

# **Distortions to Agricultural Incentives in Korea and Taiwan**

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The story of agricultural policies over the past 50 years in the Republic of Korea (the southern part of the peninsula, hereafter referred to as Korea) and the island of Taiwan, China (hereafter referred to as Taiwan) is indicative of the dramatic changes in distortions to agricultural incentives that producers and consumers face at different stages of economic development. In this study we estimate the degree of distortions for key agricultural products, as well as for the agricultural sector as a whole over a period when these economies transitioned from low- to high-income economies (1955 to 2004).

Schultz (1978) established that as economies advance from low-income to high-income stages, price and trade policies tend to switch from taxing to subsidizing agriculture relative to other tradable sectors. During the 50 years of our analysis, Korea and Taiwan jumped from the status of low-income to middle-income economies and towards high-income economies. Policy switching — shifting from negative to positive assistance to agricultural producers in the course of economic development — is clearly observable from the time series of these two economies.

We compare the switching processes of Korea and Taiwan — whose economies grew at about the same speeds — to obtain insights into the effects of policies and underlying economic causes of the changes in agricultural incentive distortions. Our findings shed light on the process of how agricultural distortions may change over different stages of economic development.

In the following sections, first we briefly characterize the structure of agriculture in Korea and Taiwan in the course of their economic development. Next, the evolution of their agricultural policies is reviewed. Distortions to agricultural incentives in Korea and Taiwan are measured in terms of the nominal and relative rates of assistance to agriculture (NRAs and RRAs, respectively). Subsequently, we discuss the policy implications of the estimates in the two economies and draw lessons for less-developed economies that are currently experiencing structural transformation in the course of their economic growth.

## **Economic development and structural changes**

The choice of agricultural policies, particularly price-distorting policies, is closely related to the process of economic development. As identified by Schultz (1978), there are two agricultural problems — “the food problem”— that underlie policies commonly adopted in low-income countries that exploit or tax agriculture. These policies contrast to the policies that protect or subsidize agriculture in many high-income countries seeking to solve “the farm problem”. Schultz’ hypothesis became an established paradigm among agricultural economists, finding support in several empirical studies (Anderson and Hayami 1986; Hayami 1988; Krueger, Schiff and Valdes 1991). More recently, Hayami (2005) and Hayami and Godo (2004) have added “the disparity problem” as specific to middle-income economies. They suggest it is important to see how distortions in agricultural incentives change in all three types of economies over their different stages of development.

The most distinguishing characteristic of Korea and Taiwan during the period of analysis is their unusually rapid rates of economic growth based on the success of industrial development. Indeed, in the so-called East Asian Miracle (World Bank 1993), while Japan was first, Korea and Taiwan, together with Hong Kong and Singapore, comprised the second runner-up group, and the ASEAN nations and China are now following them. Since economic growth is a fundamental determinant of the nature of distortions to agricultural incentives, it is useful to advance in this section an overview of development processes in Korea and Taiwan.

### ***A Historical perspective***

Regular monsoon rain, together with mountainous, undulated topography in which water can be controlled relatively easily through cooperation at the family and community levels, made this region well suited to rice production by small family farms organized into village communities. The agrarian structure was characterized by a uni-modal distribution of smallholders operating farms on an average plot of about one hectare. In comparison to Southeast Asia, large agribusiness plantations based on hired labor were almost completely

absent not only in Korea, located in the temperate zone, but also in Taiwan where tropical cash crops such as sugar and banana comprise a significant sub-sector of agriculture. The rural community was traditionally stratified across landlords, land-owning cultivators and landless tenants. Agricultural laborers subsisting on hired labor wages were not a significant component of the rural population in this region. Land reforms after the Second World War significantly changed the distribution of land ownership, but the distribution of operational land holdings remained essentially intact.

There is a high degree of similarity in the agrarian structures of Korea and Taiwan, due in part to the fact that Japan brought its institutions to its colonies: Taiwan conceded from China to Japan in 1895 and Korea was annexed to Japan in 1910. The biggest reform from Japanese colonization was the granting of fee simple titles to land owners through cadastral surveys in return for their commitment to pay land tax. Japanese efforts to develop the colonies concentrated on agriculture, especially on rice when the shortage of relative supply within Japan became evident after the so-called Rice Riot in 1918. The promotion of rice production through agricultural research and extension systems, and irrigation and drainage infrastructure, plus protection from rice imports from the rest of the world (see Anderson and Tyers 1992), was considered a major success from Japan's viewpoint in that its rice imports from the two colonies increased from 5 to 20 percent of consumption in Japan between 1915 and 1935.

The increased export of rice and other primary commodities and the corresponding inflows of manufactured commodities meant dependency on agriculture remained high in the Korean and Taiwan economies. This was especially so in South Korea because Japanese industrial development efforts in Korea were concentrated in the north in order to exploit the hydro electric power of the Yalu River and feed the complex of chemical industries, which was larger than those in Japan. The heavy dependency on agriculture in the south was furthered by urban destruction during the Korean War (1950-53). In Taiwan, commerce and industry were more active because the relatively larger cash-crop sector required larger amounts of processing and marketing activities relative to Korean agriculture which was dominated by subsistence crops such as rice and barley. Today, the wide dispersion of small and medium industries in rural areas in Taiwan contrasts with the concentration of Korean industry in large-scale establishments in urban areas, and seems to be, at least in part, rooted in such tradition.

This is not the place to discuss why Japan, Korea and Taiwan were able to achieve remarkable success in economic development as forerunners in the East Asian Miracle.<sup>1</sup> Here it suffices to say that their success was due to borrowed technology from advanced economies. Gerschenkron (1962) suggested that the later the start of industrialization, the larger the scope for economic growth through the borrowing of technology. Why then were Korea and Taiwan in particular so successful in such borrowing among many late starters? One reason is that Korea and Taiwan were endowed with cheap but relatively well-educated labor, due to the diffusion of compulsory elementary education systems during the colonial period. This made the initial borrowing of labor-intensive industrial technologies more rewarding in these resource-poor economies. The continued accumulation of human capital through newly independent governments' education investments smoothed the way for later switching to capital/knowledge-intensive technologies. Another reason was the constant danger of communist aggression, which compelled their leaders to adopt policies to achieve economic success for the sake of maintaining their legitimacy. In addition, the success of development based on industrial technology borrowing in their neighbor Japan motivated them to adopt this strategy.

Despite much similarity, some significant differences in the industrialization strategy between Korea and Taiwan are worth noting. In Taiwan, although the Nationalist Party strongly controlled formal sectors, the government intervened little in the activities of small/medium entrepreneurs in informal sectors. Informal sectors were able to grow by developing various marketing and financial linkages among themselves and with foreign firms. These enterprises dispersed widely over both urban and rural areas and were able to achieve high international competitive strength (Ho 1979, 1982). In contrast, the government control in Korea was stronger and more complete, especially under the military administration of Pak Chong-hui (1961-79). All formal credits were channeled from nationalized banks to large industries, while foreign direct investment was tightly controlled. Such a strategy underlay the high concentration of industrial production in a small number of large enterprises predominantly located in the urban areas of Korea (Cole and Park 1983, Amsden 1989).

### ***Economic growth and structural transformation***

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<sup>1</sup> For our perspective on such a question, see Hayami and Godo (2005, Section 8.4) and Hayami and Aoki

We now turn to a quantitative summary of economic development in Korea and Taiwan in the past five decades. Table 1 shows some indicators of economic development: the first three rows indicate real GDP per capita in 2000 constant prices at purchasing power parity (PPP) in Korea and Taiwan, which are taken from Heston, Summers and Aten (2006). Until 1960, Korea and Taiwan stayed at a low level of per capita GDP below \$1,500. Thereafter, their income levels rose rapidly exceeding \$2,500 in the 1970s, \$5,000 in the 1980s and \$10,000 in the 1990s.<sup>2</sup> Their economic growth paths were largely parallel but, after 1960, Taiwan went slightly ahead with a lead of about five years.

It is convenient to classify the development of the two economies into 4 stages as follows:

- Low-income stage (\$1,500 or less): before 1960;
- Lower middle-income stage (\$1,500-\$5,000): 1960-80;
- Upper middle-income stage (\$5,000-\$10,000): 1980-90; and
- High-income stage (\$10,000 or more): after 1990.

The criteria of classification are not universal but are tentatively adopted for the sake of comparison of the economies' development processes.<sup>3</sup>

Although Korea and Taiwan experienced similar changes in per capita real GDP over the four stages, significant differences can be observed in their economic structures. The GDP share of agriculture in 1955 in Korea was nearly 50 percent whereas in Taiwan it was below 30 percent. This reflects Korea's higher dependency on agriculture. In both countries, the share of agriculture in GDP declined significantly over time — to 3.8 percent in Korea and 1.7 percent in Taiwan in 2004 — although Korea's share remained at nearly double Taiwan's.

Historical differences can be observed in agriculture's shares of the labor force in Korea and Taiwan: in 1955 as many as 80 percent of workers in Korea were employed in agriculture versus about 50 percent in Taiwan. The difference in the share of the labor force employed in agriculture in Korea and Taiwan disappeared over time: in 2004, about 7.7 percent of workers were employed in Korean agriculture versus 7.5 percent in Taiwanese agriculture. Relatively faster declines in the labor force share as compared to the GDP share

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(1998)

<sup>2</sup> To be precise, it was 1983 and 1978, respectively, when Korea and Taiwan exceeded \$5,000 per capita GDP, and it was 1991 and 1988, respectively, when they exceeded \$10,000.

<sup>3</sup> In terms of real GDP per capita in 2000 constant prices, for example, China exceeded \$1,500 in 1990 and \$5,000 in 2004 whereas Thailand passed the \$1,500 level in 1968 and the \$5,000 level in 1991. In the

in Korea reflect the urban concentration of its industries. In Taiwan, there is a wide dispersion of industries over rural areas, and farmers were able to increase their incomes from off-farm employment. While engaging in non-farm activities in much of their time, they continued to be classified as farmers. In contrast, in Korea, rural people had to quit farming and migrate to urban areas to obtain non-farm employment. Such differences are also reflected in the much faster decrease in the share of farm household population in the total population in Korea versus Taiwan.

The last rows in Table 1 report the ratios of agricultural GDP per worker to the total GDP per worker. This can be considered an indicator of the relative labor productivity of agriculture to the total labor productivity of the whole economy in nominal value. It may also be regarded as an indicator of the income gap between the agricultural sector and the whole economy. This measure must be interpreted with care. It declined much faster in Taiwan than in Korea, which may appear to indicate faster growth in agricultural labor productivity in Korea. In fact, however, this apparently faster growth of agricultural labor productivity in Korea relative to Taiwan was due to faster decreases in the farm labor force owing to faster out-migration of farm labor to urban occupations in the former than in the latter. As previously explained, the number of agricultural workers decreased more slowly in Taiwan because they continued farming while increasing the allocation of their labor to non-farm activities. Thus, growth in the labor productivity of farmers engaging in agricultural activities relative to that of other workers would not have been slower and could have been even faster in Taiwan if the ratio was calculated using output per hour of labor instead of output per worker according to the official sectoral labor force classification.

### *Changes in the structures of agriculture*

How did the structure of agriculture in Korea and Taiwan change in the process of economic growth outlined in the previous section? Table 2 shows that in 1955 Korea had 2.2 million farm households accounting for 62 percent of the total population in Korea, while Taiwan had 0.73 million farm households accounting for 51 percent of the total population in Taiwan. The number of farm households in Taiwan has been relatively stable, whereas it has decreased rapidly in Korea. The number of people in farm households in Korea also declined at much faster rates than in Taiwan, resulting from faster decreases in both the number of

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high-income stage, the United Kingdom and France exceeded \$10,000 in 1960 and 1964, respectively, whereas

farm households and the number of persons per household in the former versus the latter. These observations represent further evidence of the scarcity of non-farm employment opportunities in rural areas due to urban-centered industrialization in Korea. Indeed, from 1970 to 2004 the share of agricultural income in the total income of farm households declined from 49 to 22 percent in Taiwan, whereas in Korea it was as high as 76 percent in 1970 and still 39 percent in 2004.

Arable land in Korea increased from about 2 million hectares in 1955 to 2.3 million hectares by 1970, but declined to 1.8 million hectares in 2004. In Taiwan, arable land increased from 0.87 million hectares in 1955 to 0.97 million hectares in 1980, and declined to 0.84 million hectares in 2004.

Changes in farm-size in Korea and Taiwan during the past five decades resulted almost exclusively from changes in the number of farm households. In Korea, the average farm size increased from 0.9 hectares of arable land in 1955 to 1.6 hectares in 2004. Meanwhile the farm size in Taiwan remained almost constant at 1.2 hectares. The much faster increase in the operational farm size in Korea than in Taiwan was the result of the faster out-migration of farm population to urban areas owing to more urban-centered industrialization in Korea.

The distinct characteristic of industrialization in Korea is clearly reflected in its high share of agricultural income in total farm household income. This ratio decreased with increases in off-farm employment for members of farm households. In Taiwan the share of agricultural income was already below 50 percent in 1970, when its economy was in the low-income stage, and it decreased to about 20 percent in the 1990s, when Taiwan approached the high-income stage. By contrast, in Korea, the share of agricultural income in total farm household income was 76 percent in 1970 and still nearly 40 percent in 2004, which is not only higher than in Taiwan but also higher than in Japan at comparable development stages.

Major differences in the adjustments of agriculture to economic growth based on industrial development are also observable in the changes in the commodity mix in farm production. Rice was traditionally the most important crop in both countries and its importance declined as per-capita income increased. However, the changes in the relative importance of rice was different in the two countries. From 1960 to 2004, the share of rice in the total value of agricultural production declined in Korea from 59 to 28 percent. In Taiwan,

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the United States already exceeded \$10,000 in 1950.



the share of rice was originally low at 37 percent in 1960 and decreased more rapidly to only 7 percent in 2004. The difference reflects Taiwan's greater opportunity to grow tropical cash crops. It also reflects its success in achieving greater agricultural diversification toward high-valued commodities such as vegetables, fruits, chicken and pork in response to the shift in demand for more income-elastic commodities.

### **Evolution of agricultural policy**

We now outline changes in agricultural policies over the different stages of development in Korea and Taiwan.

#### ***Korea***<sup>4</sup>

Before 1960 Korea was a low-income country, with per-capita income below \$1500. Its economy was left severely damaged by the Korean War. The agricultural policy adopted in this stage aimed to maintain low domestic consumer prices for staple foods, notably rice and barley, as well as for fertilizer. The Grain Management Law, enacted in 1950, gave the government the authority to regulate the price of staple foods. However, government control was not very effective during the 1950s since the market share of government-controlled rice was less than 10 percent. The government was supposed to purchase grain directly from farmers, but they were unable to purchase sufficient amounts due to budgetary constraints and upward spiraling grain prices due to inflation in the mid-1950s. Schemes to collect rice as land tax in kind and to barter fertilizer for rice were initiated. The former was successful but the latter was not because the implicit price of rice in the barter was lower than the market price. Grain imports from the United States under Public Law 480, which amounted to 8 to 12 percent of total domestic grain during 1956-65, helped the Korean government to keep grain prices low.

In the 1960s, Korea began to launch in a massive way the policies of promoting industrialization under the development autocracy of Pak Chong-hui. Agricultural policies at this time were designed to keep the price of staple food crops low so as to maintain low costs

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<sup>4</sup> This section draws heavily on Moon and Kang (1989).

of living and wage rates for industrial workers, rather than maintaining adequate incomes for farmers. The government purchase prices were below market prices, which were considered necessary for the purpose of increasing industrial profits and capital formation. Over time, the Korean government's price intervention became more intense. The market share of government-controlled rice was expanded to 20-25 percent during the 1960s, which was used mainly for maintaining low domestic prices. These agricultural-taxing policies continued in the beginning of the lower middle-income stage.

As Korea's economy quickly advanced toward the upper middle-income stage, the direction of agricultural policy gradually moved toward supporting farmers. In the early 1970s, the buffer-stock operation for non-cereal products was set in motion for counteracting their price declines. In addition to chemical fertilizers, pesticides and farm machinery were added to the list of subsidized inputs (alleviating the adverse impact on farmers of import protection to manufacturers of those inputs). The government's purchase prices for rice and barley were steadily raised with the aim of increasing food production as well as reducing the urban-rural income gap. Although the government raised the producer prices for staple food grains, it did so without a comparable rise in the market prices of rice and barley in order to prevent the cost of living and the wage rate of industrial workers from rising. Likewise, it assisted livestock producers in part by using import quotas rather than tariffs to protect them from import competition, with the rent from those quotas being captured by the producer-managed meat import agency.<sup>5</sup>

The implementation of the two-price system, however, conflicted with the need to maintain financial and monetary stability. As the difference between the purchase and sale prices of rice and barley widened, the deficit of the grain management fund increased. Since a large portion of this deficit was financed by long-term overdrafts from the Bank of Korea, this policy became a major addition to inflationary pressure. Expansion of the government deficit due to the two-price policy became a serious constraint on the policy.

Upon entering the upper middle-income stage in the 1980s, the Korean government took a step toward reducing both tariff and non-tariff protection for manufacturing industries. In contrast, agricultural policies toward protecting farmers were strengthened. The producer

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<sup>5</sup> This drove a small wedge between the nominal rate of assistance for producers and the consumer tax equivalent for beef (Anderson 1986). This was very similar to the scheme operating in Japan in the 1970s. On why the government chose that scheme rather than a more efficient equally-protective tariff plus a consumer subsidy funded by the tariff revenue is discussed in Hayami (1979) and Anderson (1983b).

prices of farm products were increased to levels far above border prices by means of quantitative import restrictions on most agricultural commodities.

After Korea entered the high-income stage in the early 1990s, significant policy changes in were mostly related to the Uruguay Round Agreement on Agriculture (URAA) stipulated in 1995. According to the provisions of the URAA, all of Korea's quantitative restrictions were converted to tariffs for all agricultural products except rice. In the Uruguay Round negotiations, Korea retained the status of a developing country, which gave it special treatment in implementing commitments to reduce border protection. The agricultural products under tariffication were subject to a protection reduction commitment of 24 percent on average within ten years, with the minimum cut of 10 percent. Tariff rates of Korean agricultural products were over 60 percent on average. Tariffs on products which were considered particularly important in Korea were cut by the minimum rate of 10 percent.

In addition, imports of many agricultural products began under the minimum market access commitment. This commitment required that for all agricultural products, at least 3 percent of consumption must be purchased from overseas in the first year and the import share must increase annually up to 5 percent of consumption within ten years. Low tariff rates were applied to the in-quota volume so as to guarantee easy market access from exporting countries. Many key agricultural products such as rice, barley, orange, red pepper, garlic, and onion began to be newly imported under this commitment.

Rice, the most important item for Korean agriculture, was temporarily exempted from tariffication as provided in Annex 5.B of the URAA. As an exception, rice was subject to an import quota, beginning with 1 percent of total consumption and gradually increasing up to 4 percent in 2004, the final implementation year. If Korean rice had not been exempted from tariffication, Korea would have complied with the standard market access commitment of from 3 percent to 5 percent. The temporary exemption from tariffication expired in 2004, but Korea opted to continue invoking a rice exemption from tariffication for another 10 years, to 2014.

### *Taiwan*<sup>6</sup>

After World War II Taiwan suffered from high inflation rates, serious shortages of food and other necessities, and a heavy defense burden. The government gave the highest priority to

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<sup>6</sup> This section draws heavily on Mao and Schive (1995).

economic stabilization, food production increases, and the repair of war damages. To alleviate the intense population pressure on limited land, it decided to grant incentives to farmers. Together with the land reform program implemented between 1949 and 1953, war-damaged irrigation and drainage facilities were repaired, fertilizers and other farm inputs were made available, and farmers' organizations were strengthened.

In the recovery stage of the Taiwan economy the Sino-American Joint Commission on Rural Reconstruction (JCRR), established in Nanking in 1948, played an important role. JCRR served as a non-permanent agency for the postwar rural reconstruction of China. From 1951 to 1965 the United States provided a total of \$1.5 billion in aid. Approximately one-third went to agriculture, which was used to build infrastructure and foster human resources for agriculture. Also, substantial imports of U.S. aid-financed commodities and increases in domestic production, especially of food, helped relieve demand pressures.

In the low-income stage of economic development (before 1960), agricultural policy in Taiwan was designed mainly to supply rice at low stable prices to non-farm population. In those days two important taxes were imposed on farmers: the farm land tax and the hidden rice tax. This was done by means of compulsory rice purchases and the rice-fertilizer barter system. The compulsory purchase of paddy from landowners at official prices was another source of government-control over rice. All the paddy lands were subject to the paddy land tax plus the compulsory procurement of rice. The compulsory procurement was assessed on the basis of tax units determined by land productivity. The difference between the government procurement prices and farmers' market prices constituted a hidden tax on paddy landowners who were mostly farm operators after the implementation of land reform program. The hidden tax was gradually reduced as per-capita income rose, but it continued to exist until its abolition in 1973.

The government's rice collection by all of these methods during 1950-70 averaged 50 to 60 percent of the total amount of rice produced minus farmers' home consumption. By 1973, however, this share had declined to 20 percent. In subsequent years it increased again because of the implementation of the guaranteed rice price policy. The total of this hidden rice tax was larger than Taiwan's total income tax before 1963 and was more than twice the farm land tax before 1961, except in 1954. After 1961, when Taiwan moved to the lower middle-income stage, the hidden rice tax decreased rapidly: the ratio of the hidden rice tax to the total income tax was only 8.5 percent in 1971 (Kuo 1975).

Agricultural policy geared to exploit agriculture for the sake of supporting industrial development (and military development) largely ended during the 1970s, when the shift to subsidizing agriculture began. This was the period when Taiwan rapidly expanded its labor-intensive light industries in response to increases in export demand. Because many light industries such as garments and footwear were located in rural areas, non-farm incomes became increasingly more important to farm households. Taiwan farmers were able to take advantage of employment in manufacturing without leaving home and, also, many of them engaged in non-farm self-employed activities in less-busy farm seasons. Therefore, the need for farmers to rely on agricultural protection policies was smaller than in Korea.

It was 1978 when Taiwan entered the upper middle-income stage with its real GDP per capita exceeding \$5,000. Still, to help equalize the income level of farm workers with that of the rapidly expanding industrial sector, the government offered loans and subsidies for promoting farm mechanization, which were designed to raise farmers' labor productivity. At this time the growth of rice production began to slow down in response to an increased emphasis on livestock and fishery products and high-value export crops. Increases in industrial employment also were pushing up the costs of farm labor. Labor productivity in agriculture continued to lag behind that of the industrial sector, and the gap between farm and non-farm per capita incomes was increasing, especially for farmers who relied mainly on rice production. The problems faced by Taiwan agriculture were similar to those that many other industrial countries experienced at a comparable development stage, especially Japan in the early 1960s and Korea in the late 1970s.

In Taiwan, per-capita consumption of rice fell from 140 kilograms per year in 1968 to 74 kilograms in 1988. Correspondingly, an accumulation of the rice stock became a serious problem. In order to reduce production, farm extension workers encouraged farmers to plant other crops in rice fields, but their efforts were not successful because no economic incentive was provided. A six-year rice-crop substitution plan was inaugurated in 1984 that gave direct subsidies of 1 metric ton of paddy rice per hectare to farmers who shifted their rice fields to corn or sorghum, or 1.5 metric tons of paddy rice per hectare to farmers who shifted to crops other than corn and sorghum. In addition, corn and sorghum were purchased by the government at guaranteed prices. Under the program, rice production declined to 1.84 million metric tons in 1988, which was smaller by 0.9 million metric tons than the peak of 1976. The paid-in-kind subsidy was changed to a cash payment in 1988 to improve efficiency in the management of the program.

Taiwan entered the high-income stage in the late 1980s with its real GDP per capita exceeding \$10,000 from 1988. The most important changes in agricultural policy in Taiwan in the high-income stage were related to its accession to the WTO that became effective on 1 January 2002. In line with the level of economic development, Taiwan agreed to bring its tariff rates to a level between those of Japan and Korea. Taiwan agreed to reduce its tariffs from the average nominal tariff rate of 20 percent in 2001 to 14 percent in the first year of its accession and to gradually reduce it to 12.9 percent by 2004. The target date for tariff reductions was 2002, except for 137 items that are under tariff rate quotas (TRQs). Of the 41 products that were under import quota restrictions before accession, 18 were moved to tariffication after WTO accession. Rice received a special exemption and the remaining 22 items are governed by the tariff rate quota regime.

Similar to Korea, the special treatment of rice is based on the rules of Annex V of the URAA. The quota of rice imports was set in 2002 at 8 percent of the average domestic consumption between 1990 and 1992 (144,720 tons of brown rice). By negotiation, this amount was divided into governmental and private import quotas. The government rice quota (65 percent of rice imports) was subject to the same treatment as rice purchased from local growers. The imported rice cannot be exported for food aid nor can be used for animal feed. The remaining (35 percent) was imported by private firms and was allocated on first-come-first-serve basis. For both private and government quotas, there is a ceiling on the price mark-up of NT\$23.26 per kilogram for rice and NT\$25.59 for rice products when they are sold on the domestic market. If the sale of quota rice is slow, the price mark-up can be cut by NT\$3 every two weeks. The mark-up reduction can be continued until all of the quantities are sold out.

### **Measurement of distortions to agricultural incentives**

The main focus of the present study is to measure the extent of distortions to agricultural prices brought about by government-imposed policy measures that create a gap between domestic prices and what they would be under free markets. Since it is not possible to understand the characteristics of agricultural development with a sectoral view alone, the project's methodology not only estimates the effects of direct agricultural policy measures

(including any distortions in the foreign exchange market), but also generates estimates of distortions in non-agricultural sectors for comparative evaluation. Specifically, this study computes a Nominal Rate of Assistance (NRA) for farmers including an adjustment for direct interventions on inputs such as border protection on fertilizers. It also generates an NRA for nonagricultural tradables, for comparison with that for agricultural tradables via the calculation of a Relative Rate of Assistance (RRA – see Anderson et al. 2008).

The commodities for which we calculate a NRA include rice, wheat, barley, soybean, beef, pigmeat, poultry, egg, and milk for Korea. For Taiwan, we estimate NRAs for rice, wheat, beef, pigmeat, poultry, and egg. Domestic prices are converted to US dollars using market rates of foreign exchange rates except for 1955-64 in Korea and for 1955-61 in Taiwan, for which the shadow exchange rates estimated for Korea by Frank, Kim and Westphal (1975) and for Taiwan by Scott (1979) are used to take into account the distortions to the foreign exchange market in early years. Aggregate NRAs on output for each county are calculated using weights of domestic production of commodities valued at undistorted prices.

In addition to the commodities above covered in this study, three other crops — Chinese cabbage, peppers, and garlic — are included in the calculation of NRAs for Korea. The estimates for these products come from the OECD's estimates of PSEs and CSEs (OECD 2007). The data for these crops are available only from 1986. We assume distortions of those crops prior to 1986 were at the level of 90 percent of distortions for the available covered products.

The percentage of agricultural output covered in this study is (valued at distorted prices) between 50 and 70 for Korea and somewhat less for Taiwan. It is difficult to judge the levels of NRAs for the residual, non-covered products. We assume it is made up of the following share trends (at distorted prices) between 1955 and the present: import-competing 50 to 80 percent and nontradables 50 to 20 percent in Korea, with distortions of the residual products assumed to be zero for nontradables and the same as that of the four OECD products for import-competing products. For Taiwan, we assume that the distortions of all the non-covered residual products are zero, because most of them are nontradable or exportable.

To compute the RRA, we estimate the NRA for non-agricultural industries. For the latter, weighted tariffs were available in only selected years for Korea and Taiwan. We linearly interpolated for the years between those for which the data are available. For the early years the tariff rates are estimated as total tariff revenue divided by value of imports. Assuming the exportable industries receive no assistance, the weighted average tariff is

multiplied by the share of import-competing industries in the value of all non-agricultural tradables. This procedure undoubtedly underestimates assistance to non-agricultural industries (and thereby implicit taxation of agriculture) in the 1950s and to a lesser extent the 1960s because it does not account for non-tariff import restrictions that were rife, nor for Korea's subsidized credit to target industries.

The estimation results for nominal rates of assistance (NRA) for covered farm products are summarized as 5-year averages in Tables 3 and 4 for Korea and Taiwan, respectively,<sup>7</sup> while Table 5 reports the RRAs for both Korea and Taiwan. Annual movements of the NRAs and RRAs are shown in Figures 1 to 6 for Korea and Taiwan separately.

The estimated RRAs for Korea and Taiwan in the 1950s and 1960s — in the low-income and in the lower middle-income stages of development — were very low, involving negative rates for most years before the 1970s. If the non-tariff barriers limiting industrial imports had been able to be included in the calculations, the RRAs would have shown up as even more negative in that period. But even without that, the RRAs suggest farmers in the latter 1950s faced relative prices for outputs that were about one-third below what they would have been under free markets in Korea, and nearly one-quarter below in Taiwan. They were still below in the 1960s, by about one-seventh in Korea and one-twentieth in Taiwan (Table 5 and Figure 1). In Korea the rapid rise of agricultural assistance and decline of manufacturing protection began in the 1970s when the economy moved from the lower- to the upper middle-income stage.<sup>8</sup> For Taiwan the transition was similar but less rapid, so their RRA lines in Figure 1 crossed over in the late 1960s and – apart from 1974

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<sup>7</sup> The NRAs for commodities are different from those estimated for Korea by the OECD. The key differences are two-fold: our domestic prices are wholesale prices whereas OECD uses farm-gate prices; and border prices in our calculations are based on the study in Anderson and Hayami (1986) whereas OECD uses a different set of reference prices. The fact that the producer price was above the wholesale (consumer) price in the case of grains and soybean in Korea is captured by setting the NRA equal to the measured CTE times the ratio NRA/CTE in Anderson (1989) for the period to 1985 and times the negative of the ratio PSE/CSE in OECD (2007) for the period from 1986. Most differences in NRA between OECD and our measures come from the differences in border prices. For example, our border price of rice for Japan and Korea is the world import unit value adjusted by a quality coefficient. But OECD's border price of rice for Korea is China's export price of rice adjusted by transportation costs and, from 2001, the average of import prices of rice from China, the United States and Thailand. This makes our series of NRAs for rice more stable than that of OECD's in recent years, and so explains the stability of our NRA for Korean rice compared with that of the OECD's. For meat products also the border prices are different. In the estimation of NRAs for beef, pork and chicken the OECD uses basically the meat data of the US or Canada for border prices while we use Japan's import price for beef and own-country unit values for pork and chicken (or, for the 1950s, Hong Kong's import prices). Our approach is preferred for estimating NRAs consistently for longer time periods, particularly for the period when Korean imports were absent or negligible. Also, our approach is necessary for comparing the NRAs between Korea and Taiwan on a similar basis.



when world food price spiked – Taiwan’s RRA thereafter remained below and grew less rapidly than Korea’s, despite the fact that Taiwan was slightly ahead of Korea in terms of per capita income. Even after Korea and Taiwan entered the high-income development stage in the 1990s, their trend RRAs continued to rise, reaching nearly 170 percent in Korea (above Japan’s 125 percent) and almost 70 percent in Taiwan in the first half of the present decade (Table 5).

Figure 2 shows the movement of the weighted average NRAs for agricultural products alone in Korea and Taiwan. They are similar to those of the RRA in both economies after the 1970s, as the impact of non-agricultural NRAs on the RRA calculation became trivial.

For Korea that NRA refers only to import-competing products, as there have been no significant farm exports from Korea for decades. For Taiwan, however, note two things. First, tradable products have a higher estimated NRA than for the sector as a whole. This is because we assume that the minority of products not covered explicitly in our study are exportable or nontradable with a zero average NRA. And second, Taiwan’s covered exportables (predominantly rice) have a higher NRA average than import-competing covered products (Figure 3). This generates the positive trade bias index shown in Table 5, and is possibly unique: typically governments find it much easier politically to provide assistance to import-competing industries (via import restrictions) than to those exporting.

There were wide fluctuations in Korea’s RRA in the late 1990s caused by the currency crises in Asia that began in 1997. Sharp increases in Taiwan’s RRA in 1999 and 2000 were caused by shortages of livestock products due the September 1999 earthquake and reduced production of pigmeat resulting from the spread of foot-and-mouth disease among pigs in 1997.

Fluctuations in the RRA and NRA (see Figure 4) come mainly from changes in the NRA of individual farm commodities and changes in the weight of each commodity. In both Korea and Taiwan the most important agricultural product was rice. Its protection therefore had a large influence on the RRA. The movement of the NRA for rice in the two economies, shown in Figure 5, is very clear: a strong upward trend from the mid-1970s in both economies, as they began to move out of the lower middle-income stage. In Korea during the past three decades the weight of rice in agricultural production has been twice that in Taiwan, being more than 40 percent in the 1970s – even when valued at undistorted prices – and still above 15 percent in the present decade. Korea was exempted from tariffication of rice under

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<sup>8</sup> Fertilizer subsidies also were being provided in Korea, but they were only a partial offset to the protection

the Uruguay Round Agreement on Agriculture, allowing its rice NRA to grow despite its WTO commitments to lower protection of other farm products.

### *Consumer tax equivalents on food*

The support provided to farmers in Korea and Taiwan has mostly come via food import restrictions, but in addition there have been schemes whereby crop producer prices have been supported above those charged to grain and soybean consumers (including feedmixers providing livestock producers with animal feedstuffs). Thus the CTE is below the NRA for some crop products. As a result of that, together with the different weights of various products in consumption as compared with production, the average NRA for covered products is around 50 percent above the CTE for Korea in 2000-04 (compare Tables 3 and 6). Thus consumers have been spared some of the implicit tax that otherwise would have been imposed on them had border measures alone been used to raise producer prices above international levels.

### **Sources of agricultural protection growth**

The experiences of Korea and Taiwan provide good examples of policy switching from exploitation to protection of agriculture as economies grow and industrialize. This shift is most clearly illustrated by these two economies in which agricultural protection levels were negative in the 1950s and the 1960s and began to rise sharply from the late 1970s with the success of industrial development.

In Anderson, Hayami and Honma (1986), the growth of agricultural protection during the three decades to the early 1980s was found to be far more rapid in these economies than in the earlier starters of industrialization in the West, or even compared with Japan. Korea and Taiwan were not exceptional in their bent toward agricultural protection growth, and the speed of that growth was exceptionally fast because so too were their industrial development and associated structural changes. Their protection growth continued at the same speed for to

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from import competition that was provided to the domestic fertilizer manufacturing industry (Anderson 1983a).

the early 1990s while they were in the middle-income stage but it began to decelerate thereafter, particularly in Korea, when they reached the high-income stage.

This rapid growth of agricultural protection is largely explained by the shift in comparative advantage away from agriculture to industry as the result of successful industrialization, which was most pronounced in the middle-income stage. Korea and Taiwan are characterized by meager endowments of natural resources including land for cultivation relative to their population. Industrialization was the only possible route to achieve economic growth and catch up with advanced economies. Economic growth through the exploitation of abundant natural resources – so-called “vent-for-surplus growth” (Myint 1965) – was not an option in these economies, unlike in Southeast Asian countries such as Malaysia and Thailand (Douangneune et al. 2005). The decline in agriculture’s comparative advantage due to successful industrialization increased the inter-sectoral resource adjustment costs and led to a widening rural-urban income disparity that had to be shouldered by farmers if left to competitive markets. That increased their demand for agricultural protection.

The association between the rise in agricultural protection and the decline in agriculture’s comparative advantage was tested in Honma and Hayami (1986) using multiple regression analysis and a pooled data set for 15 countries at 6 points of time ending in 1980. A strong correlation was found between the level of aggregate NRP<sup>9</sup> and the index of agriculture’s labor productivity relative to total economy’s labor productivity. According to those results, Honma and Hayami conclude that the high level of agricultural protection in East Asia resulted not so much from factors unique to East Asia but mainly from factors common to all industrial countries.

One may argue that the high rates of agricultural protection hinder adjustments in the direction of raising agricultural productivity to slow the growth in agriculture’s comparative disadvantage. However, it is doubtful whether the adjustments of agriculture to the rapid industrial development experienced by East Asia’s high performers could have been achieved sufficiently rapidly and smoothly under free markets to avoid major social instability and disruption. This is particularly so given these economies’ agrarian structure involving as it does a large number of small independent family farms with very unfavorable resource endowments.

As already observed, Korea and Taiwan stayed in the low-income stage of economic development in the 1950s but soon entered the middle-income stage in the 1960s. In that

middle-income stage, productivity growth in agriculture lagged behind that of non-agriculture as a result of successful industrialization. Farmers' income levels declined relative to those of non-farm households. Nevertheless, it was not possible for the government in the lower middle-income stage to secure sufficient finance to close the income gap, since the share of agriculture in both national income and the labor force still remained large. Thus, agricultural protection in Korea and Taiwan remained at a low level before they approached the upper middle-income level, despite growing rural-urban income disparity.

The basic agricultural problem confronted by middle-income economies like Korea and Taiwan in the 1960s and 1970s is called the "disparity problem" (Hayami and Godo 2004, Hayami 2005). It is the problem of income disparity between farm and non-farm households, brought about by a lag in productivity growth in agriculture relative to non-agriculture as a result of the successful industrialization that raised these economies to the middle-income stage. At this stage, compared with the previous low-income stage, food supply capacity rises due to both the productivity growth of domestic agriculture and the increased foreign exchange earnings that enable increased food imports, while factors causing growth in demand for food, such as high population growth and high demand elasticities, are weakened. As the result, the terms of trade between agriculture and non-agriculture worsen.

Farmers' income levels tend to decline relative to non-farmers' corresponding to the widening inter-sectoral productivity gap. Farmers, who observe non-farm workers' rapid escape from poverty, begin to realize how relatively poor they are, even if their income level did not decrease or increased slightly from the previous stage. Dissatisfaction among farmers who remain poor, despite visible improvements in other sectors, often becomes a significant source of social instability. Thus, at the middle-income stage, it becomes a prime concern of policymakers to prevent rural-urban income disparity from widening. To achieve this goal, the government might adopt agricultural protection measures to appease farmers and prevent their dissatisfaction elevating to serious anti-governmental movements. That protection may not be strong enough to close the income gap between farmers and urban workers until the country graduates from the lower middle-income stage, however. Because the shares of agriculture in both national income and the labor force are still large, it is difficult to either (a) raise sufficient revenue from the non-farm sectors to close the growing farm-nonfarm income gap with direct support payments or (b) pass on the cost of agricultural protection to consumers by raising food import barriers, because increases in food prices erode real wages

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<sup>9</sup> Actual data used for the level of agricultural protection in the regression analysis are the nominal protection

paid by the large number of small-scale enterprises that rely heavily on cheap labor. Faced with the disparity problem, policymakers in middle-income countries are forced to search for ways and means to protect farmers within the constraint of the food problem that is still binding because a large number of urban workers are still absolutely poor and so still have a high share of food in their household expenditure.

As per-capita incomes rose rapidly in the late 19970s/early 1980s as Korea and Taiwan approached the upper middle-income level, both the government and the non-agricultural sectors became capable of shouldering the cost of agricultural protection from the upper middle-income stage. It might be argued that high protection contributed to the loss of agricultural comparative advantage in Korea and Taiwan, by lowering incentives to improve agricultural productivity. Its effect on comparative advantage was much smaller than the effect of industrial productivity growth which was unusually fast among the high performers in East Asia. The necessary conditions for agricultural protection growth were created by rapid industrial productivity growth at speeds far above agricultural productivity growth; while the sufficient conditions were met by the increased capacity of the non-agricultural sector to support agriculture.

Despite many common features of agricultural protection in Korea and Taiwan, there were some differences in the policy approach. The reason agricultural protection in Korea rose faster and to much higher levels than in Taiwan during the upper-middle income stage seems to reflect the difference in the cost of inter-sectoral adjustment corresponding to changes in comparative advantage, which farmers had to shoulder. In Korea the shift of labor from agriculture to non-agriculture involved the migration for workers from rural to urban areas, whereas in Taiwan much of the shift was done by farm households increasing their non-farm activities while continuing to live in their home villages and towns. Correspondingly, both the pecuniary and psychological costs of inter-sectoral labor reallocation would have been much higher for farmers in Korea.

The ratio of agricultural GDP per worker to total GDP per worker in nominal terms decreased faster in Taiwan than in Korea, as observed in Table 1. This does not mean slower agricultural adjustment in Taiwan if allowance is made for the fact that output per hour of labor used for agricultural activities differs from output per farm worker as defined in official statistics. Since farmers in Taiwan depended much more heavily on earnings from non-farm activities (Table 2), it is likely that their household income per capita was not lower but

higher than in Korea despite GDP per farm worker being lower in the former than in the latter relative to GDP per worker in total economy.

The relationship between the relative GDP per worker and the RRA in Korea and Taiwan for 1955-2004 is shown in Figure 6.<sup>10</sup> There is a negative correlation, except for Korea in 1990 and 2000 (observations in the north east corner of the graph). This implies that Korea intensified agricultural protection despite the relatively high income level of farmers in recent years. Korea may have had some specific reasons for strengthening agricultural protection, particularly at the farm-gate level. In addition to the high cost of inter-sectoral adjustment shouldered by farmers, the constant menace of communist aggression from the north would have made citizens aware of the need to support farmers for maintaining the political stability.

In the analysis by Honma and Hayami (1986), it was found that political power in the agricultural sector is maximized when the share of agriculture declines to 4 to 5 percent of GDP or 5 to 8 percent of the labor force. Korea recently entered this peak zone in terms of both GDP and labor force, as did Taiwan in terms of the labor share (having passed over this zone in 1990 in terms of GDP share). Political economy factors may well underlie the rise of agricultural protectionism in Korea at the high-income stage after 1990, as observed in terms of the NRA at the farm-gate level despite no apparent further increase in its agricultural comparative disadvantage.<sup>11</sup>

## Concluding remarks

This chapter examines changes in distortions to agricultural incentives in terms of price distortions in Korea and Taiwan in a manner consistent with the methodology in Anderson et al (2008). Rates of assistance to the agricultural sector are estimated for the half-century since 1955. These are based on estimates of the nominal rates of assistance for selected individual commodities and the relative rates of assistance as between agricultural and industry. The estimates show that the growth of agricultural protection in Northeast Asia, together with the

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<sup>10</sup> RRA of 1955-59 average is paired with agricultural GDP per worker relative to total GDP per worker in 1955 and so on.

<sup>11</sup> The shares of Korean agriculture in GDP and the labor force were 3.8 percent and 7.7 percent, respectively, in 2004, while those in Taiwan were 1.7 percent of GDP and 7.5 percent of the labor force in that year (Table 1, rows 2 and 3).

decline of industrial protection rates, caused the RRA to rise there over the five post-War decades under investigation. The data show that agricultural protection in Korea and Taiwan stayed negative when they were in the low-income stage of development and continued to be low at the lower middle-income stage, but rose sharply after these economies approached the upper middle-income stage of development. The experience in these two economies seems to be explained by factors common to rapidly industrializing economies: first, strong demand for protection from farmers who shoulder the high cost of inter-sectoral adjustment in resource allocation under rapidly declining comparative advantage in agriculture; and second, the increased capacity of non-agriculture to support agriculture associated with the growing tolerance of non-farmers on policies to protect farmers. Although the first condition emerged from the beginning of the lower middle income stage, the second was not met until the economies approached the upper-middle-income stage.

Following the sharp increase in agricultural protection in the upper middle-income stage of development, Korea and Taiwan continued to suffer from problems caused by a high level of protection. These included the misallocation of resources and a high fiscal burden in the domestic economy as well as serious international trade frictions, which are shared in common among high-income economies. These problems could have been less serious if the farm-nonfarm income gap was dealt with more appropriately at the middle-income stage.

The agricultural problem in the middle-income stage is called the “disparity problem”. Greater attention should be paid to this problem. The challenge is to compromise the conflicting needs of support to farmers’ incomes, on the one hand, and the supply of low-cost food to a large number of urban workers on the other, under the still weak capacity of the government to raise sufficient revenue from non-agricultural sectors.

Contrasting patterns of agricultural and industrial growth between Korea and Taiwan provide a key to the solution of this problem. Despite largely parallel progress in industrial and economic development between Korea and Taiwan, the growth of agricultural protection was significantly lower in the latter. The difference seems to be largely explained by differences in both industrial and agricultural structures. The industrial structure of Taiwan was characterized by the wide diffusion of small and medium industries over rural areas, as compared with urban-centered industrialization in Korea. The cost of inter-sectoral labor reallocation that had to be shouldered by farmers was considerably lower in the former, therefore. The advantage this gave to Taiwan was further augmented by the success of Taiwanese agricultural diversification toward high income-elastic commodities such as

horticultural and livestock products and away from traditional subsistence crops, especially rice. As a result, the demand for farming assistance was significantly lower in Taiwan, despite pressures from rapid industrial development. Developing economies currently pursuing rapid development, using the same strategy of industrial technology borrowing, may benefit from analysis of the different experiences of Korea and Taiwan.

## References

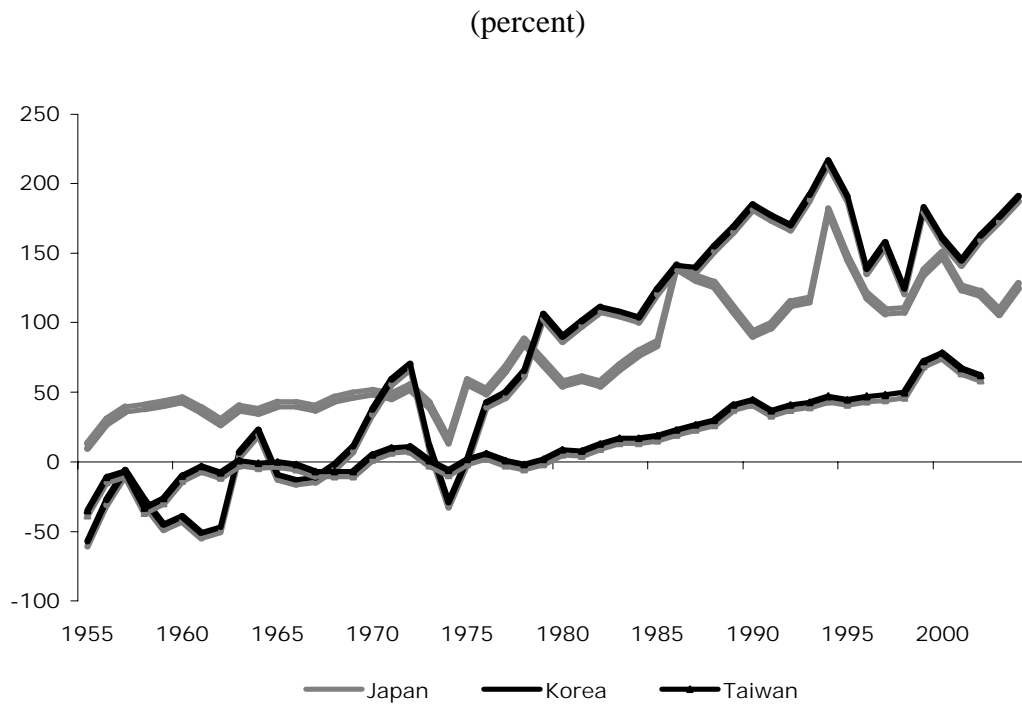
- Amsden, A. (1989), *Asia's Next Giant: South Korea and Late Industrialization*, New York: Oxford University Press.
- Anderson, K. (1983a), "Fertilizer Policy in Korea", *Journal of Rural Development* 6(1): 43-57, June.
- Anderson, K. (1983b), "The Peculiar Rationality of Beef Import Quotas in Japan", *American Journal of Agricultural Economics* 65(1): 108-12, February.
- Anderson, K. (1986), "The Peculiar Rationality of Beef Import Quotas in Japan and Korea", Ch. 7 in K. Anderson and Y. Hayami with associates, *The Political Economy of Agricultural Protection: East Asia in International Perspective*, London and Sydney: Allen and Unwin.
- Anderson, K. (1989), "Korea: A Case of Agricultural Protection", Ch. 4 in *Food Price Policies in Asia*, edited by T. Sicular, Ithaca: Cornell University Press.
- Anderson, K. and Y. Hayami with associates (1986), *The Political Economy of Agricultural Protection: East Asia in International Perspective*, London and Sydney: Allen and Unwin.
- Anderson, K., Y. Hayami and M. Honma (1986), "The Growth of Agricultural Protection", Chapter 2 in K. Anderson and Y. Hayami with associates, *The Political Economy of Agricultural Protection: East Asia in International Perspective*, London and Sydney: Allen and Unwin.
- Anderson, K., M. Kurzweil, W. Martin, D. Sandri and E. Valenzuela (2008), "Methodology for Measuring Distortions to Agricultural Incentives", *Agricultural Distortions Working Paper 02*, Washington DC: World Bank, revised January.
- Aoki, M. and Y. Hayami (eds.) (1988), *The Institutional Foundation of East Asian Economic Development*, London: Macmillan.



- Cole, D.C. and Y.C. Park (1983), *Financial Development in Korea, 1945-1978*, Cambridge MA: Harvard University Press.
- Douangneune, B., Y. Godo and Y. Hayami (2005), "Education and Natural Resources in Economic Development: Thailand Compared with Japan and Korea", *Journal of Asian Economics* 16: 179-204, April.
- Frank, C.R., K.S. Kim and K. Westphal (1975), *Foreign Trade Regimes and Economic Development: South Korea*, New York: Columbia University Press for the NBER.
- Gerschenkron, A. (1962), *Economic Backwardness in Historical Perspective*, Cambridge MA: Harvard University Press.
- Hayami, Y. (1979), "Trade Benefits to All: A Design of the Beef Import Liberalization in Japan", *American Journal of Agricultural Economics* 62(2): 342-47, May.
- Hayami, Y. (1988), *Japanese Agriculture Under Siege: The Political Economy of Agricultural Policies*, London: Macmillan.
- Hayami, Y. (2006), "Emerging Agricultural Problem in High-Performing Economies in Asia", Presidential Address at the 5th Conference of the Asian Society of Agricultural Economists, held in Zahedan, Iran, 29-31 August.
- Hayami, Y. and Y. Godo (2004), "The Three Agricultural Problems in the Disequilibrium of World Agriculture", *Journal of Agriculture and Development* 1: 3-16, June.
- Hayami, Y. and Y. Godo (2005), *Development Economics: From the Poverty to the Wealth of Nations*, 3rd edition, London: Oxford University Press.
- Heston, A., R. Summers and B. Aten (2006), *Penn World Table Version 6.2*, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September.
- Ho, S.P.S. (1979), "Decentralized Industrialization and Rural Development in South Korea and Taiwan", *Economic Development and Cultural Change* 28: 77-96, October.
- Ho, S.P.S. (1982), "Economic Development and Rural Industry in South Korea and Taiwan", *World Development* 10: 973-90, November.
- Honma, M. and Y. Hayami (1986), "Determinants of Agricultural Protection Levels: An Econometric Approach", Chapter 4 in K. Anderson and Y. Hayami with associates, *The Political Economy of Agricultural Protection: East Asia in International Perspective*, London and Sydney: Allen and Unwin.
- Honma, M. and Y. Hayami (2007), "Distortions to Agricultural Incentives in Japan, Korea and Taiwan", Agricultural Distortions Working Paper 35, Washington DC: World Bank, December.

- Kawano, S. (1969), "Effects of the Land Reform on Consumption and Investment of Farmers", pp. 374-97 in K. Ohkawa, B.F. Johnston and H. Kaneda (eds.), *Agriculture and Economic Growth: Japan's Experience*, Tokyo: University of Tokyo Press.
- Kuo, S.W.Y. (1975), "Effects of Land Reform, Agricultural Pricing Policy, and Economic Growth on Multiple Crop Diversification in Taiwan", *Philippine Economic Journal* 14 (1 and 2).
- Krueger, A.O., M. Schiff and A. Valdes (eds.) (1991), *Political Economy of Agricultural Pricing Policies*, 3 volumes, Baltimore: Johns Hopkins University Press.
- Myint H.U. (1965), *The Economic Theory of the Developing Countries*, New York: Praeger.
- Mao, Y-K. and C. Schive (1995), "Agricultural and Industrial Development in Taiwan", in J. Mellor (ed.), *Agriculture on the Road to Industrialization*, Baltimore: Johns Hopkins University Press.
- Moon, P.Y. and B.S. Kang (1989), *Trade, Exchange Rate, and Agricultural Pricing Policies in the Republic of Korea*, World Bank Comparative Studies on the Political Economy of Agricultural Pricing Policy, Washington DC: World Bank.
- OECD (2007), *Producer and Consumer Support Estimates, OECD Database 1986-2005*.  
[http://www.oecd.org/document/54/0,2340,en\\_2649\\_33727\\_35009718\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/54/0,2340,en_2649_33727_35009718_1_1_1_1,00.html)
- Scott, M. (1979), "Foreign Trade," in J. Galenson (ed.), *Economic Growth and Structural Change in Taiwan: The Postwar Experience of the Republic of China*, Ithaca: Cornell University Press.
- Schultz, T.W. (ed.), (1978), *Distortions of Agricultural Incentives*, Bloomington: Indiana University Press.
- World Bank (1993), *The East Asian Miracle: Economic Growth and Public Policy*, Oxford: Oxford University Press.

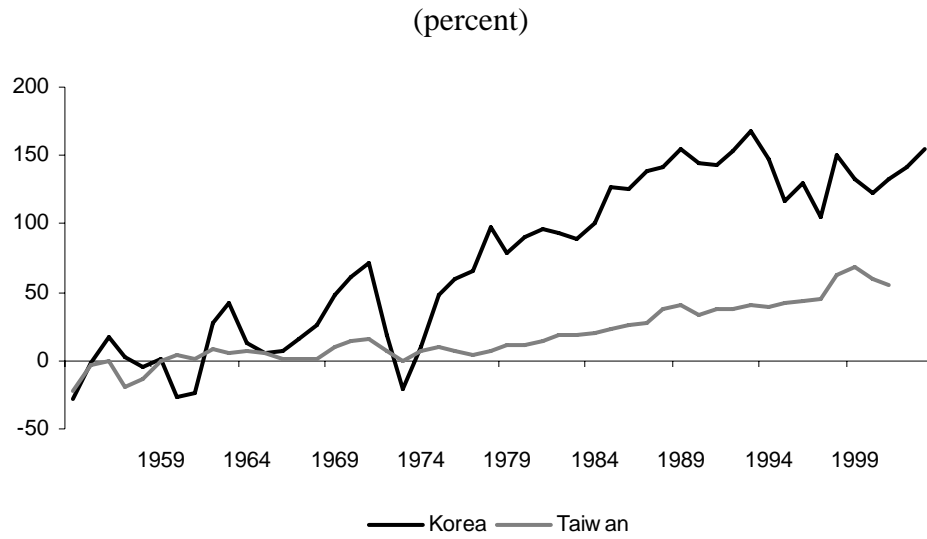
Figure 1: Relative rate of assistance to agricultural versus non-agricultural tradables,<sup>a</sup> Japan, Korea and Taiwan, 1955 to 2004



<sup>a</sup> The RRA is defined as  $100 * [(100 + NRA_{ag}^t) / (100 + NRA_{nonag}^t) - 1]$ , where  $NRA_{ag}^t$  and  $NRA_{nonag}^t$  are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

Source: Honma and Hayami (2007)

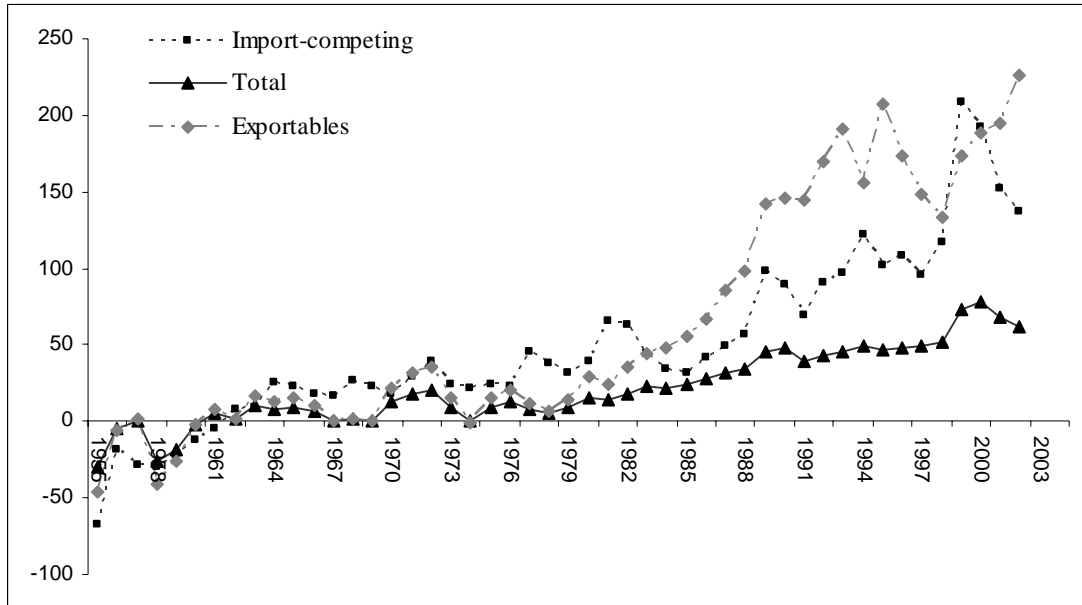
Figure 2: Nominal rates of assistance to all agricultural products, Korea and Taiwan, 1955 to 2004



Source: Authors' spreadsheet

Figure 3: Nominal rate of assistance to exportable, import-competing and all agricultural products, Taiwan, 1955 to 2002

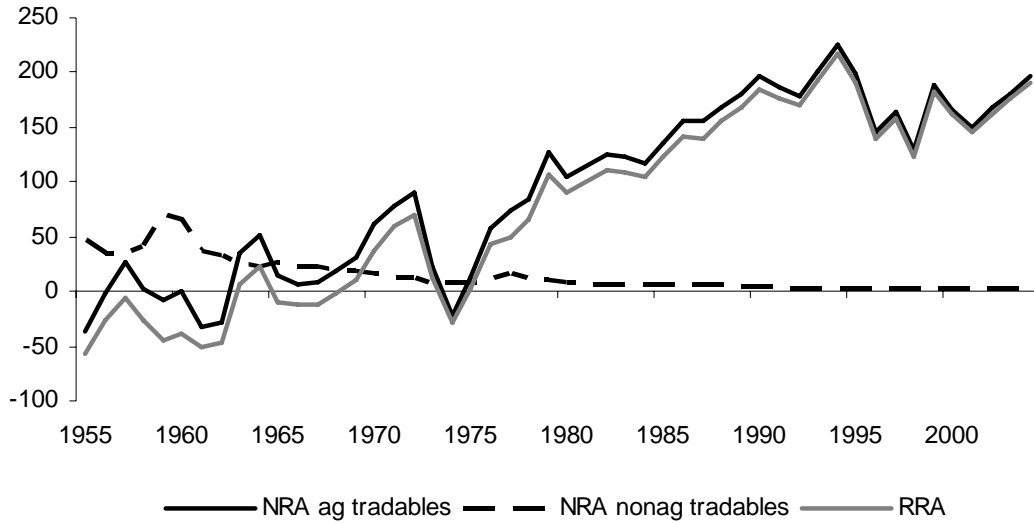
(percent)



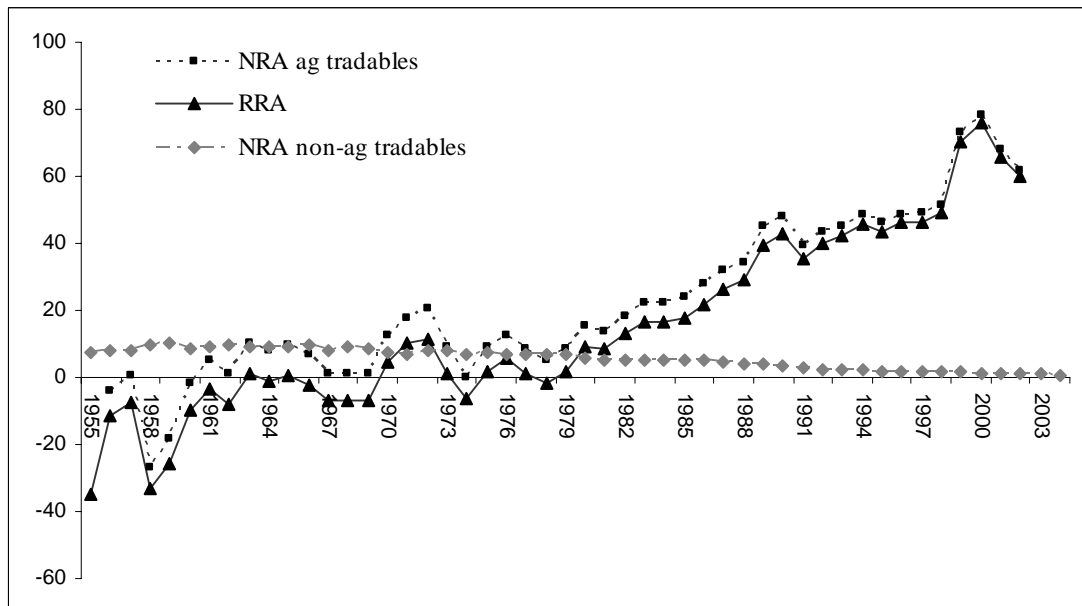
Source: Authors' spreadsheet

Figure 4: Nominal rates of assistance to all non-agricultural tradables, all agricultural tradable industries, and relative rates of assistance<sup>a</sup>, Korea and Taiwan, 1955 to 2004 (percent)

(a) Korea



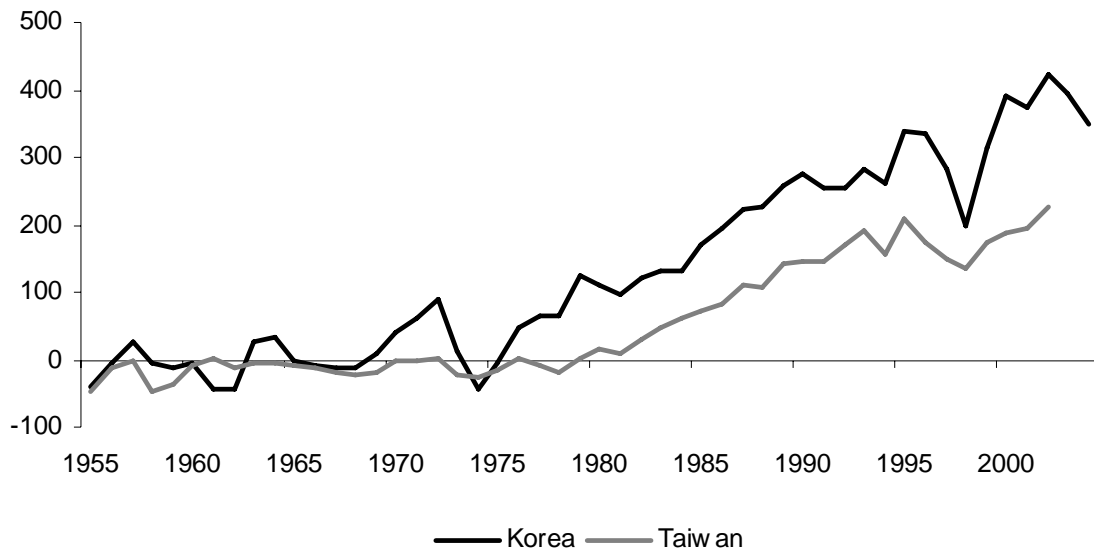
(b) Taiwan



<sup>a</sup> The RRA is defined as  $100 * [(100 + \text{NRA}_{\text{ag}}^t) / (100 + \text{NRA}_{\text{nonag}}^t) - 1]$ , where  $\text{NRA}_{\text{ag}}^t$  and  $\text{NRA}_{\text{nonag}}^t$  are the percentage NRAs for the tradable parts of the agricultural and non-agricultural sectors, respectively.

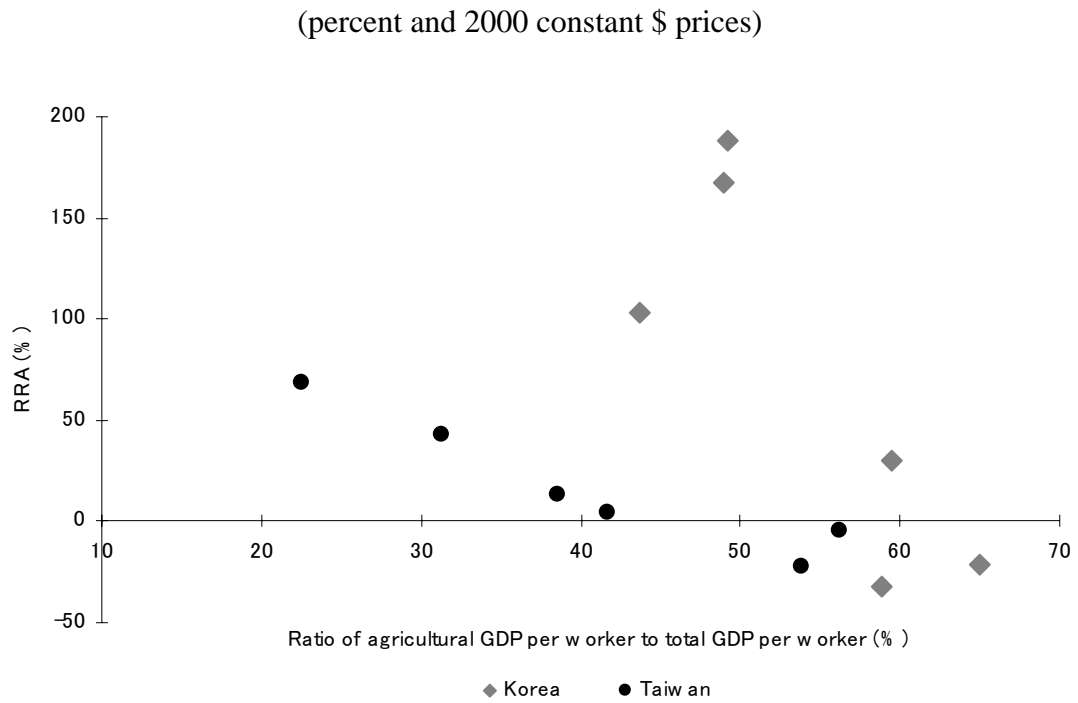
Source: Authors' spreadsheet

Figure 5: Nominal rates of assistance for rice, Korea and Taiwan, 1955 to 2004  
(percent)



Source: Authors' spreadsheet

Figure 6: Relative rate of assistance to agriculture and relative GDP per agricultural worker, Korea and Taiwan, 1955 to 2004



Source: Authors' spreadsheet



Table 1: Economic growth and structural transformation in Korea and Taiwan, 1955 to 2004

		1955	1960	1970	1980	1990	2000	2004
Real GDP per capita in 2000 constant prices (\$)	Korea	1,429	1,458	2,552	4,497	9,593	15,702	18,424
	Taiwan	1,241	1,444	2,846	5,963	11,248	19,184	20,868
Share of agriculture <sup>a</sup> in GDP ( percent)	Korea	46.9	39.1	29.2	16.2	8.9	4.9	3.8
	Taiwan	28.9	28.2	15.3	7.5	4.0	2.0	1.7
Share of agriculture in economically active population <sup>a</sup> ( percent)	Korea	79.7	60.2	49.1	37.1	18.1	10.0	7.7
	Taiwan	53.6	50.2	36.7	19.5	12.8	8.9	7.5
Share of farm household population in total population (percent)	Korea	61.9	58.2	44.7	28.4	15.5	8.6	7.1
	Taiwan	50.7	49.8	40.9	30.3	21.1	16.5	14.3
Agricultural GDP per worker / total GDP per worker ( percent)	Korea	58.8	65.0	59.5	43.7	49.2	49.0	49.4
	Taiwan	53.9	56.2	41.7	38.5	31.3	22.5	22.7

<sup>a</sup> Shares of agriculture in GDP and the labor force include forestry and fisheries.

Source: Heston, Summers and Aten (2006); Korean Government, *Major Statistics of Agriculture, Forestry and Fisheries*, various issues; Taiwan Government, *Taiwan Agricultural Yearbook*, various issues.

Table 2: Changes in agricultural structure in Korea and Taiwan, 1955 to 2004

		1955	1960	1970	1980	1990	2000	2004
Number of farm households (1000)	Korea	2,218	2,350	2,483	2,155	1,768	1,383	1,240
	Taiwan	733	786	880	891	860	721	721
Population in farm households (1000)	Korea	13,300	14,559	14,422	10,827	6,661	4,031	3,415
	Taiwan	4,603	5,373	5,997	5,389	4,289	3,669	3,225
Persons per farm household	Korea	6.00	6.20	5.81	5.02	3.77	2.91	2.75
	Taiwan	6.28	6.84	6.81	6.05	4.99	5.09	4.47
Arable land (1000ha)	Korea	1,995	2,025	2,298	2,196	2,109	1,918	1,836
	Taiwan	873	869	905	907	890	852	836
Arable land per farm household (ha)	Korea	0.90	0.86	0.93	1.02	1.19	1.39	1.48
	Taiwan	1.19	1.11	1.03	1.02	1.03	1.18	1.16
Share of agric income in total farm household income (percent)	Korea			75.8	65.2	56.8	47.2	39.3
	Taiwan			48.7	24.8	20.1	17.6	22.0
Share of rice in value of agricultural production (percent)	Korea		59.3	37.3	34.1	36.9	32.9	27.6
	Taiwan	37.4	36.5	25.7	19.8	12.1	9.6	7.1

Source: Korean Government, *Major Statistics of Agriculture, Forestry and Fisheries*, various issues; Taiwan Government, *Taiwan Agricultural Yearbook*, various issues.

Table 3: Nominal rates of assistance to covered agricultural products<sup>c</sup>, Korea, 1955 to 2004  
(percent)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
<b>Exportables<sup>a</sup></b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>
<b>Import-competing products<sup>a</sup></b>	<b>-3.9</b>	<b>4.4</b>	<b>16.6</b>	<b>47.6</b>	<b>73.8</b>	<b>122.8</b>	<b>166.7</b>	<b>201.9</b>	<b>182.9</b>	<b>213.6</b>
Rice	-8.2	-7.0	-5.4	31.3	59.6	118.4	214.4	265.9	294.3	385.9
Barley	41.2	83.5	72.3	120.3	101.2	165.9	357.0	524.3	543.0	562.8
Wheat	-43.0	-26.7	-11.2	0.4	26.5	92.2	144.4	216.0	122.8	135.4
Beef	38.8	34.4	64.9	73.9	162.6	163.2	126.2	200.8	159.9	167.8
Pigmeat	-15.2	21.7	158.7	204.1	202.9	169.1	124.7	149.3	116.2	134.4
Poultry	-11.8	6.9	131.4	103.5	161.7	94.2	86.6	155.6	171.7	179.2
Egg	-32.3	-24.7	23.0	0.1	-7.5	14.9	19.4	28.0	26.6	54.3
Milk	n.a.	n.a.	173.3	108.8	189.0	179.8	185.2	203.7	140.7	149.8
Cabbage	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	30.0	30.0	29.1	27.6
Peppers	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	175.0	245.4	145.5	197.0
Soybean	-13.0	18.8	58.8	80.0	122.2	253.0	361.8	508.2	625.6	757.4
Garlic	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	250.3	288.8	213.3	122.6
<b>Total of covered products</b>	<b>-3.9</b>	<b>4.4</b>	<b>16.6</b>	<b>47.6</b>	<b>73.8</b>	<b>122.8</b>	<b>166.7</b>	<b>201.9</b>	<b>182.9</b>	<b>213.6</b>
Dispersion of covered products <sup>b</sup>	33.4	40.0	82.7	81.0	87.2	64.7	112.4	164.2	200.1	225.4
% coverage (at undistorted prices)	45	55	64	61	61	56	60	57	52	46

<sup>a</sup> Weighted averages, with weights based on the unassisted value of production.

<sup>b</sup> Dispersion is a simple 5-year average of the annual standard deviation around the weighted mean of NRAs of covered products.

<sup>c</sup> n.a. = data not available; n.ap. = not applicable.

Source: Authors' spreadsheet

Table 4: Nominal rates of assistance to covered agricultural products<sup>c</sup>, Taiwan, 1955 to 2004  
(percent)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-02
<b>Exportables<sup>a</sup></b>	<b>-23.5</b>	<b>7.5</b>	<b>5.7</b>	<b>20.7</b>	<b>13.4</b>	<b>35.9</b>	<b>89.5</b>	<b>161.4</b>	<b>167.6</b>	<b>203.1</b>
Rice	-29.6	-6.6	-17.9	-9.4	-7.6	32.5	103.3	161.4	167.6	203.1
Pigmeat <sup>b</sup>	-8.1	64.0	99.7	98.3	60.6	42.6	64.8	n.ap.	n.ap.	n.ap.
<b>Import-competing products<sup>a</sup></b>	<b>-33.0</b>	<b>5.3</b>	<b>21.7</b>	<b>26.7</b>	<b>32.5</b>	<b>49.1</b>	<b>55.4</b>	<b>93.6</b>	<b>126.3</b>	<b>160.0</b>
Wheat	48.2	36.0	39.4	32.2	57.2	92.3	n.a.	n.a.	n.a.	n.a.
Beef	13.7	41.2	28.8	22.0	79.6	77.0	101.3	98.5	82.6	72.8
Pigmeat <sup>b</sup>	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	107.1	131.3	173.2
Poultry	-47.5	-3.7	21.2	27.1	30.0	63.6	84.6	143.0	228.7	279.5
Egg <sup>c</sup>	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	0.7	26.8	23.9	17.9	24.7
<b>Non-tradable<sup>a</sup></b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>	<b>n.ap.</b>
Egg <sup>c</sup>	0.0	0.0	0.0	0.0	0.0	0.0	n.ap.	n.ap.	n.ap.	n.ap.
<b>Total of covered products<sup>a</sup></b>	<b>-23.2</b>	<b>7.2</b>	<b>6.2</b>	<b>20.0</b>	<b>14.0</b>	<b>35.1</b>	<b>76.1</b>	<b>109.5</b>	<b>134.0</b>	<b>167.8</b>
Dispersion of covered products <sup>d</sup>	33.4	35.3	47.5	40.5	40.5	34.5	56.9	66.1	86.9	106.4
% coverage (at undistorted prices)	53	49	49	48	50	42	35	34	35	36

<sup>a</sup> Weighted averages, with weights based on the unassisted value of production.

<sup>b</sup> Pigmeat changed trade status in 1989, from import-competing to exportable. The period average reported here corresponds to 1985-88 for the import-competing product, and 1989-94 for the exportable product.

<sup>c</sup> Eggs were assumed to be a non-tradable with zero distortions prior to 1983.

<sup>d</sup> Dispersion is a simple 5-year average of the annual standard deviation around the weighted mean of NRAs of covered products.

<sup>e</sup> n.a. = data not available; n.ap. = not applicable (because shown elsewhere in the table with the opposite trade status).

Source: Authors' spreadsheet

Table 5: Nominal rates of assistance to agricultural relative to non-agricultural industries,<sup>e</sup> Korea and Taiwan, 1955 to 2004

	(percent)									
<b>(a) Korea</b>	<b>1955-59</b>	<b>1960-64</b>	<b>1965-69</b>	<b>1970-74</b>	<b>1975-79</b>	<b>1980-84</b>	<b>1985-89</b>	<b>1990-94</b>	<b>1995-99</b>	<b>2000-04</b>
Covered products <sup>a</sup>	-3.9	4.4	16.6	47.6	73.8	122.8	166.7	201.9	182.9	213.6
Non-covered products	-1.7	-0.2	7.0	15.3	25.3	37.4	64.3	88.0	74.6	71.7
All agricultural products <sup>a</sup>	-3.2	4.0	13.4	35.7	56.3	89.4	126.1	152.8	129.8	137.3
Non-product specific (NPS) assistance	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
<b>Total agricultural NRA (incl. NPS)<sup>b</sup></b>	<b>-3.2</b>	<b>4.0</b>	<b>13.4</b>	<b>35.7</b>	<b>56.3</b>	<b>89.4</b>	<b>126.1</b>	<b>152.8</b>	<b>129.8</b>	<b>137.3</b>
Trade bias index <sup>d</sup>	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.	n.ap.
<i>Assistance to just tradables:</i>										
All agricultural tradables	-3.3	4.9	16.3	46.1	71.8	118.6	159.3	197.6	164.8	171.9
All non-agricultural tradables	45.6	37.1	22.3	11.4	11.7	6.8	5.7	3.3	2.3	1.7
<b>Relative rate of assistance, RRA<sup>c</sup></b>	<b>-32.6</b>	<b>-21.4</b>	<b>-4.8</b>	<b>30.5</b>	<b>53.9</b>	<b>104.8</b>	<b>145.5</b>	<b>188.2</b>	<b>158.8</b>	<b>167.3</b>
<b>(b) Taiwan</b>										
Covered products <sup>a</sup>	-23.2	7.2	6.2	20.0	14.0	35.1	76.1	109.5	134.0	167.8
Non-covered products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All agricultural products <sup>a</sup>	-11.8	3.5	3.0	9.2	7.0	14.6	26.4	37.2	45.5	60.0
Non-product specific (NPS) assistance	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
<b>Total agricultural NRA (incl. NPS)<sup>b</sup></b>	<b>-11.8</b>	<b>3.5</b>	<b>3.0</b>	<b>9.2</b>	<b>7.0</b>	<b>14.6</b>	<b>26.4</b>	<b>37.2</b>	<b>45.5</b>	<b>60.0</b>
Trade bias index <sup>c</sup>	-0.15	0.05	0.02	0.12	0.05	0.15	0.27	0.11	0.02	0.00
<i>Assistance to just tradables:</i>										
All agricultural tradables	-15.8	4.7	3.9	12.0	8.9	18.5	32.7	45.0	53.6	69.2
All non-agricultural tradables	8.8	9.3	8.8	7.5	7.0	5.2	4.5	2.6	1.8	1.1
<b>Relative rate of assistance, RRA<sup>d</sup></b>	<b>-22.5</b>	<b>-4.2</b>	<b>-4.5</b>	<b>4.2</b>	<b>1.7</b>	<b>12.7</b>	<b>27.0</b>	<b>41.3</b>	<b>51.0</b>	<b>67.3</b>

<sup>a</sup> NRAs including product-specific input subsidies.

<sup>b</sup> NRAs including product-specific input subsidies and non-product-specific (NPS) assistance. Total of assistance to primary factors and intermediate inputs divided to total value of primary agriculture production at undistorted prices (%).

<sup>c</sup> Trade bias index is  $TBI = (1 + NRA_{agx}/100)/(1 + NRA_{agm}/100) - 1$ , where  $NRA_{agm}$  and  $NRA_{agx}$  are the average percentage NRAs for the import-competing and exportable parts of the agricultural sector.

<sup>d</sup> The RRA is defined as  $100 * [(100 + NRA_{agt}) / (100 + NRA_{nonagt}) - 1]$ , where  $NRA_{agt}$  and  $NRA_{nonagt}$  are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

<sup>e</sup> n.a. = data not available; n.ap. = not applicable; the final column for Taiwan is 2000-02. Source: Authors' spreadsheet

Table 6: Consumer tax equivalents to covered agricultural products<sup>c</sup>, Korea and Taiwan, 1955 to 2004

(percent)

## (a) Korea

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Rice	-7.7	-5.5	-5.0	29.1	54.5	113.4	211.5	261.7	290.8	385.3
Barley	40.8	77.8	64.9	96.6	57.3	119.6	325.6	411.5	341.2	327.5
Wheat	-46.2	-22.5	-11.1	1.1	16.2	46.0	132.8	167.4	80.5	80.6
Beef	38.8	34.4	64.9	73.9	162.6	163.2	122.1	200.7	153.9	167.7
Pigmeat	-15.0	21.7	158.7	204.1	202.9	169.1	124.7	149.3	116.2	134.4
Poultry	-11.6	7.0	131.4	103.5	161.7	94.2	86.6	155.6	171.7	179.2
Egg	-27.1	-24.7	23.0	0.1	-7.5	14.9	19.4	28.0	26.6	54.3
Milk	na	na	130.0	108.8	189.0	179.8	185.2	203.7	140.7	149.8
Soybean	-19.8	8.2	51.6	63.2	95.2	245.4	112.2	75.5	63.6	66.8
Total of covered products <sup>a</sup>	na	6.6	13.6	39.2	63.3	110.6	150.8	185.9	159.6	163.9

## (b) Taiwan

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-02
Rice	-29.6	-6.6	-17.9	-9.4	-7.6	32.5	103.3	161.4	167.6	203.1
Wheat	33.9	23.5	29.3	14.7	-1.1	40.3	183.4	n.a.	n.a.	n.a.
Beef	13.7	41.2	28.8	22.0	79.6	77.0	101.3	98.5	82.6	72.8
Pigmeat	-8.1	64.0	99.7	98.3	60.6	42.6	64.8	107.1	131.3	173.2
Poultry	-47.5	-3.7	21.2	27.1	30.0	63.6	84.6	143.0	228.7	279.5
Egg	0.0	0.0	0.0	0.0	0.0	0.7	26.8	23.9	17.9	24.7
Total of covered products <sup>a</sup>	26.2	27.0	21.7	23.2	18.6	39.9	82.6	116.4	136.7	99.8

<sup>a</sup> Weighted averages, with weights based on the undistorted value of consumption. In Korea's case this includes cabbage, peppers and garlic.

<sup>c</sup> n.a. = data not available; n.ap. = not applicable.

Source: Authors' spreadsheet

Appendix Table A1: Annual distortion estimates, Korea, 1955 to 2004

(a) Nominal rates of assistance to covered products

(percent)

	Barley	Beef	Cabbage	Egg	Garlic	Milk	Peppers	Pig meat	Poultry	Rice	Soybean	Wheat	All covered
1955	-11	7	na	na	na	na	na	-42	-43	-42	-33	-56	-38
1956	36	36	na	na	na	na	na	-39	-31	-6	-28	-41	-3
1957	90	54	na	na	na	na	na	-15	-6	26	-5	-32	28
1958	63	62	na	-16	na	na	na	29	9	-6	-11	-43	3
1959	27	35	na	-38	na	na	na	-8	13	-12	12	-43	-7
1960	65	53	na	-45	na	na	na	-2	6	-4	29	-41	1
1961	19	-3	na	-50	na	na	na	-41	-33	-44	-33	-56	-36
1962	19	21	na	-40	na	na	na	16	-13	-44	-23	-45	-32
1963	144	61	na	-13	na	na	na	68	12	25	61	-8	36
1964	171	40	na	25	na	na	na	67	62	32	60	16	52
1965	61	39	na	25	na	na	na	108	81	-2	44	-19	16
1966	43	26	na	24	na	na	na	114	81	-10	55	-15	7
1967	68	30	na	34	na	105	na	145	134	-14	104	-10	10
1968	85	87	na	30	na	210	na	235	203	-11	38	-6	19
1969	105	143	na	2	na	205	na	191	158	9	53	-6	32
1970	144	119	na	28	na	216	na	207	152	39	131	10	64
1971	149	120	na	9	na	133	na	286	153	63	76	17	82
1972	198	85	na	-8	na	41	na	222	80	88	102	25	95
1973	74	18	na	-7	na	60	na	193	52	11	48	-20	23
1974	36	28	na	-21	na	94	na	112	80	-44	43	-31	-27
1975	59	80	na	-17	na	133	na	154	107	-4	59	-20	13
1976	76	128	na	-14	na	187	na	189	144	48	108	-4	60
1977	112	218	na	-11	na	189	na	169	182	65	118	53	76
1978	131	224	na	-2	na	175	na	270	212	66	174	61	89
1979	129	162	na	6	na	261	na	232	164	123	152	42	131
1980	57	137	na	12	na	223	na	181	90	109	199	89	112
1981	125	186	na	4	na	194	na	285	122	98	252	86	119
1982	170	190	na	8	na	169	na	196	90	122	290	92	131
1983	241	159	na	36	na	153	na	106	87	130	292	110	129
1984	238	144	na	14	na	160	na	78	82	133	232	84	123
1985	293	68	na	23	na	128	na	164	75	169	275	69	144
1986	399	97	30	11	250	211	175	144	64	196	302	99	158
1987	417	93	30	3	250	238	175	100	57	222	415	171	161
1988	336	178	30	7	250	162	175	119	112	226	410	204	177
1989	341	195	30	54	250	187	175	97	126	259	407	178	195
1990	363	207	30	39	250	152	175	190	142	276	459	222	209
1991	494	223	30	9	250	289	175	172	136	254	461	265	200
1992	461	206	30	40	250	158	175	95	138	254	508	201	184
1993	534	171	30	12	310	197	281	116	165	283	554	195	198
1994	769	197	30	39	383	222	421	173	198	262	559	197	219
1995	632	223	30	59	210	154	204	130	171	340	734	200	214
1996	403	200	29	15	44	128	108	138	185	336	604	134	186
1997	635	144	29	17	232	147	153	88	161	284	453	99	177
1998	449	71	29	7	373	118	87	60	135	199	393	64	127
1999	596	162	29	35	207	157	176	166	206	313	945	116	210
2000	740	139	28	30	30	205	192	124	220	390	908	157	216
2001	412	175	28	42	8	105	221	93	201	374	702	137	194
2002	561	254	28	40	88	154	144	122	164	422	780	130	221
2003	572	142	27	55	205	139	267	134	131	395	750	129	211
2004	528	129	27	105	282	145	162	199	180	350	647	124	226

Appendix Table A1 (continued): Annual distortion estimates, Korea, 1955 to 2004  
 (b) Nominal and relative rates of assistance to all<sup>a</sup> agricultural products, to exportable<sup>b</sup> and import-competing<sup>b</sup> agricultural industries, and relative<sup>c</sup> to non-agricultural industries  
 (percent)

	Total ag NRA				Ag tradables NRA			Non-ag tradables	
	Covered products		Non-covered products	All products (incl NPS)	Exportables	Import-competing	All	NRA	RRA
	Inputs	Outputs							
1955	0	-38	-19	-28	nap	-36	-36	48	-57
1956	0	-3	1	-2	nap	-2	-2	35	-27
1957	0	28	11	17	nap	26	26	35	-6
1958	0	3	2	2	nap	3	3	41	-27
1959	0	-7	-4	-5	nap	-7	-7	69	-45
1960	0	1	0	1	nap	1	1	66	-39
1961	0	-36	-17	-27	nap	-33	-33	37	-51
1962	0	-32	-15	-23	nap	-29	-29	34	-47
1963	0	36	15	27	nap	35	35	26	7
1964	0	52	21	42	nap	51	51	23	23
1965	0	16	7	13	nap	15	15	27	-9
1966	0	7	4	6	nap	7	7	23	-13
1967	0	10	5	8	nap	9	9	23	-11
1968	0	19	10	15	nap	19	19	21	-2
1969	0	32	15	25	nap	31	31	18	11
1970	0	64	25	48	nap	61	61	17	38
1971	0	82	31	61	nap	78	78	12	59
1972	0	95	33	72	nap	90	90	12	70
1973	0	23	10	18	nap	22	22	9	12
1974	0	-27	-8	-21	nap	-23	-23	8	-29
1975	0	13	6	10	nap	12	12	9	2
1976	0	60	27	48	nap	58	58	11	43
1977	0	76	35	59	nap	75	75	17	50
1978	0	89	38	66	nap	85	85	12	65
1979	0	131	52	98	nap	127	127	10	106
1980	0	112	44	79	nap	105	105	8	90
1981	0	119	48	90	nap	114	114	6	101
1982	0	131	52	96	nap	125	125	7	111
1983	0	129	53	93	nap	123	123	7	108
1984	0	123	52	89	nap	117	117	6	104
1985	0	144	59	101	nap	136	136	6	124
1986	0	158	69	126	nap	156	156	6	141
1987	0	161	67	125	nap	155	155	6	140
1988	0	177	69	138	nap	169	169	6	155
1989	0	195	70	141	nap	180	180	4	169
1990	0	209	76	155	nap	196	196	4	185
1991	0	200	77	145	nap	187	187	4	177
1992	0	184	81	143	nap	179	179	3	170
1993	0	198	96	153	nap	200	200	3	192
1994	0	219	109	168	nap	226	226	3	217
1995	0	214	87	148	nap	198	198	2	191
1996	0	186	50	117	nap	145	145	3	139
1997	0	177	77	129	nap	164	164	2	158
1998	0	127	75	105	nap	129	129	2	124
1999	0	210	83	150	nap	188	188	2	183
2000	0	216	60	133	nap	166	166	2	161
2001	0	194	56	123	nap	150	150	2	145
2002	0	221	66	133	nap	168	168	2	163
2003	0	211	85	142	nap	181	181	2	176
2004	0	226	91	155	nap	196	196	1	191

a. NRAs including assistance to nontradables and non-product specific assistance.

b. NRAs including products specific input subsidies.

c. The Relative Rate of Assistance (RRA) is defined as  $100 * [(100 + NRA_{ag}^t) / (100 + NRA_{nonag}^t) - 1]$ , where  $NRA_{ag}^t$  and  $NRA_{nonag}^t$  are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.



Appendix Table A1 (continued): Annual distortion estimates, Korea, 1955 to 2004  
(c) Value shares of primary production of covered<sup>a</sup> and non-covered products,  
(percent)

	Barley	Beef	Cabba ge	Egg	Garlic	Milk	Pepp ers	Pigme at	Poultr y	Rice	Soybe an	Wheat	Non-c overe d
1955	5	1	0	0	0	0	0	3	0	37	1	1	51
1956	6	1	0	0	0	0	0	4	0	30	1	1	57
1957	4	1	0	0	0	0	0	3	0	29	1	1	61
1958	4	1	0	1	0	0	0	3	0	34	1	1	56
1959	5	2	0	2	0	0	0	4	1	32	1	1	53
1960	4	2	0	3	0	0	0	3	1	31	1	1	54
1961	6	1	0	1	0	0	0	2	1	38	1	1	49
1962	7	1	0	2	0	0	0	1	1	37	1	1	50
1963	5	1	0	2	0	0	0	1	1	46	1	1	42
1964	9	2	0	2	0	0	0	2	1	50	2	1	31
1965	11	2	0	2	0	0	0	2	1	44	2	1	36
1966	11	2	0	2	0	0	0	2	1	46	1	1	35
1967	9	2	0	2	0	0	0	2	1	45	1	1	37
1968	10	2	0	2	0	0	0	1	1	45	2	1	36
1969	7	2	0	4	0	0	0	2	1	46	1	1	36
1970	7	2	0	4	0	0	0	2	1	39	1	1	41
1971	8	3	0	5	0	0	0	2	1	38	2	1	40
1972	7	3	0	6	0	0	0	2	2	39	2	1	38
1973	7	4	0	4	0	0	0	2	1	42	2	0	38
1974	4	2	0	3	0	0	0	1	1	51	1	0	35
1975	7	3	0	4	0	0	0	2	1	49	1	0	32
1976	7	3	0	4	0	0	0	2	1	43	1	0	37
1977	3	2	0	5	0	0	0	3	1	44	2	0	40
1978	3	2	0	4	0	1	0	3	1	41	1	0	44
1979	4	5	0	4	0	1	0	5	1	39	1	0	40
1980	3	5	0	4	0	1	0	6	2	31	1	0	47
1981	2	5	0	4	0	1	0	5	1	40	1	0	41
1982	2	4	0	4	0	1	0	6	1	36	1	0	43
1983	2	4	0	4	0	2	0	7	2	33	1	0	46
1984	2	5	0	4	0	2	0	7	2	31	1	0	46
1985	1	7	0	4	0	2	0	6	2	28	1	0	48
1986	1	7	3	4	2	2	4	6	3	31	1	0	36
1987	1	7	4	5	1	2	3	6	3	27	1	0	38
1988	1	5	5	4	2	3	4	6	3	30	1	0	36
1989	1	4	5	4	2	3	1	6	3	26	1	0	44
1990	1	4	4	4	3	4	2	7	3	26	1	0	41
1991	1	5	4	5	3	2	3	7	3	23	0	0	45
1992	1	6	3	4	3	3	5	9	3	22	0	0	40
1993	1	6	3	4	2	3	3	10	3	19	0	0	44
1994	0	6	4	4	2	3	2	8	3	21	0	0	46
1995	0	5	3	4	4	3	4	8	3	15	0	0	52
1996	0	4	3	4	4	3	5	7	3	16	0	0	51
1997	0	5	3	4	2	3	3	9	3	19	0	0	48
1998	0	6	3	5	2	3	4	10	3	21	0	0	43
1999	0	6	3	4	2	3	3	9	3	19	0	0	47
2000	0	5	3	3	3	3	3	7	2	16	0	0	54
2001	0	4	3	4	4	4	3	8	2	16	0	0	51
2002	0	3	3	4	2	4	3	8	3	13	0	0	56
2003	0	5	4	4	1	4	2	9	3	14	0	0	55

<sup>a</sup> At undistorted farmgate prices

Source: Authors' spreadsheet

Appendix Table A2: Annual distortion estimates, Taiwan, 1955 to 2002

(a) Nominal rates of assistance to covered products (percent)

	Beef	Egg	Pigmeat	Poultry	Rice	Wheat	All
1955	-23	0	-39	-68	-49	96	-47
1956	52	0	10	-37	-11	31	-6
1957	47	0	9	-30	-3	38	1
1958	-10	0	-20	-55	-48	53	-41
1959	3	0	-1	-46	-37	23	-25
1960	20	0	14	-34	-9	31	-3
1961	49	0	24	-14	3	34	8
1962	48	0	73	2	-13	32	2
1963	51	0	120	4	-7	41	16
1964	39	0	88	25	-7	42	13
1965	66	0	118	20	-8	43	16
1966	51	0	112	14	-14	30	11
1967	4	0	87	18	-21	36	2
1968	0	0	113	31	-24	43	2
1969	24	0	69	23	-21	45	1
1970	14	0	82	19	0	55	21
1971	29	0	109	29	0	39	31
1972	50	0	114	39	2	65	35
1973	-4	0	111	27	-24	8	16
1974	22	0	74	22	-25	-6	0
1975	105	0	125	22	-15	0	15
1976	73	0	57	20	3	29	20
1977	89	0	45	42	-10	84	13
1978	91	0	49	35	-19	90	9
1979	41	0	28	31	3	83	15
1980	54	0	46	39	17	81	29
1981	72	0	48	65	8	81	27
1982	75	0	44	63	29	115	37
1983	88	1	41	85	46	na	46
1984	96	2	33	66	63	na	47
1985	95	9	41	57	73	na	53
1986	104	19	56	70	84	na	64
1987	108	17	72	87	110	na	81
1988	102	27	90	98	108	na	93
1989	97	61	123	110	142	na	122
1990	97	9	112	107	146	na	112
1991	97	-1	76	112	144	na	93
1992	95	41	93	149	170	na	115
1993	99	30	100	168	191	na	126
1994	106	40	138	178	156	na	140
1995	66	33	108	167	208	na	131
1996	97	2	124	167	174	na	126
1997	101	-1	94	195	149	na	114
1998	85	11	108	242	134	na	128
1999	63	44	221	372	174	na	212
2000	44	33	201	347	189	na	202
2001	95	22	168	254	195	na	169

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2002	79	19	150	237	226	na	164
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Appendix Table A2 (continued): Annual distortion estimates, Taiwan, 1955 to 2002  
 (b) Nominal and relative rates of assistance to all<sup>a</sup> agricultural products, to exportable<sup>b</sup> and import-competing<sup>b</sup> agricultural industries, and relative<sup>c</sup> to non-agricultural industries  
 (percent)

	Total ag NRA				Ag tradables NRA			Non-agric tradables	
	Covered products		Non-covered products	All products (incl NPS)	Exportables	Import-competing	All		
	Inputs	Outputs							
1955	0	-47	0	-22	-35	-7	-30	7	-35
1956	0	-6	0	-3	-4	-3	-4	8	-11
1957	0	1	0	0	1	-2	0	8	-7
1958	0	-41	0	-20	-31	-3	-27	10	-33
1959	0	-25	0	-14	-21	-3	-18	10	-26
1960	0	-3	0	-1	-2	-1	-2	9	-10
1961	0	8	0	4	7	-1	5	9	-3
1962	0	2	0	1	1	1	1	10	-8
1963	0	16	0	8	13	1	11	9	1
1964	0	13	0	6	10	2	8	9	-1
1965	0	16	0	7	12	2	10	9	0
1966	0	11	0	5	8	2	7	10	-2
1967	0	2	0	1	1	2	1	8	-7
1968	0	2	0	1	1	3	1	9	-7
1969	0	1	0	1	0	3	1	8	-7
1970	0	21	0	10	16	2	13	8	5
1971	0	31	0	14	23	3	18	7	10
1972	0	35	0	16	26	5	20	8	11
1973	0	16	0	7	12	3	9	8	1
1974	0	0	0	0	-1	3	0	7	-6
1975	0	15	0	7	12	3	9	7	2
1976	0	20	0	10	16	4	13	7	6
1977	0	13	0	7	9	8	8	7	1
1978	0	9	0	4	5	6	5	7	-2
1979	0	15	0	7	10	5	9	7	2
1980	0	29	0	12	21	6	15	5	9
1981	0	27	0	11	17	9	14	5	8
1982	0	37	0	14	25	8	19	5	13
1983	0	46	0	19	31	12	23	5	17
1984	0	47	0	19	33	10	23	5	17
1985	0	53	0	20	37	9	25	5	19
1986	0	64	0	23	44	11	29	5	23
1987	0	81	0	26	53	13	33	5	27
1988	0	93	0	28	58	13	35	4	30
1989	0	122	0	38	53	45	47	4	41
1990	0	112	0	41	60	45	50	4	45
1991	0	93	0	34	57	34	41	3	37
1992	0	115	0	37	56	40	45	2	41
1993	0	126	0	38	61	41	46	2	43
1994	0	140	0	41	51	50	50	2	47
1995	0	131	0	39	60	43	47	2	45
1996	0	126	0	42	55	48	50	2	47
1997	0	114	0	43	58	48	50	2	48
1998	0	128	0	45	51	54	53	2	50
1999	0	212	0	63	61	79	74	2	72
2000	0	202	0	69	70	83	80	1	78
2001	0	169	0	60	66	70	69	1	67
2002	0	164	0	55	75	60	63	1	62

a. NRAs including assistance to nontradables and non-product specific assistance.

b. NRAs including products specific input subsidies.

c. The Relative Rate of Assistance (RRA) is defined as  $100 * [(100 + \text{NRA}_{\text{ag}}^t) / (100 + \text{NRA}_{\text{nonag}}^t) - 1]$ , where  $\text{NRA}_{\text{ag}}^t$  and  $\text{NRA}_{\text{nonag}}^t$  are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

Appendix Table A2 (continued): Annual distortion estimates, Taiwan, 1955 to 2002

(c) Value shares of primary production of covered<sup>a</sup> and non-covered products,

(percent)

	Beef	Egg	Pigmeat	Poultry	Rice	Wheat	Non-covered
1955	0	0	12	1	34	0	52
1956	0	0	15	1	40	0	43
1957	0	0	16	1	35	0	48
1958	0	0	12	1	36	0	50
1959	0	1	17	1	37	0	43
1960	0	1	13	1	33	0	53
1961	0	1	13	2	35	0	49
1962	0	1	8	1	40	0	49
1963	0	1	9	2	38	0	50
1964	0	1	9	1	35	0	54
1965	0	1	9	1	36	0	53
1966	0	1	9	1	37	0	52
1967	0	1	10	2	37	0	51
1968	0	1	9	1	39	0	50
1969	0	1	11	2	35	0	50
1970	0	1	12	2	32	0	53
1971	0	1	12	2	29	0	55
1972	0	2	12	3	28	0	55
1973	0	1	12	3	29	0	54
1974	0	1	12	2	38	0	46
1975	0	2	10	2	36	0	50
1976	0	2	15	3	31	0	49
1977	0	2	17	4	26	0	51
1978	0	3	16	4	26	0	52
1979	0	2	18	4	22	0	54
1980	0	2	14	4	21	0	58
1981	0	2	14	4	21	0	59
1982	0	2	15	4	18	0	61
1983	0	3	16	5	17	0	59
1984	0	3	16	5	15	0	60
1985	0	3	16	5	14	0	62
1986	0	3	17	5	11	0	64
1987	0	2	16	5	9	0	68
1988	0	2	14	5	10	0	69
1989	0	2	14	6	9	0	69
1990	0	3	17	6	10	0	63
1991	0	3	19	5	9	0	64
1992	0	3	17	5	7	0	68
1993	0	3	15	5	7	0	70
1994	0	3	14	5	7	0	70
1995	0	3	16	5	6	0	70
1996	0	4	17	6	7	0	67
1997	0	5	17	7	8	0	62
1998	0	5	14	7	8	0	65
1999	0	5	11	6	8	0	70
2000	0	5	14	7	8	0	66
2001	0	5	16	7	7	0	64
2002	0	5	14	7	7	0	67

<sup>a</sup> At undistorted farmgate prices

Source: Authors' spreadsheet

Appendix Table 3: Consumer tax equivalents for covered agricultural products, Korea, 1955 to 2004 (percent)

	Barle y	Beef	Cabb age	Egg	Garli c	Milk	Pepp ers	Pigm eat	Poult ry	Rice	Soyb ean	Whea t	All cover ed
1955	-12	7	na	na	na	na	na	-42	-43	-39	-40	-62	na
1956	37	36	na	na	na	na	na	-39	-31	-6	-36	-44	na
1957	90	54	na	na	na	na	na	-15	-6	23	-11	-36	na
1958	63	62	na	-16	na	na	na	29	9	-6	-18	-47	na
1959	26	35	na	-38	na	na	na	-8	13	-11	6	-42	na
1960	62	53	na	-45	na	na	na	-2	6	-4	25	-32	na
1961	18	-3	na	-50	na	na	na	-41	-33	-39	-41	-53	-30
1962	18	21	na	-40	na	na	na	16	-13	-39	-31	-36	-28
1963	133	61	na	-13	na	na	na	68	12	24	35	-5	33
1964	158	40	na	25	na	na	na	67	62	31	53	14	51
1965	56	39	na	25	na	na	na	108	81	-2	37	-18	14
1966	41	26	na	24	na	0	na	114	81	-9	50	-17	7
1967	63	30	na	34	na	105	na	145	134	-13	97	-9	6
1968	77	87	na	30	na	210	na	235	203	-10	24	-5	15
1969	88	143	na	2	na	205	na	191	158	8	50	-6	27
1970	122	119	na	28	na	216	na	207	152	32	120	9	49
1971	134	120	na	9	na	133	na	286	153	53	65	13	67
1972	153	85	na	-8	na	41	na	222	80	81	90	23	81
1973	51	18	na	-7	na	60	na	193	52	9	25	-13	16
1974	23	28	na	-21	na	94	na	112	80	-29	16	-25	-17
1975	37	80	na	-17	na	133	na	154	107	-3	38	-15	8
1976	50	128	na	-14	na	187	na	189	144	44	89	-2	47
1977	65	218	na	-11	na	189	na	169	182	59	87	32	66
1978	72	224	na	-2	na	175	na	270	212	58	146	38	79
1979	63	162	na	6	na	261	na	232	164	115	116	29	116
1980	24	137	na	12	na	223	na	181	90	97	173	43	95
1981	72	186	na	4	na	194	na	285	122	97	246	47	109
1982	109	190	na	8	na	169	na	196	90	119	301	44	121
1983	192	159	na	36	na	153	na	106	87	126	295	52	118
1984	201	144	na	14	na	160	na	78	82	127	212	45	109
1985	246	68	na	23	na	128	na	164	75	157	252	44	122
1986	322	92	30	11	250	211	175	144	64	195	56	80	135
1987	381	84	30	3	250	238	175	100	57	222	77	157	148
1988	336	174	30	7	250	162	175	119	112	226	83	204	168
1989	343	193	30	54	250	187	175	97	126	257	92	179	180
1990	342	207	30	39	250	152	175	190	142	274	96	209	197
1991	380	223	30	9	250	289	175	172	136	254	51	204	192
1992	397	206	30	40	250	158	175	95	138	252	68	173	176
1993	409	171	30	12	310	197	281	116	165	276	87	150	179
1994	529	197	30	39	383	222	421	173	198	253	75	102	186
1995	435	222	30	59	210	154	204	130	171	329	87	138	201
1996	305	199	29	15	44	128	108	138	185	333	67	101	181
1997	302	130	29	17	232	147	153	88	161	282	42	47	143
1998	254	55	29	7	373	118	87	60	135	198	40	36	95
1999	411	162	29	35	207	157	176	166	206	312	83	80	179
2000	364	139	28	30	30	205	192	124	220	389	79	77	180
2001	312	175	28	42	8	105	221	93	201	372	73	104	179
2002	362	254	28	40	88	154	144	122	164	420	67	84	208
2003	301	142	27	55	205	139	267	134	131	395	57	68	166
2004	299	129	27	105	282	145	162	199	180	350	57	70	87

Appendix Table 4: Consumer tax equivalents for covered agricultural products, Taiwan, 1955 to 2002

	(percent)						
	Beef	Egg	Pigmeat	Poultry	Rice	Wheat	All covered
1955	-23	0	-39	-68	-49	96	49
1956	52	0	10	-37	-11	31	19
1957	47	0	9	-30	-3	38	25
1958	-10	0	-20	-55	-48	53	28
1959	3	0	-1	-46	-37	23	10
1960	20	0	14	-34	-9	31	23
1961	49	0	24	-14	3	34	27
1962	48	0	73	2	-13	32	24
1963	51	0	120	4	-7	41	31
1964	39	0	88	25	-7	42	30
1965	66	0	118	20	-8	43	32
1966	51	0	112	14	-14	30	23
1967	4	0	87	18	-21	36	20
1968	0	0	113	31	-24	43	19
1969	24	0	69	23	-21	45	14
1970	14	0	82	19	0	55	26
1971	29	0	109	29	0	39	33
1972	50	0	114	39	2	65	38
1973	-4	0	111	27	-24	8	17
1974	22	0	74	22	-25	-6	2
1975	105	0	125	22	-15	0	15
1976	73	0	57	20	3	29	22
1977	89	0	45	42	-10	84	19
1978	91	0	49	35	-19	90	16
1979	41	0	28	31	3	83	20
1980	54	0	46	39	17	81	34
1981	72	0	48	65	8	81	32
1982	75	0	44	63	29	115	42
1983	88	1	41	85	46	na	45
1984	96	2	33	66	63	na	47
1985	95	9	41	57	73	na	53
1986	104	19	56	70	84	na	65
1987	108	17	72	87	110	na	82
1988	102	27	90	98	108	na	93
1989	97	61	123	110	142	na	120
1990	97	9	112	107	146	na	110
1991	97	-1	76	112	144	na	94
1992	95	41	93	149	170	na	116
1993	99	30	100	168	191	na	125
1994	106	40	138	178	156	na	138
1995	66	33	108	167	208	na	126
1996	97	2	124	167	174	na	124
1997	101	-1	94	195	149	na	112
1998	85	11	108	242	134	na	124
1999	63	44	221	372	174	na	196



2000	44	33	201	347	189	na	184
2001	95	22	168	254	195	na	163
2002	79	19	150	237	226	na	153

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