, rice has been the most important commodity for Japan. In 2004, rice comprised 23% of the population's total calorie intake, followed by wheat, which contributed 13% of the total. The government keeps large emergency stocks of rice and other major crops to secure the food supply, while making continuing efforts to increase the country's food self-sufficiency rate.

High trade barriers on rice have played an important role in the achievement of an almost perfect self-sufficiency rate for rice. Proponents of these trade barriers argue that they are necessary to maintain the overall self-sufficiency rate of food because the supply of other foods depends heavily on imports. Even though trade theories imply gains from trade, proposals for free rice trade have never been accepted in Japan because free trade lowers the food self-sufficiency rate, and thereby increases the dependency of the food supply on imports, which is supposed to make the food supply less secure.

The impact of agricultural trade liberalization is twofold: (1) deterministic gains from trade achieved through the removal of trade barriers and (2) stochastic gains and losses caused by productivity shocks, whose magnitude can be exacerbated or mitigated depending on the level of trade openness. Researchers have often analyzed the first aspect of trade liberalization but have rarely examined the second aspect. This lack of analysis of the second aspect leads to people being uninformed and triggers their opposition to trade liberalization, simply because trade liberalization is generally believed to make the domestic economy susceptible to shocks from abroad.

The rice trade and its barriers

Japan has strictly prohibited imports of rice but permitted minimum access (MA) imports of rice in 1995 and their tariffication in 1999 as a part of the WTO Uruguay Round agreement. The imports account for only 10% of domestic production because of prohibitively high trade barriers. If this trade barrier is abolished, imports are expected to have a very high share in the total rice supply as suggested by previous studies, for example, Cramer et al. (1993) and Wailes (2005).

Japan's rice consumption is comprised mainly of mid- or short-grain rice (so-called japonica rice), rather than long-grain rice (indica rice). The former is strongly preferred in East Asian countries while the latter type is popular elsewhere in Asia and in other regions. Japan's rice trade patterns reflect this preference. Japan's three major rice trade partners (China, the US, and Australia) produce japonica rice and expect to increase their exports to Japan after the rice trade is liberalized.

As rice in many countries is mainly produced and consumed domestically, its international trade is thin. Only a small fraction of production is exported and imported internationally unlike wheat, maize, and so on. The top 10 rice producing countries, many of which are in Asia, cover almost 90% of the world's total production of rice. Their production fluctuates with weather conditions, including droughts, cool summer days, and cyclones/typhoons. While productivity has an upward-sloping trend, it sometimes shows sudden drops (see Fig. 1).

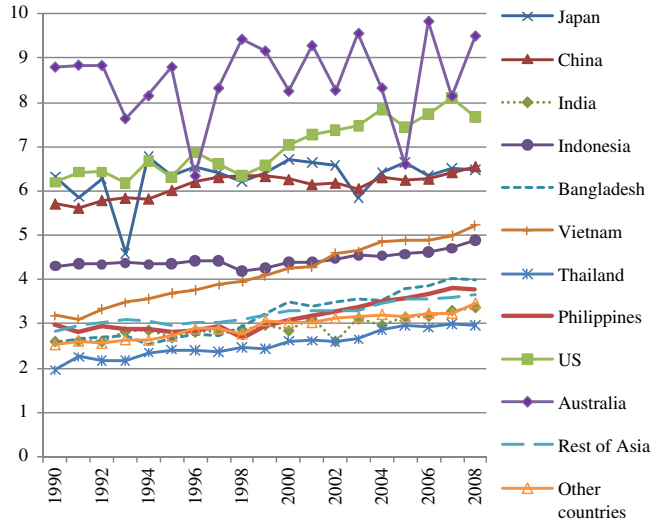

Fig. 1. Productivity fluctuations of paddy rice. [Unit: tons/hectare].

Once Japan's rice market is liberalized, any shocks in the domestic and foreign markets will directly affect its food supply. Furthermore, taking into account Japan's strong preference towards japonica rice, the international market seems much less reliable as an alternative supply source. Therefore, it might seem a reasonable idea that national food security can only be established by protecting the domestic rice market in order to maintain the self-sufficiency rate of food, rather than by depending on foreign supply sources.

Literature review

The majority of existing studies on Japan's rice trade liberalization have been conducted from a deterministic viewpoint. Cramer et al. (1999) developed a 22-country world rice trade model and found that Japan would import three million tons of rice (about one-third of domestic consumption) with an 8% annual tariff reduction after tariffication. In their conclusion, they suggested that food security could be improved by increasing accessibility to international markets, rather than through protection. However, they did not explicitly consider whether the international markets could be reliable, considering fluctuating productivity inside and outside of Japan.

Using a spatial equilibrium model, Cramer et al. (1993) found that the removal of direct and indirect rice trade barriers in all countries would lead to increases in Japan's rice imports by about 5 million tons. Wailes (2005) conducted a similar but updated analysis on the elimination of tariffs and export subsidies and found that the increase in rice imports would be about 2 million tons. Overall, these results indicate that free rice trade would lead to imports into Japan constituting as much as 20–50% of domestic consumption. Through these imports, foreign-made shocks would affect the Japanese economy.

On the other hand, there are only a few studies that have examined agricultural trade liberalization from the view of national food security. Hosoe (2004) developed a world trade computable general equilibrium (CGE) model to evaluate the impact of Japan's domestic productivity shock in 1993 on its own economy under rice price controls and the impact of Japan's emergency rice imports on other countries. The productivity shock was assumed to be deterministic in the sense that its magnitude was calibrated to reproduce that historical event in 1993. Most recently, Maeda and Kano (2008) examined the effect of an international rice reserve system to stabilize rice markets, using a spatial equilibrium