Distortions to Agricultural Incentives

in Thailand

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Thailand is a major net agricultural exporter and its agricultural trade policy is dominated by this fact. The list of agricultural exports includes many of the most important agricultural products produced and consumed within the country, including the staple food, rice — exports of which account for between 30 and 50 percent of its total output — and also cassava, sugar, rubber and poultry products. The list of imported agricultural commodities is much thinner. Maize was a net export in most years but it was a net import for some years in the 1990s. Soybeans was a net export for several decades, but since the early 1990s it has been a net import. Palmoil fluctuated between a net import and a net export but since the late 1990s it has been a net export.

Historically, Thailand's large agricultural surplus led to a degree of policy complacency regarding the agricultural sector. Agricultural-importing countries are typically concerned about food security and raising agricultural productivity to reduce import dependence. In Thailand, these matters were not a significant concern, although stabilizing food prices for consumers has been a recurrent theme of agricultural pricing policy. Until the 1980s, agricultural exports were viewed as a source of revenue for the central government. Unlike manufacturing, traditional agriculture was not seen as a dynamic sector of the economy which could contribute to rapid growth. Because the price elasticity of supply of most agricultural products was very low, at least in the short run, it was perceived that their production could be taxed heavily without producing a significant contraction of output. Moreover, most agricultural producers were impoverished, poorly educated and politically unorganized. This was particularly the case for rice producers, so taxing agriculture, and especially rice, was politically attractive and rice exports were indeed taxed until 1986 (Siamwalla, Setboonsarng and Patamasiriwat 1993).

With greatly increased incomes per person, rapid urbanization and the move to more democratic political institutions, policy shifted away from taxing agriculture, towards a more neutral set of trade policies. This change almost certainly owed more to politics — the political

necessity of finding ways to attract the support of the huge rural electorate and the desire of the urban electorate for better economic conditions for the farm population — than to a desire to liberalize agricultural trade for the efficiency-based reasons that economists emphasize. But the move away from taxing agriculture has not progressed far in the direction of subsidizing it. This is for one key reason: the fact that so many of the important agricultural commodities are net exports has made subsidizing agriculture problematic, inhibiting what would otherwise have been strong political pressure to protect Thai farmers had the commodities they produced been competing with imports and hence able to be protected by imposing tariffs.

Thailand is an active member of the Cairns Group of agricultural-exporting countries within the WTO membership, but while its agricultural trade is relatively liberal, it cannot be described as a free-trading country with regard to agricultural commodities. Within Thailand, opposition to agricultural import liberalization is strong in the cases of soybeans, palmoil, rubber, rice and sugar. Protective measures employed include non-tariff instruments, which permits a high degree of discretion on the part of government officials. The set of import controls includes import prohibitions, strict licensing arrangements, local content rules and requirement for special case-by-case approval of imports. The commodities for which these restrictions are applied include the five mentioned above and also onions, garlic, potatoes, pepper, tea, raw silk, maize, coconut products and coffee.

The inclusion of rice in this list of protected commodities may seem strange. Thailand is the world's largest exporter of rice and is undoubtedly one of the world's most efficient producers. Why should its rice industry require protection from imports? Imports of rice are in fact *prohibited* unless specifically approved by the Ministry of Commerce. The Ministry of Agriculture and Cooperatives vigorously opposes any liberalization commitments with regard to rice. The reasons apparently relate to the Ministry's wish to keep its options open with respect to rice policy in the event that market conditions should change unexpectedly. Sudden changes in the price of rice can have far-reaching political consequences. The domestic rice market operates almost entirely without government intervention, but the instruments for potential intervention are ever ready.

A lesser reason for the import controls on rice is that, as with most agricultural commodities, 'rice' is in fact a highly differentiated commodity. Not all grades of rice are produced efficiently within Thailand and the government wishes to protect domestic producers

from imports of grades of rice that are closer substitutes for local grades on the consumption side than they are on the production side. Lower grades of rice produced in Vietnam, but not in Thailand, are an important example.

Thailand's "general exclusion list", which applies to the ASEAN Free Trade Area (AFTA) agreements, includes several agricultural industries, among them are rice, sugar, and palmoil (both crude and refined). Within Thai government circles, discussion of the problems of the agricultural sector relates overwhelmingly to the treatment of Thai exports by others. Thailand's own agricultural import policy is a closed issue. Problems have been encountered with a number of trading partners with respect to environmental and sanitary and phytosanitary (SPS) issues concerning Thailand's agricultural exports. These problems have included the well-known dispute with the United States regarding shrimp (environmental issues) and with Australia regarding Thailand's exports of frozen, cooked chicken (SPS issues).

Within Thailand, poverty is heavily concentrated in rural areas and public opinion favors government support for the rural poor. Since the economic crisis of 1997–98, and especially during the government of Prime Minister Thaksin Shinawatra (2001-2006), a wide range of income support programs, cash grants to villages, and subsidized credit schemes have been introduced. Support for these schemes was a significant component of the 'populist' economic policy agenda of the Thaksin government. However, few if any of these schemes operated through the prices faced by agricultural producers. Since they were not linked directly to the production of agricultural commodities, it seems that they were not 'distorting' in terms of resource allocation. The results of the present study make it possible to assess whether the price incentives facing agricultural producers were indeed 'distorted' relative to international prices during this period of populist government.

The following section of the chapter briefly describes the changing structure of the Thai economy, especially concerning the agricultural sector. The core of the analysis, contained in the next section, uses price comparisons between domestic and international prices of major agricultural commodities and fertilizer, and relates the price comparisons to tariff and non-tariff barriers for these same products. It focuses on the question of whether relative prices for traded commodities at the wholesale level have differed from their relative border prices, adjusted for transport and handling costs. The next section extends this analysis to the farm level. The raw commodities produced by farmers generally do not enter international trade directly. These raw

commodities are inputs into production of the processed commodities which actually enter international trade. For example, rice produced at the farm level (paddy) must be milled before it can be traded internationally. Rice milling, transport, packaging and storage are all costly activities and several steps in the marketing chain intervene between the farmer and the international market. This raises the controversial question of how protection of the processed commodities (such as milled rice), observed at the wholesale level, as captured by the price comparisons, affects the prices actually received by farmers (such as paddy). We analyze this issue econometrically using Thai price data and derive from this the imputed rates of protection for farm-produced commodities. The final section concludes with a discussion of the future prospects for agricultural trade policy in Thailand.

Economic growth and structural change

Over almost four decades, from 1968 to 2005, Thailand's economic output grew in real terms at an average annual rate of 6.5 percent. The broad characteristics of this growth are summarized in Table 1 and Appendix Figure A1. For ease of comparison with other Asian economies, the table distinguishes between the 'pre-boom' two decade period ending in 1986 and the following 'boom' decade, which preceded the Asian crisis of 1997-99. As the table shows, Thailand's growth rate during the boom decade was 9.5 percent, the fastest in the world and almost half as rapid again as during the two decades. Output contracted during the 'crisis' years of 1997 to 1999. During the subsequent 'recovery' period, growth has averaged a moderate 5.1 percent.

As is typical of rapidly growing economies, agricultural output grew more slowly than GDP, implying a declining share of agriculture in aggregate output (Appendix Figure A2). The agricultural sector accounted for 32 percent of GDP in 1965. By 2004 this share had declined to 10 percent. Over the same period the GDP share of industry rose from 23 to 43 and the share of services grew from 45 to 47 percent. Part of this long term contraction is explained by declining terms of trade for Thailand's agricultural exports (Appendix Figure A3).

For more detailed study of the changing composition of the agricultural sector it is convenient to use the input-output tables, which are available at five yearly intervals from 1975

to 2000. Over this period, value added in paddy production (unmilled rice as produced at the farm level) declined from 38 to 26 percent of total agricultural value added (Table 2). Changes in the distribution of expenditures as incomes increased explain most of this change. As incomes rise, expenditure on starchy staples typically declines as a share of total expenditures. The share of maize and cassava similarly declined, but the shares of fruits, poultry, cattle and rubber increased.

For almost all agricultural commodities, the share of intermediate input use in the value of total output increased significantly over the two and a half decades since 1975 (Appendix Table A1). In paddy production, for example, this share increased from 14 to 30 percent. For the entire agricultural sector, this cost share rose from 21 to 37 percent over the same period. Most intermediate goods used in Thai agriculture are domestically produced, but the share of imports in total intermediate input use increased from 10 to 17 percent (Appendix Table A2).

There have been substantial changes in the pattern of sales of agricultural products. In 1975, sales of agricultural products to intermediate users (millers and processors) accounted for 57 percent of total sales, but by 2000 these sales had increased to 70 percent. Almost all paddy is milled into edible rice commercially, rather than on-farm. Paddy is neither exported nor imported, but milled rice has historically been an important export item, as has refined sugar. Cassava is similarly exported in the form of processed animal feeds. Rubber exports have become increasingly significant since the 1990s. Soybeans (included in 'other crops' in these tables) has become an important net import and is used for processed foods and for animal feed (Appendix Tables A3 to A5).[1]

The changing structure of assistance at the wholesale level

In their definitive study of agricultural price policy in Thailand up to the mid-1980s, Siamwalla and Setboonsarng (1989 and 1991) make the point that policies for the various agricultural commodities were determined individually, in response to political circumstances which varied

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[1] A full description of the trading position of the major agricultural commodities is provided in the data provided in the Appendix.

among the commodities concerned, rather than as a part of a single, integrated agricultural policy strategy. For this reason, they argue that it is best to consider the main commodities one at a time, which they do for the commodities rice, sugar, maize and rubber. The discussion which follows will also adopt this strategy, except that the range of agricultural commodities considered includes cassava, soybeans and palmoil, in addition to the four reviewed by Siamwalla and Setboonsarng. Our analysis also considers a major input, urea fertilizer. Following this commodity-specific review, we turn to the issue of what common themes, if any, can be found for Thai agricultural policy as a whole.

The main focus of the present study's methodology (Anderson et al. 2008) is on government-imposed distortions 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 but it also includes estimates of distortions in non-agricultural tradable sectors for comparative evaluation. Specifically, Nominal Rates of Assistance (NRAs) for farmers are computed, including an adjustment for direct interventions on tradable inputs such as fertilizer.[2] It also generates NRAs for nonagricultural tradables for use with that for agricultural tradables to calculate a Relative Rate of Assistance (RRA).

The analysis is conducted at the wholesale level, so in what follows the 'domestic price' means the domestic wholesale price. In the calculation of the NRAs, the border prices are amended by the transport and handling costs involved in getting imports from the cif level to the domestic wholesale level and in getting exports from the domestic wholesale level to the fob level. These transport and handling costs are summarized in Appendix Table A7. This adjustment is required to obtain prices comparable with domestic wholesale prices. The border prices adjusted by transport and handling costs are then interpreted as indications of what the domestic wholesale prices would be in the absence of protection.

Rice

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[2] The price variables and the formula used in these NRA calculations are summarized in Appendix Table A6. All of the annual price data are included in the Appendix also.

From the end of World War II to 1986, Thailand taxed its exports of rice. There were four individual instruments of export taxation, each with different legal foundations, and each under the control of different parts of the bureaucracy. The revenues the different instruments generated went to different destinations within the government. Siamwalla and Setboonsarng (1989 and 1991) describe these differences and point out that their combined effect was a rate of export taxation of around 40 percent from the late 1950s to the early 1970s. The rate increased to around 60 percent during the commodity price boom of 1972–74, but subsequently diminished quickly to about 20 percent. There was a further peak of about 40 percent, at the time of the second OPEC oil price shock in 1979–80, and then a steady decline until all four forms of tax were suspended in 1986. Rice exports have remained untaxed for the two decades since then.[3]

The implications of these events for actual prices are summarized in Figure 1(a), based on the data assembled in Appendix Table A8. As with each similar figure to be presented below for other agricultural commodities, the figure compares domestic wholesale prices with border prices for commodities of comparable quality. Since rice is a net export, "border price" in the diagram means export price, adjusted for transport and handling costs between the wholesale and export level. The NRP calculations that emerge are similar to those that would be inferred from the rates of taxation described above, except that the NRPs after 1986 are not zero, but average around -6 percent. It is possible that the transport and handling costs between the wholesale and fob locations are not fully accounted for in the data shown in Appendix Table A7. For rice, the data shown in Figure 1(a) support the view that the domestic market has received zero protection and zero subsidy, and that it now is also not taxed as in the past.

Maize

Maize was a net export item for Thailand until the 1990s. In 1992 and again from 1995 to 2000, imports dominated, but maize has subsequently reverted to being a net export good. Between 1965 and 1981 the government intervened in the export market in an effort to preserve Thailand's exports to Japan and Taiwan, primarily for use as animal feed. For both of these

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[3] The economic effects of Thailand's rice export tax, including its distributional effects, are explored in Warr (2001). See also the analyses by Pinthong (1977, 1984), Wong (1978), Meenaphant (1981), Barker and Herdt (1985), Roumasset and Setboonsarng (1988), Somporn and Poapongsakorn (1995), Warr and Wollmer (1997) and Choeun, Godo and Hayami (2005).

markets, season-long stability of supply was required. To ensure fulfillment of contracts intended to ensure this stability, the government imposed quota restrictions on exports to markets other than these two countries. The effects of this policy included an increase in the price volatility passed on to the domestic producer, and somewhat reduced average earnings. As countries closer to Thailand, including Malaysia and Singapore, developed their own livestock industries, the need to preserve the Japanese and Taiwan markets was seen as being less crucial and by 1981 the export controls were removed. The data shown in Figure 1(b), based on the data assembled in Appendix Table A9, indicate roughly zero protection for the maize industry, and this outcome does not seem to have varied over time in any systematic way with whether maize was a net import or a net export product.

Cassava

Thailand's cassava exports developed for the supply of animal feed to European and some Asian markets, including Taiwan. The quota restrictions of the EU led to rents attached to export quotas from Thailand, which in turn led to corruption in the allocation of these quotas. The rents associated with the quotas are analogous to a privately collected export tax, resulting in the export price exceeding the domestic price by amounts averaging around 10 percent, as shown in Figure 1(c), based on the data assembled in Appendix Table A10.

Soybean

Soybean was a net export item for Thailand from 1960 until 1988, before becoming a net import item from 1992 onwards (Appendix Table A11). During the export period exports were taxed, but from 1995 onwards the trade regime shifted nominally to one of tariff quotas. The operation of these tariff quotas is summarized in Appendix Table A12. Within the quota volume of imports, soybeans could be imported at low or zero tariffs. Beyond the quota the applied tariff was set at the maximum amount permitted by Thailand's WTO obligations, which varied between 80 and 90 percent. Figure 1(d) indicates that the transition of soybeans from a net export to net import in 1992 coincided with a shift from negative nominal rates of protection (around -20 percent) to positive rates of 30 to 40 percent.

Sugar

In discussions of agricultural trade policy, the sugar industry is often an outlier in terms of the treatment it receives. Thailand is no exception. Sugar was an imported item until the late 1950s, but since has been a net export item. Nevertheless, it receives protection in the form of a 'home price scheme'. This type of scheme involves taxing consumers and using the proceeds to subsidize exports. A scheme of this kind was practiced in the Australian sugar and dairy industries in the 1950s and 1960s (Sieper 1982). Reportedly, a Thai economics student at an Australian university learned about the scheme and imported the idea into Thailand, where it has since been applied to the Thai sugar industry, long after the scheme was abandoned in Australia.

A home price scheme drives up the domestic consumer and producer prices of the product, subsidizing the producer at the expense of the consumer. To make the scheme work, leakage from the export market to the more profitable domestic market has to be prevented. In most industries, this is difficult. Re-importing for domestic consumption must also be restricted and, as Corden (1974 p. 17) points out, this can be achieved by a sufficiently restrictive tariff. From the point of view of the finance ministry, an attraction is that the scheme is self-financing. But as a protectionist device, a limitation of the scheme is that the capacity of the consumption tax to subsidize exports is reduced if the volume of exports becomes a large share of total output (exports plus domestic consumption). This has been an issue in the case of the Thai sugar industry.

Siamwalla and Setboonsarng (1989 and 1991) attribute the political power of the Thai sugar industry to technological changes within the sugar milling industry which required large mills and precise scheduling of sugar deliveries to these mills. Sugar milling is a highly capital intensive business, and during the sugar processing season it is essential that the processing plants be fully utilized. Growers and millers have bickered over prices, but they have been able to combine their efforts to lobby the government for intervention on their behalf, something other agricultural export industries in Thailand have been unable to achieve. In Thailand, sugar growers and millers are highly organized. In the case of the Thai sugar industry, the technological changes mentioned above also helped restrict leakage from the export market to home consumption, because the mills were large and few in number.

Consumer prices have been stabilized by the scheme, relative to the export price. Figure 1(e), based on the data assembled in Appendix Table A13, shows two series: the ratio of the consumer price to the border price (left axis) and the ratio of the miller rice to the grower price (right axis). The peak export prices of the early 1970s were not transmitted to consumers or producers and at this time the NRP for sugar (calculated as the percentage deviation of the grower price from the export price) was negative. But for most of the operation of the scheme, consumer and producer prices have been well above export prices. Since the mid-1980s the NRPs averaged over 60 percent. Even though it is exported, sugar is by far the most heavily protected of Thailand's agricultural industries.

Palmoil

Thailand's palmoil industry fluctuated between being a net importer and a net exporter, as summarized in Appendix Table A14. Although the industry has been a net exporter since 1998, a system of import quotas remains in place, as described in Appendix Table A15. Figure 1(f) shows the NRP for palmoil, measured at the wholesale level.

Rubber

Rubber is a net export item for Thailand, and the Thai rubber industry was for a long time subject to an export tax. The manner of calculating the tax meant that the rate drifted upwards with inflation and, due to the inflation of the 1970s, the rate of export tax had reached 26 percent by the early 1980s. Pressure from members of Parliament from the rubber growing areas of the south of Thailand led to the revision of the system of calculation, which led to a return to the lower rates of taxation that were in place in the 1960s. Figure 1(g), based on the data assembled in Appendix Table A16, confirms that since 1990 the taxation of rubber has been close to zero.

Fertilizer

Thailand imports urea for use as fertilizer, and urea imports have been subjected to declining rates of tariff protection over time. Taxation of imports of this agricultural input implies

disprotection for agricultural industries which use it. The decline in tariff rates began in the early 1990s, and by the early 2000s the tariff rates were negligible. These policy changes are confirmed by the price comparisons reported in Figure 1(h), based on the data assembled in Appendix Table A17. Nominal rates of protection have declined steadily and are currently close to zero. This treatment of fertilizer in Thailand — steadily declining rates of taxation — contrasts with several neighboring countries, where fertilizer use has tended to be subsidized as part of a general program of agricultural subsidization.

Imputed assistance at the farm level

The above discussion of protection rates has focused to the effects that policy interventions have at the wholesale market level. In this section, we extend the analysis to consider the way protection (or its opposite) at the wholesale level produces price effects at the farm level.

Theory

One of the intentions of agricultural protection policy is to influence prices at the farm level. But the goods produced directly by farmers seldom enter international trade themselves. The raw commodities produced by farmers are generally non-traded, whereas the commodities which enter international trade are the processed or partially processed versions of these raw products. Between the non-traded raw product produced by the farmer and the traded processed commodity which enters international trade, there may be several steps of transport, storage, milling, processing and re-packaging.

The significance of this point is that border protection policy operates directly on the goods which actually enter international trade, either exported or imported, not the raw commodities produced by farmers. Protection at the farm level is therefore a derived effect. It depends on the extent to which policies applied to trade in processed agricultural goods induce changes in their prices which are then transmitted to the prices actually faced by farmers. The question thus arises as to what extent price changes at the wholesale level, induced by protection policy, affect the prices actually received by farmers for the raw products they sell.

We construct a simple econometric model to investigate this issue. We use the notational convention that upper case Roman letters (like X) will denote the values of variables in their levels and lower case Roman letters (like x) will denote their natural logarithms. Thus $x = \ln X$. Protection at the wholesale level is defined as

$$P_{it}^{W} = P_{it}^{*}(1 + T_{it}^{W}),\tag{1}$$

where P_{it}^{W} denotes the level of the wholesale price of commodity i at time t, P_{it}^{*} is the corresponding border price, expressed in the domestic currency and adjusted for handling costs in getting the commodity from the cif level to the domestic wholesale level, in the case of an import, and for the cost of getting it from the wholesale level to the fob level in the case of an export. The nominal rate of protection at the wholesale level is given by T_{it}^{W}. In this discussion, both the border price and the nominal rate of protection are treated as exogenous variables. The border price is determined by world markets and the country concerned is presumed to be a price taker. The nominal rate of protection is determined by the government's protection policy.

The farm gate price of the raw material is denoted by P_{it}^{F} and its logarithm, p_{it}^{F}, is related to the logarithm of the wholesale price by

$$p_{it}^{F} = a_{i} + b_{i}p_{it}^{W} + u_{it},\tag{2}$$

where a_{i} and b_{i} are coefficients and u_{it} is a random error term. The coefficient b_{i} is the 'pass-through' or 'transmission' elasticity. The estimated values of the coefficients a_{i} and b_{i} are denoted $\hat{a}_{i}$ and $\hat{b}_{i}$, respectively. The econometric estimation of these parameters is discussed below.

The estimated coefficients are used as follows. We estimate the logarithm of the farm price that would obtain in the *absence* of any protection as

$$\hat{p}_{it}^{F*} = \hat{a}_{i} + \hat{b}_{i}p_{it}^{W*},\tag{3}$$

where p_{it}^{W*} is the estimated value of the wholesale price that would obtain in the absence of protection, $p_{it}^{W*} = \ln P_{it}^{W*}$. This is then compared with the estimated value of the wholesale price in the *presence* of protection

$$\hat{p}_{it}^{F} = \hat{a}_i + \hat{b}_i p_{it}^{W} . \tag{4}$$

Denoting the anti-logs of $\hat{p}_{it}^{F}$ and $\hat{p}_{it}^{F*}$ by $\hat{P}_{it}^{F}$ and $\hat{P}_{it}^{F*}$, respectively. The nominal rate of protection at the farm level is then estimated as

$$\hat{T}_{it}^{F} = (\hat{P}_{it}^{F} - \hat{P}_{it}^{F*}) / \hat{P}_{it}^{F} . \tag{5}$$

It is important to observe that the value of the protection-inclusive farm level price used in these calculations is the level estimated from the econometric model (equation 4) rather than the actual price given by the raw data. The reason is that our intention is to use the model to estimate the *change* in the farm gate price caused by protection at the wholesale level. Thus both the protection-inclusive and the protection-exclusive prices used in (5) are their predicted values, obtained from the model.

The implied nominal rate of protection at the farm level can be related to the nominal rate of protection at the wholesale level, as follows. Substituting $\hat{P}_{it}^{F} = \hat{A}_i (P_{it}^{W})^{\hat{b}_i}$ and $\hat{P}_{it}^{F*} = \hat{A}_i (P_{it}^{W*})^{\hat{b}_i}$ into equation (5), where $\hat{A}_i$ is the anti-log of $\hat{a}_i$, rearranging, and using equation (1), we obtain the simple expression

$$\hat{T}_{it}^{F} = (1 + T_{it}^{W})^{\hat{b}_i} - 1. \tag{6}$$

Obviously, if $T_{it}^{W} = 0$, then $\hat{T}_{it}^{F} = 0$, regardless of the value of $\hat{b}_i$. Similarly, if $\hat{b}_i = 0$, then $\hat{T}_{it}^{F} = 0$, regardless of the value of T_{it}^{W}. Also, if $\hat{b}_i = 1$, then $\hat{T}_{it}^{F} = T_{it}^{W}$. It can readily be seen

that when $T_{it}^W > 0$, $\hat{T}^F \geq T_{it}^W$ as $\hat{b}_i \geq 1$ and $\hat{T}^F \leq T_{it}^W$ as $\hat{b}_i \leq 1$. When $T_{it}^W < 0$, $\hat{T}^F \leq T_{it}^W$ as $\hat{b}_i \geq 1$ and $\hat{T}^F \geq T_{it}^W$ as $\hat{b}_i \leq 1$.

Econometric application

The purpose of the econometric analysis is to estimate the parameter $\hat{b}_i$ for each commodity. Details of the econometric analysis are provided in a statistical appendix, available upon request. Here the results will be summarized. For each commodity we conduct the analysis using time series price data with each variable expressed in logarithms and each deflated by the GDP deflator for Thailand: the farm-gate price (LFP), the wholesale price (LWP), and the log of the international price, adjusted by the nominal exchange rate and transport and handling costs (LIP).

We first test each of the series for the existence of a unit root. The null hypothesis of a unit root was rejected for all price series (recalling that they are real, not nominal, price series, using the GDP deflator) for all commodities except soybean. However, in the case of soybean the two price series where the null hypothesis of a unit root could not be rejected, the series were not cointegrated. For all commodities except soybean, the price series were thus considered stationary.

Ordinary least squares (OLS) estimates of equation (2) were first produced. In most cases, autorrelation was a problem and an AR(1) correction term was included to eliminate it, which it did effectively. The OLS estimates assume that LFP is endogenous and LWP is exogenous. These assumptions were tested using Hausman's endogeneity test. In the case of each commodity, the null hypothesis that LWP was (weakly) exogenous to LFP failed to be rejected, confirming the validity of the OLS estimates. Reverse Hausman's tests were also conducted and the null hypothesis that LFP was exogenous to LWP was rejected in every case. These results support the validity of using the OLS framework to estimate the transmission elasticity from LWP to LFP, treating LWP as exogenous. For completeness, instrumental variable estimates were produced for each commodity, using LIP as the instrument for LWP. The resulting estimates of $\hat{b}_i$ differed from the OLS estimates (some larger, some smaller) but not by much.

Table 3 summarizes the estimates. All of the OLS estimates of the transmission elasticity were significantly different from zero with the expected positive signs. This is an important point. It is often asserted that middlemen prevent the commodity price changes at the wholesale level, resulting from protection or from international price movements, from being transmitted to farmers. This hypothesis is strongly rejected by the Thai data. The transmission elasticities are not zero. Economists often assume that the transmission elasticities are unity. But the estimated values are generally less than unity, most between 0.7 and 0.9. In one case (sugar) the estimate is somewhat lower (0.53) and in another (cassava) the estimated value slightly exceeds unity, but is not significantly different from unity.[4] It is likely that the true transmission elasticities change over time, but the limited data available for this exercise made it necessary to assume that the true values remain constant.

Estimation of assistance at the farm level

Given the estimated value of the transmission elastity, equation (6) is used together with the estimated nominal rates of protection at the wholesale level, discussed above, to produce estimates of imputed nominal rates of assistance at the farm level. These are shown in Appendix Figure A4. Because the estimated values of the transmission elasticity are (except for cassava) between zero and unity, the imputed nominal rates of assistance at the farm level are somewhat lower in absolute value than the nominal rates at the wholesale level, but (because of the assumption of constant transmission elasticities through time) they track the pattern of the wholesale level results closely.

Aggregate measures of agricultural assistance

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[4] There is no theoretical reason to suppose that the true value of the transmission elasticity is necessarily below unity. For example, if all margins between the farm level and wholesale level remained constant in nominal terms as the wholesale price changed, the percentage change in the derived farm level price would necessarily exceed the percentage change in the wholesale price. The transmission elasticity would therefore exceed unity.

In this section we calculate aggregate measures of rates of assistance using the information assembled from the preceding analysis and following, as much as possible, the methodology outlined in Anderson et al. (2008). The annual calculations reported in this section fluctuate somewhat from year to year. International and domestic price changes from year to year alter the protective effects of all instruments of protection except *ad valorem* tariffs. In addition, the time taken for domestic prices to adjust to international price changes means that annual data on price differences produces some spurious variation from one year to the next. Our interest is on broad trends, rather than these annual fluctuations.

Table 4 reports estimates of the nominal rates of assistance (NRA) at the farm level for all commodities, taking account of assistance to fertilizer inputs. This nominal rate of assistance is calculated as its nominal rate of protection (discussed above) minus the product of the cost share of fertilizer in production of the commodity concerned and the consumer tax equivalent (CTE) of import protection to the fertilizer industry. The CTE for fertilizer is positive in every year but one, although the rates of taxation have declined since the mid-1980s. The nominal rates for covered products at the wholesale level are therefore below the nominal rates of assistance at the farm level for every commodity using fertilizer as an input. Aside from this, the broad pattern of the nominal rates of farmer assistance is similar to the pattern of nominal rates discussed above.

The NRAs are negative in all years for rice and in most years for maize, cassava and rubber. For these commodities, the absolute magnitudes of these negative rates have declined over time. For soybean, the nominal rate was negative until soybean became a net import item in the early 1990s, since when it has been significantly protected. Sugar has been a protected commodity in almost all years. The weighted average for all covered products was more than -25 percent prior to the latter 1970s, but that mean rate of taxation has since fallen to virtually zero. The dispersion of rates for individual commodities around that mean has not fallen very much though, suggesting there is still considerable scope through further policy reform to reduce distortions within the farm sector (bottom of Table 4).

Finally, the relative rate of assistance to agriculture (RRA) is calculated to take into account not just the nominal rate of assistance to agriculture but also the nominal rate of assistance to manufacturing and other non-farm tradable sectors. The average rate for import-

competing manufacturing is estimated from Nicita and Olarreaga (2006),[5] and that for other non-farm tradable sectors is assumed to be zero. Their weighted average is then calculated using weights from the input-output tables of the National Economic and Social Development Board (various years). The estimated RRA is negative in every year, but has declined in absolute value from being more than -30 percent in the early 1970s to around -7 percent in recent years (Table 5 and Figure 3). That is, these estimates suggest that over the past four decades Thai agriculture has moved from being a severely net taxed sector to a mildly net taxed sector.

Conclusions and prospects for future reform

As Thailand has industrialized, successive Thai governments have become increasingly interested in intervening on behalf of agricultural producers. But the fact that Thailand is a major agricultural exporter has limited the scope for protection policy as a means of influencing domestic commodity prices. This chapter has used comparisons between the prices of agricultural commodities in domestic markets and international markets as a means of studying the magnitudes of these interventions.

Over time, the direct taxation of agricultural exports has been gradually eliminated. This has been important in the case of rice, where the high rates of export taxation prior to the mid-1980s have been abolished. Rubber exports, taxed prior to 1990, have been untaxed since then. Cassava exports have continued to be taxed to a minor extent by the system of export quotas. Fertilizer is a major input into agricultural production and effective taxation of fertilizer use has been steadily eliminated since the early 1990s. Maize exports have been consistently untaxed, as have chicken exports. Most of this is a story of eliminating the price distortions which formerly acted against agricultural export industries.

Three commodities depart from this general story of liberalization of agricultural markets. Soybeans was an export prior to 1992 and has been a net import since then, with

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[5] Because the Nicita and Olarreaga (2006) data are incomplete we have assumed NRAs for manufacturing before 1982 and after 2002 to be the same as the Nicita and Olarreaga 1982 and 2002 levels, respectively. This undoubtedly understates rates of manufacturing protection in the 1970s, and overstates it post-2002. More-complete estimates for manufacturing therefore would reinforce, rather than undermine our broad conclusions.

imports subject to quota restrictions. The change from net export to net import coincided with a switch from negative to positive nominal rates of protection. Since the early 1990s the domestic soybean industry received a nominal rate of protection of around between 30 and 40 percent. Sugar is an export commodity for Thailand but the domestic sugar industry is protected by a system which taxes domestic consumers and transfers the revenue to producers. Nominal rates of protection averaged over 60 percent. The political power of the highly capital intensive sugar milling industry is the explanation for this pattern of protection. The case of palmoil is qualitatively similar to sugar, but the rates of protection are somewhat lower.

Government interventions on behalf of rural people have been important, but they have generally not taken the form of intervening in agricultural commodity markets. Cash transfers to village organizations, subsidized loan schemes not linked to agricultural production, and a generally good system of public infrastructure have been the main instruments. The prospects for further trade liberalization are not encouraging, unless this occurs through bilateral preferential trading arrangements such as the scheme proposed with the United States.[6]

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[6] A bilateral trading arrangement with the United States was under negotiation prior to February 2006 but as of November 2006 the negotiations remain suspended .The protection of Thailand's soybeans industry would be an important issue in these negotiations.

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Figure 1: Price comparison and NRP[a] at wholesale level for agricultural products, Thailand, 1968 to 2004

(baht/MT and percent)

(a) Rice
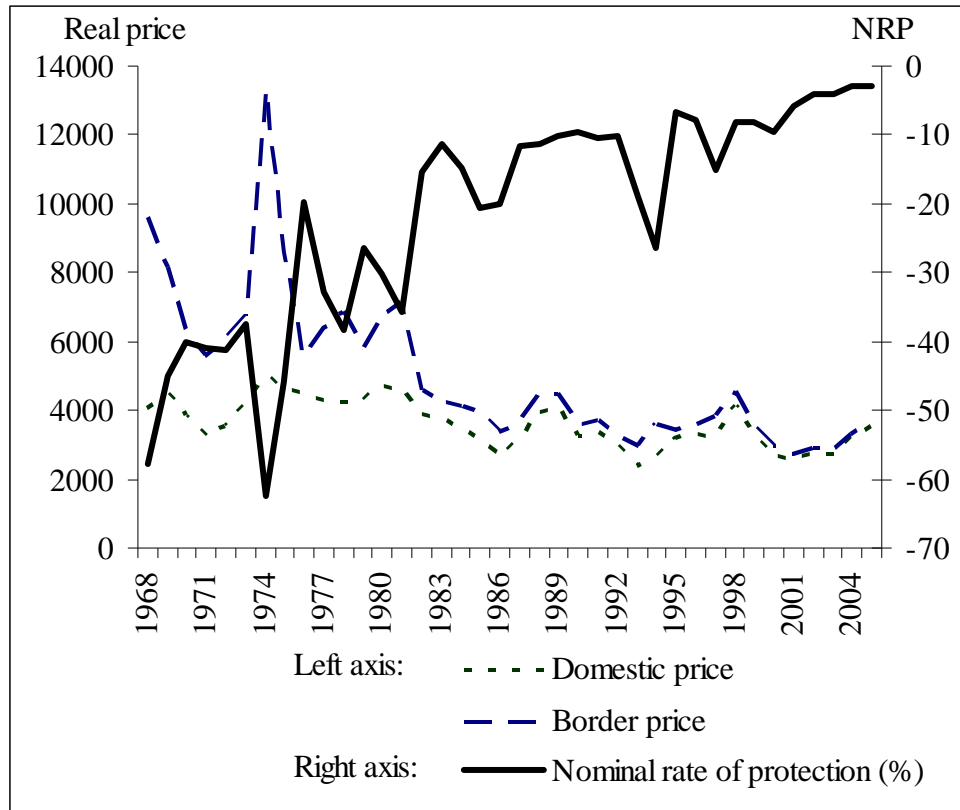
Figure 1 (continued): Price comparison and NRP[a] at wholesale level for agricultural products, Thailand, 1968 to 2004

(baht/MT and percent)

(b) Maize
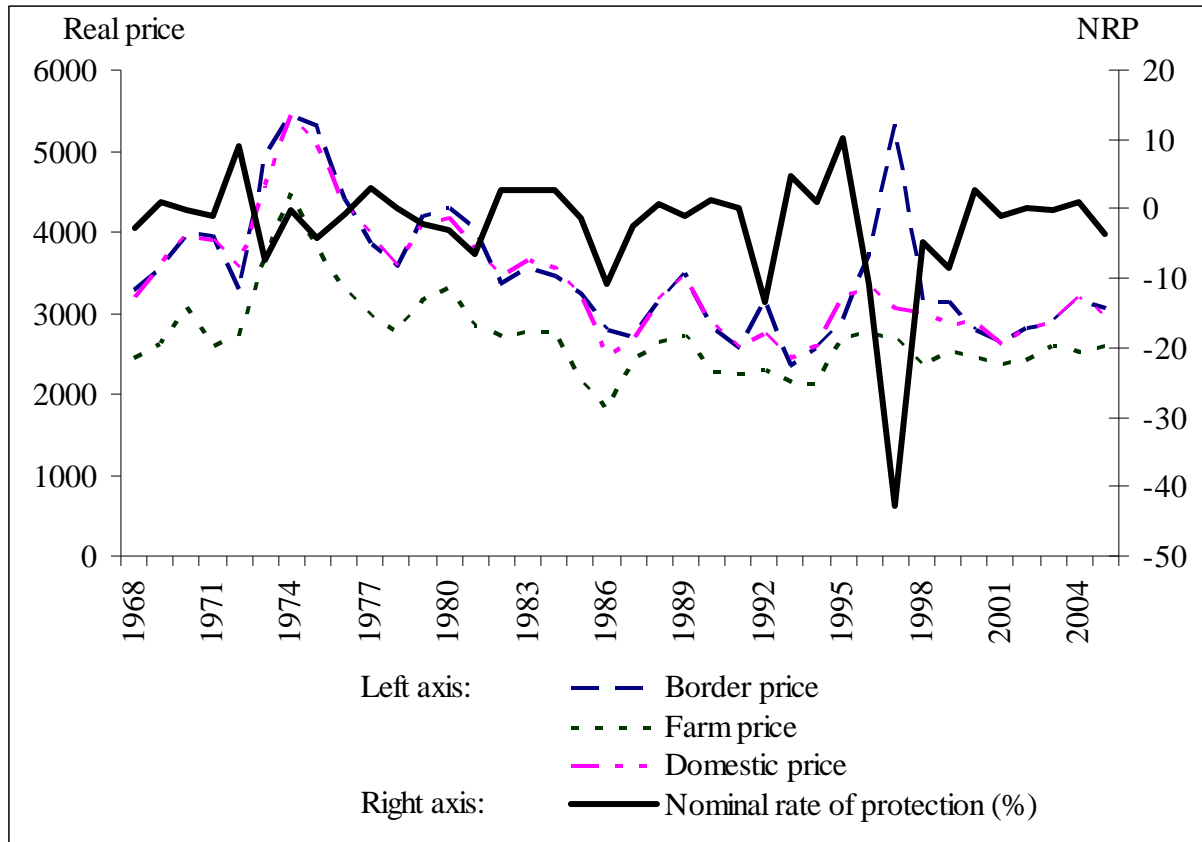
Figure 1 (continued): Price comparison and NRP[a] at wholesale level for agricultural products, Thailand, 1968 to 2004

(baht/MT and percent)

(c) Cassava
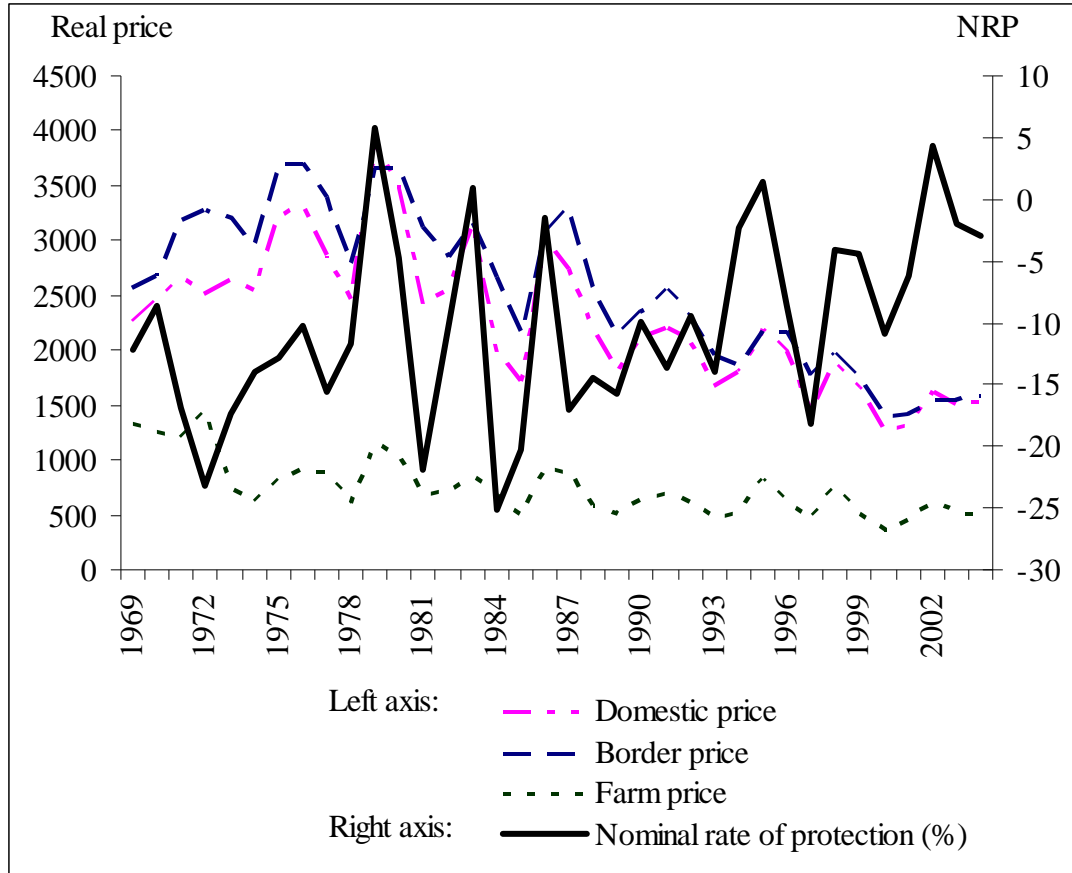
Figure 1 (continued): Price comparison and NRP[a] at wholesale level for agricultural products, Thailand, 1968 to 2004

(baht/MT and percent)

(d) Soybean
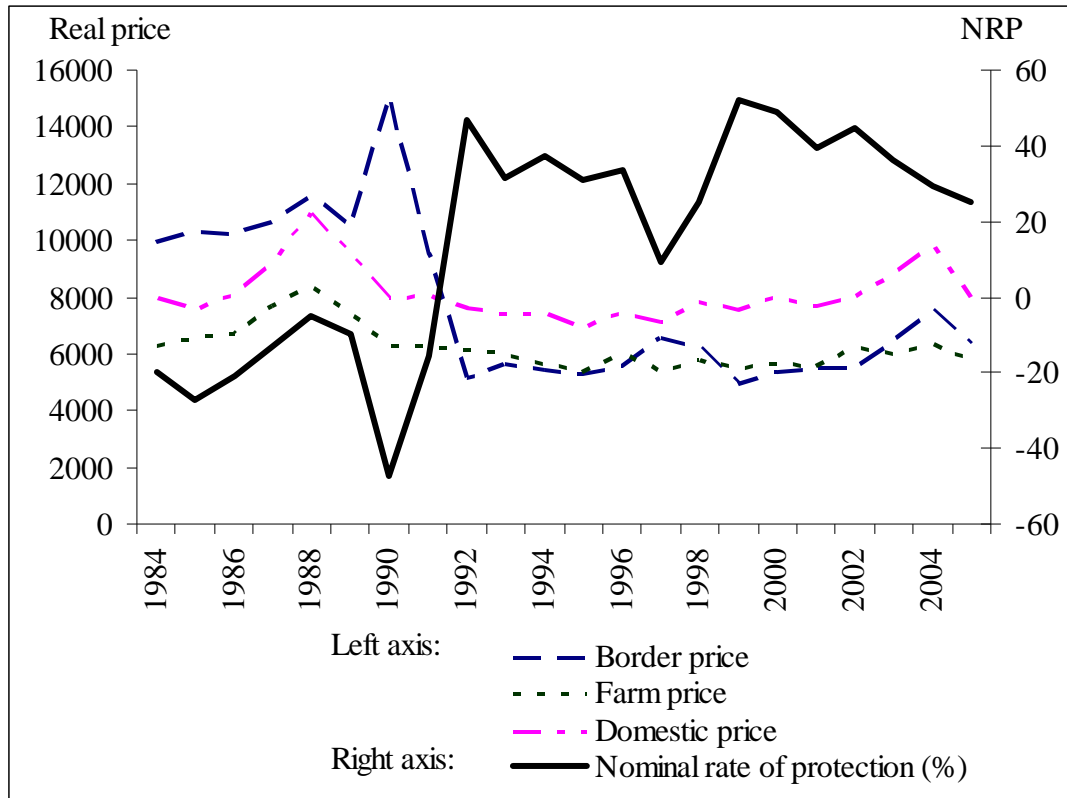
[a] Nominal rate of protection is calculated as 100*(Domestic price- Border price)/Border price.
Source: Authors' calculations based on data in Tables A4 and A10.

Figure 1 (continued): Price comparison and NRP[a] at wholesale level for agricultural products, Thailand, 1968 to 2004

(baht/MT and percent)

(e) Sugar
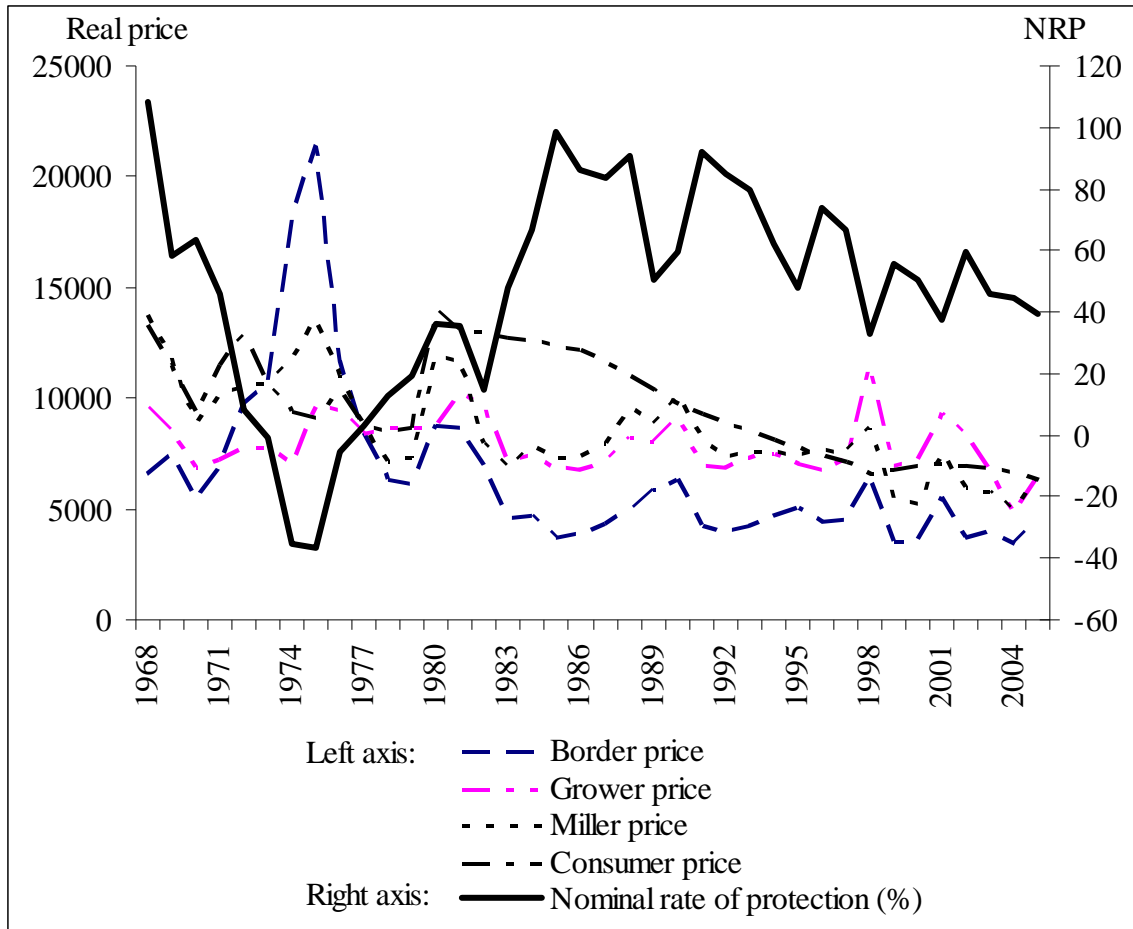
Figure 1 (continued): Price comparison and NRP[a] at wholesale level for agricultural products, Thailand, 1968 to 2004

(baht/MT and percent)

(f) Palmoil
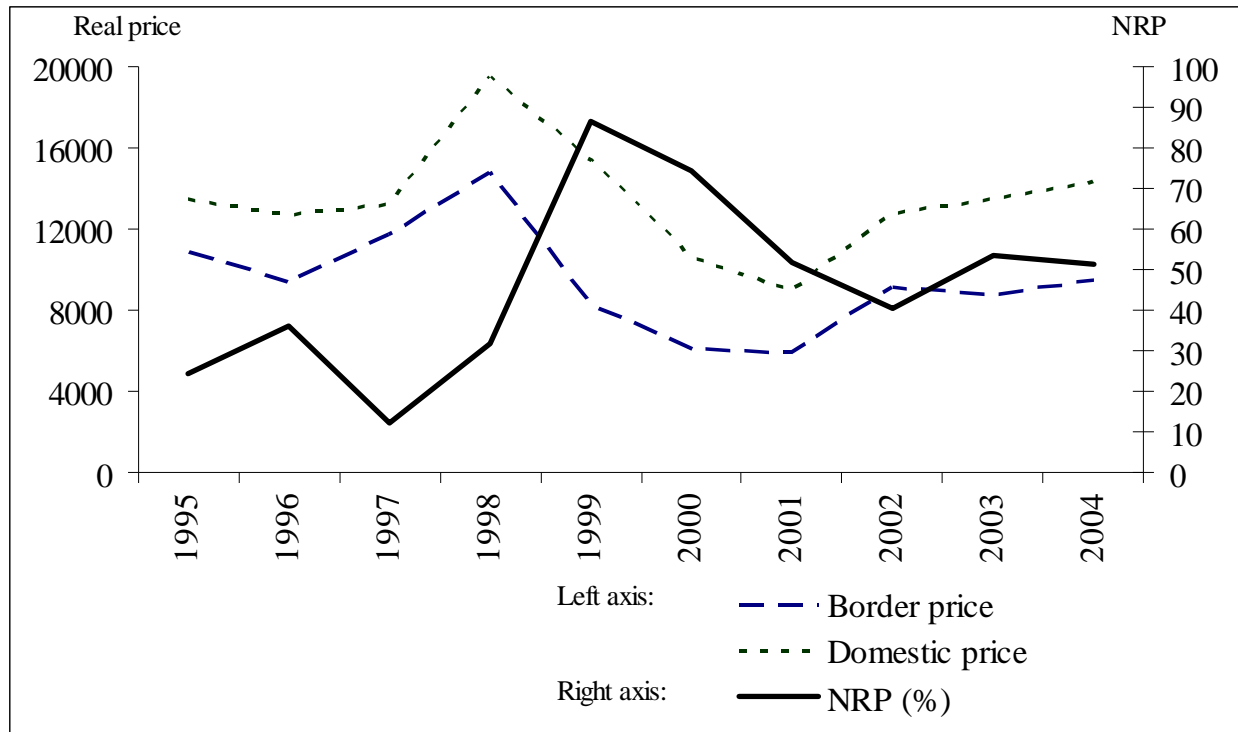
[a] Nominal rate of protection is calculated as 100*(Domestic price- Border price)/Border price.

Source: Authors' calculations based on data in Tables A6 and A10.

Figure 1 (continued): Price comparison and NRP[a] at wholesale level for agricultural products, Thailand, 1968 to 2004

(baht/MT and percent)

(g) Rubber
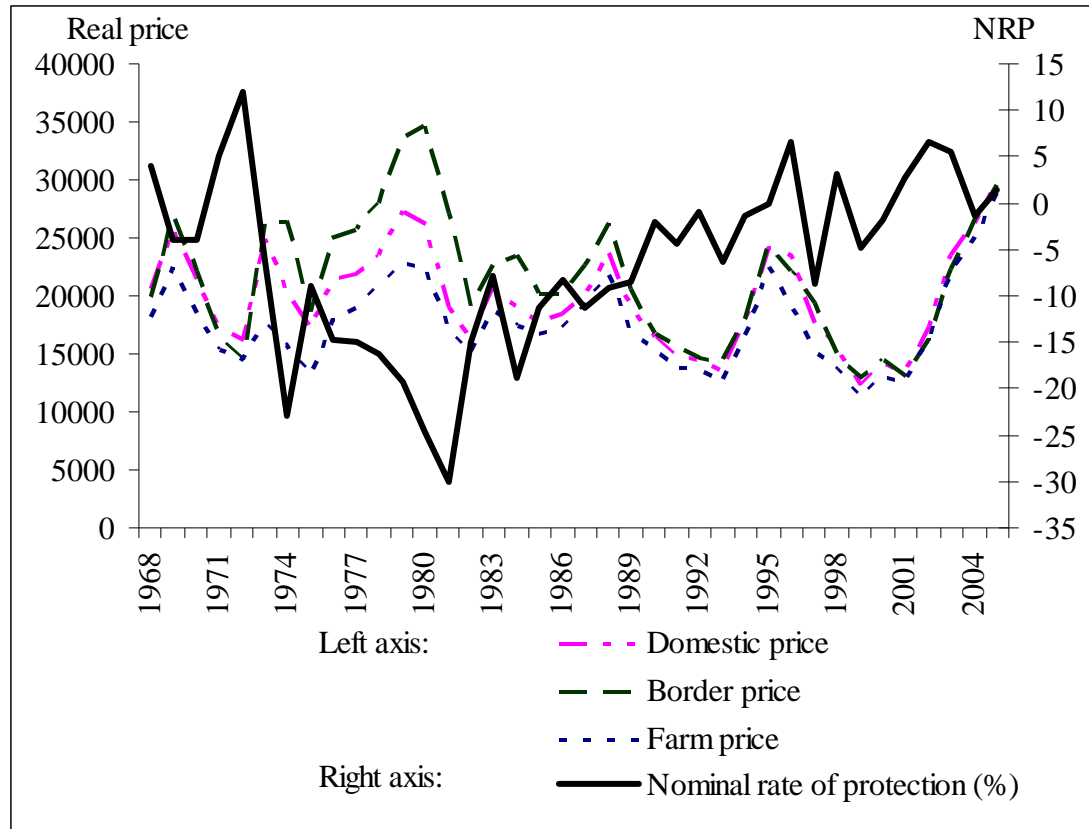
[a] Nominal rate of protection is calculated as 100*(Domestic price- Border price)/Border price.

Source: Authors' calculations based on data in Tables A7 and A10.

Figure 1 (continued): Price comparison and NRP^a at wholesale level for agricultural products, Thailand, 1968 to 2004

(baht/MT and percent)

(h) Urea fertilizer
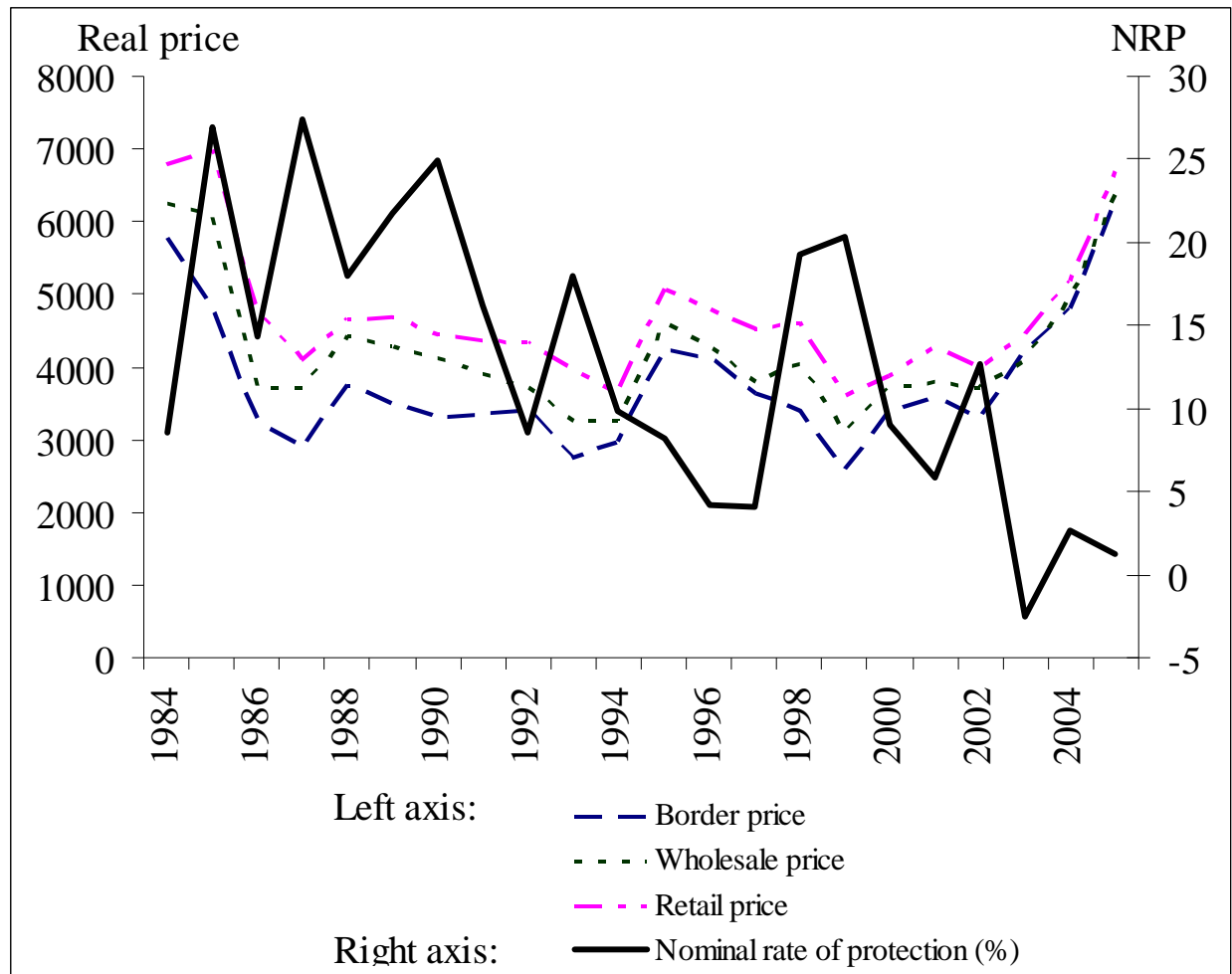
^a Nominal rate of protection is calculated as 100*(Domestic price - Border price)/Border price.

Source: Authors' calculations based on data in Tables A8 to A17.

Figure 2: Ratios of consumer price to border price and miller price to grower price for sugar, Thailand, 1968 to 2004
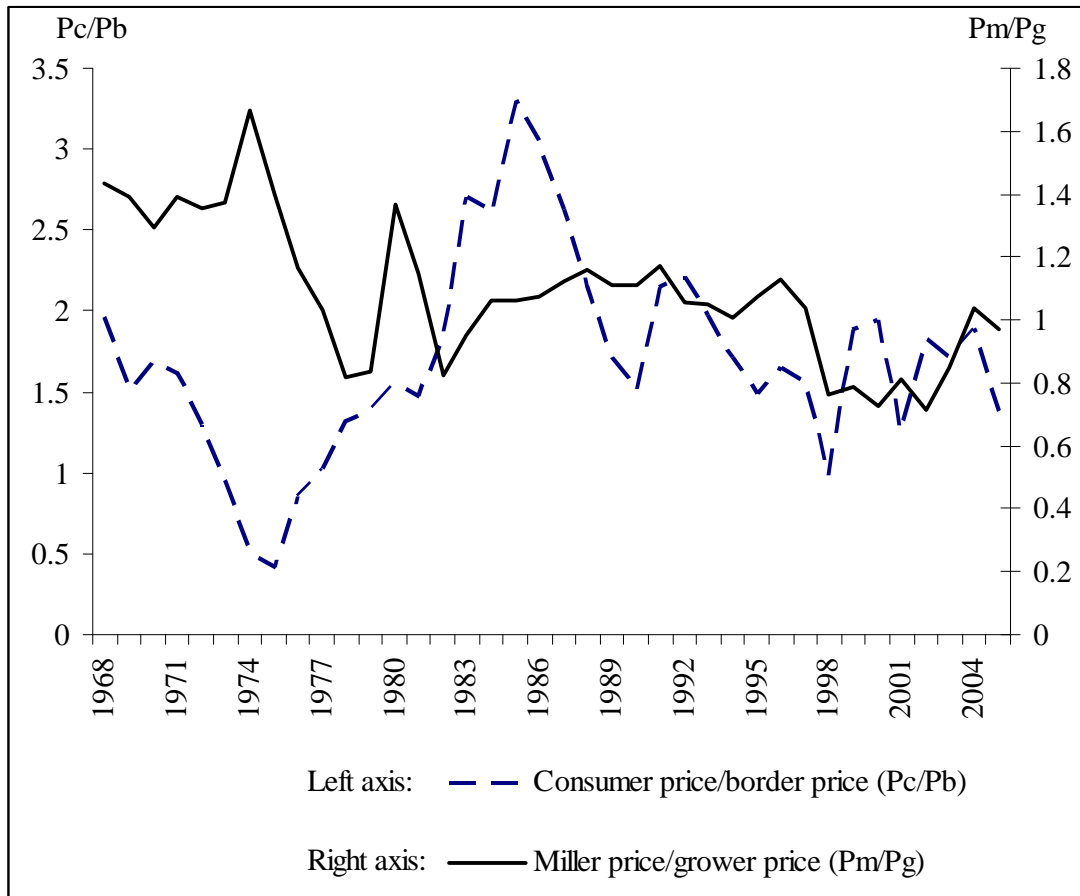
Source: Authors' calculations based on data in Appendix Table A13.

Figure 3: Nominal rates of assistance to all agricultural tradables, all non-agricultural tradable industries, and relative rates of assistance[a], Thailand, 1970 to 2004
(percent)
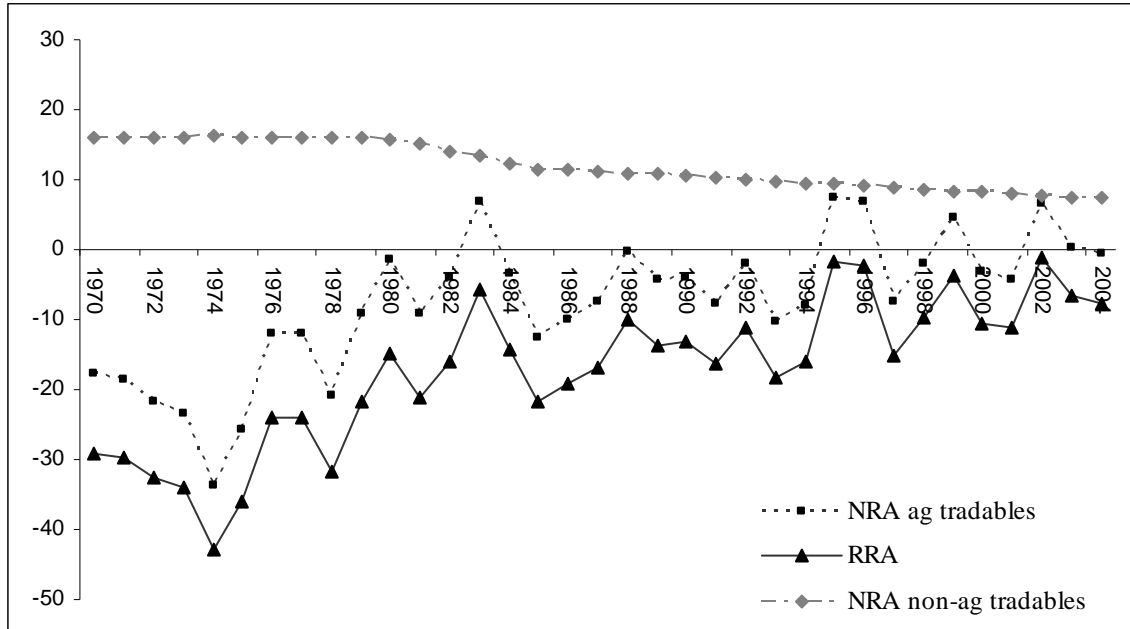
[a] The RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradable parts of the agricultural and non-agricultural sectors, respectively.

Source: Authors' spreadsheet based on data in Appendix Table A22.

Table 1: Real growth of GDP and its components, Thailand, 1968 to 2005

(percentage per annum)

	Pre-boom 1968-1986	Boom 1987-1996	Crisis 1997-1999	Recovery 2000-2005	Whole period 1968-2005
Total GDP	6.7	9.5	-2.5	5.1	6.5
Agriculture	4.5	2.6	0.1	3.6	3.5
Industry	8.5	12.8	-1.7	6.3	8.5
Services	6.8	9.0	-3.6	4.2	6.2

Source: Author's calculations from World Bank (various issues)

Table 2: Industry shares of agricultural value added, Thailand, 1975 to 2000
(percent)

Industry	1975	1980	1985	1990	1995	2000
Paddy	38.0	30.3	34.7	24.9	26.9	26.1
Maize	6.4	4.3	4.2	3.7	3.7	3.4
Other cereals	0.5	0.6	0.5	0.2	0.1	0.2
Cassava	4.2	7.6	5.5	6.6	5.2	2.5
Beans & nuts	2.4	2.5	3.7	3.0	2.1	1.7
Vegetables	11.7	10.4	9.1	12.7	9.9	10.6
Fruits	11.4	15.0	10.5	10.9	11.1	15.8
Sugar cane	5.9	5.4	3.2	6.7	5.2	5.3
Coconut	1.4	1.7	1.8	1.2	0.9	0.7
Palm nut and oil palm	0.0	0.1	0.6	1.2	1.2	1.4
Rubber	2.2	4.6	8.4	10.2	17.5	12.4
Other crops	5.7	5.2	5.3	4.3	4.3	4.3
Cattle and buffalo	2.5	3.3	5.3	6.3	3.9	4.8
Swine	3.2	3.0	1.6	1.9	1.7	1.5
Poultry	1.1	2.0	4.0	3.6	3.9	6.6
Other livestock	3.6	4.0	1.9	2.7	2.1	2.9
Total, above industries	100	100	100	100	100	100

Source: National Economic and Social Development Board (various years)

Table 3: Estimates of transmission elasticities from wholesale to farm prices, Thailand

Commodity	Estimated elasticity	(t-statistic)[a]
Rice	0.76	(7.30)
Maize	0.81	(14.38)
Cassava	1.07	(8.20)
Soybeans	0.80	(11.23)
Sugar	0.53	(3.93)
Palmoil[b]	[0.90]	(19.97)
Rubber	0.90	(19.97)
Fertilizer	0.89	(17.70)

[a] t-statistics are shown in parthentheses.
[b] Estimation for palmoil was not possible, due to insufficient data points, and the estimated value for rubber was used instead.

Source: Author's calculations, using data and methodology discussed in the text. Estimates shown relate to the parameter b_i in equation (2).

Table 4: Nominal rates of assistance to covered products, Thailand, 1970 to 2004
(percent)

	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Exportables[a]	**-26.7**	**-19.4**	**-11.1**	**-11.7**	**-9.2**	**-3.8**	**-0.6**
Soybean*	n.a.	n.a.	n.a.	-19.9	n.app.	n.app.	n.app.
Rice	-30.1	-28.3	-18.0	-15.0	-16.2	-11.0	-7.6
Maize	-2.2	-2.6	-2.2	-7.6	-4.5	-11.5	-0.3
Cassava	-23.1	-0.8	-9.0	-16.6	-10.8	-13.8	-10.0
Sugar	12.6	-3.2	12.7	36.8	34.0	22.4	12.6
Rubber	-0.5	-8.7	-17.9	-13.3	-4.4	-1.1	0.2
Poultry	-32.9	16.1	26.8	-7.1	-11.0	17.8	20.4
Palmoil	n.a.	n.a.	n.app.	n.app.	n.app.	-12.6	-18.3
Import-competing products [a]	**-4.8**	**1.9**	**45.3**	**22.0**	**6.4**	**34.4**	**4.7**
Soybean[c]	n.app.	n.app.	n.app.	n.app.	27.5	21.5	30.0
Pigmeat	-4.8	1.9	51.7	20.8	1.5	36.5	-1.8
Palmoil	n.a.	n.a.	-25.7	32.2	26.5	n.app.	n.app.
Total of covered products [a]	**-25.8**	**-18.4**	**-8.4**	**-9.7**	**-7.7**	**-1.1**	**-0.6**
Dispersion of covered products [b]	25.0	20.8	28.5	29.3	25.1	22.9	16.7
% coverage (at undistorted prices)	65	65	68	71	71	75	78

[a] Weighted averages, with weights based on the unassisted value of production.

[b] Dispersion is a simple 5-year average of the annual standard deviation around the weighted mean of NRAs of covered products.

[c] Exception to above periods: soybean averages for 1984-91 as Exportable, and 1992-94 and 2000-03 as Import-competing.

Source: Authors' spreadsheet, see Appendix Tables A18 to A20

Table 5: Nominal rates of assistance to agricultural relative to non-agricultural industries, Thailand, 1970 to 2004
(percent)

	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Covered products [a]	-25.8	-18.4	-8.4	-9.7	-7.7	-1.1	-0.6
Non-covered products	-10.4	-5.8	11.3	3.4	-0.9	10.1	1.4
All agricultural products [a]	-20.3	-14.0	-2.0	-6.2	-5.7	1.7	-0.2
Non-product specific (NPS) assistance	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total agricultural NRA (incl. NPS) [b]	**-20.3**	**-14.0**	**-2.0**	**-6.2**	**-5.7**	**1.7**	**-0.2**
Trade bias index [c]	-0.18	-0.20	-0.37	-0.24	-0.14	-0.27	-0.03
Assistance to just tradables:							
All agricultural tradables	-23.1	-15.9	-2.3	-6.9	-6.4	1.8	-0.2
All non-agricultural tradables	16.1	16.0	14.2	11.1	10.0	8.9	7.8
Relative rate of assistance, RRA [d]	**-33.7**	**-27.5**	**-14.4**	**-16.3**	**-14.9**	**-6.5**	**-7.4**

a. NRAs including product-specific input subsidies.

b. 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 (%).

c. Trade bias index is TBI = $(1+NRAag_x/100)/(1+NRAag_m/100) - 1$, where $NRAag_m$ and $NRAag_x$ are the average percentage NRAs for the import-competing and exportable parts of the agricultural sector.

d. The RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

e. These memo items show what the average NRAag, trade bias index and RRA would be if the distortions in the market for foreign currency, as captured by the methodology outlined in Appendix 1 of this book, are ignored.

Source: Authors' spreadsheet, see Appendix Table A21.

Appendix Figure A1: Annual growth rate of real GDP, Thailand, 1965 to 2005
(percent per year)
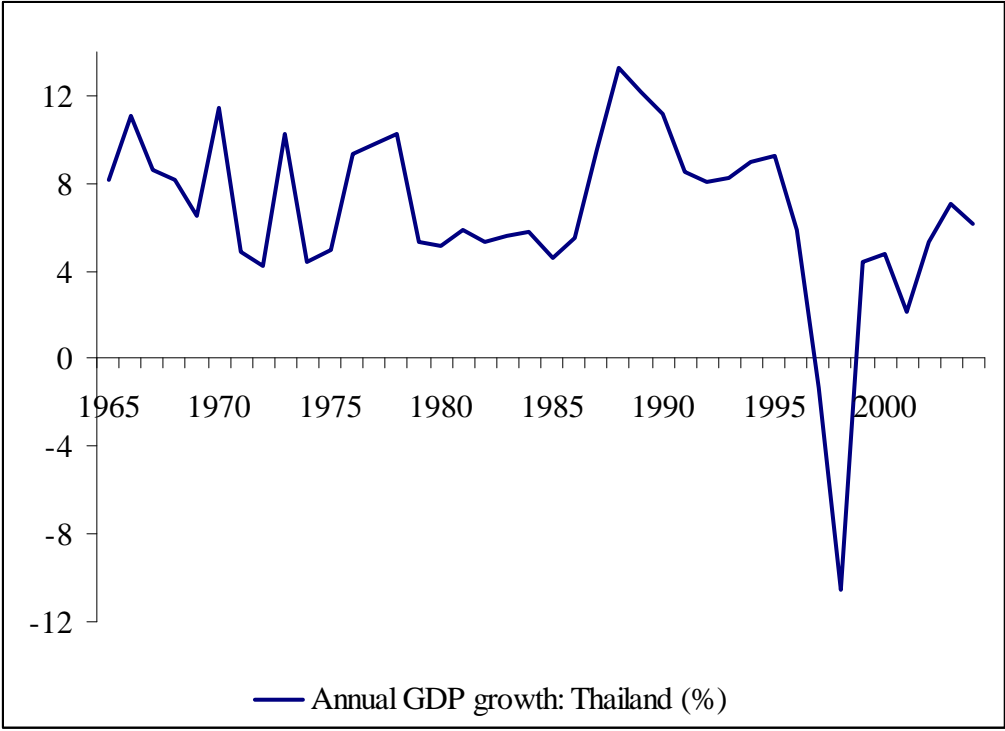
Source: World Bank (various issues)

Appendix Figure A2: Sectoral shares of GDP, Thailand, 1965 to 2005
(percent)
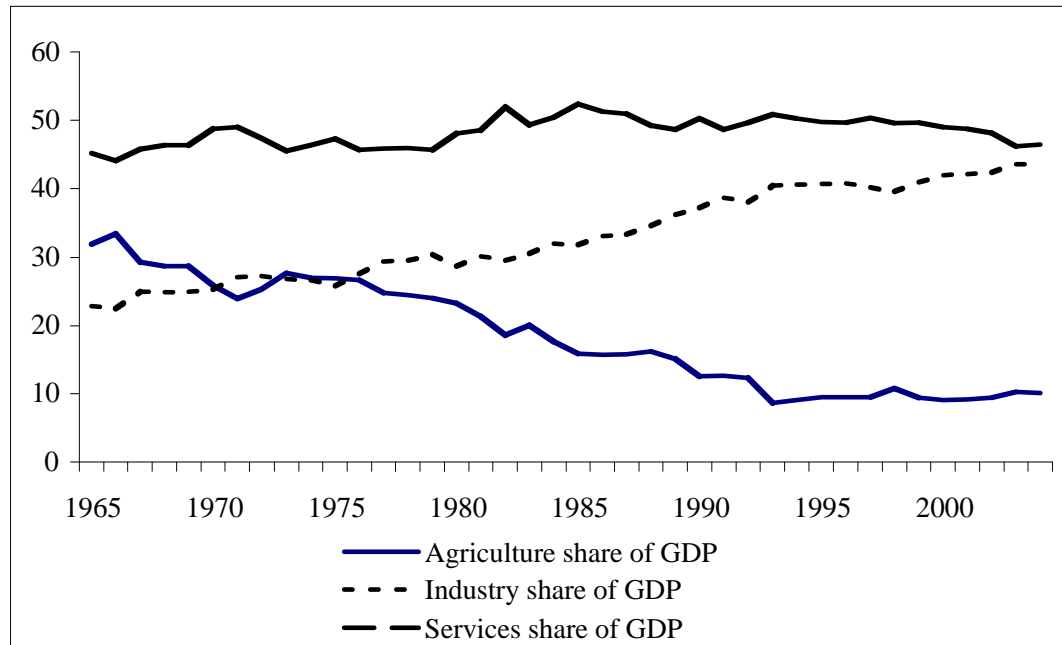
Source: World Bank (various issues)

Appendix Figure A3: External terms of trade[a], Thailand, 1965 to 2004
(2000 = 100)
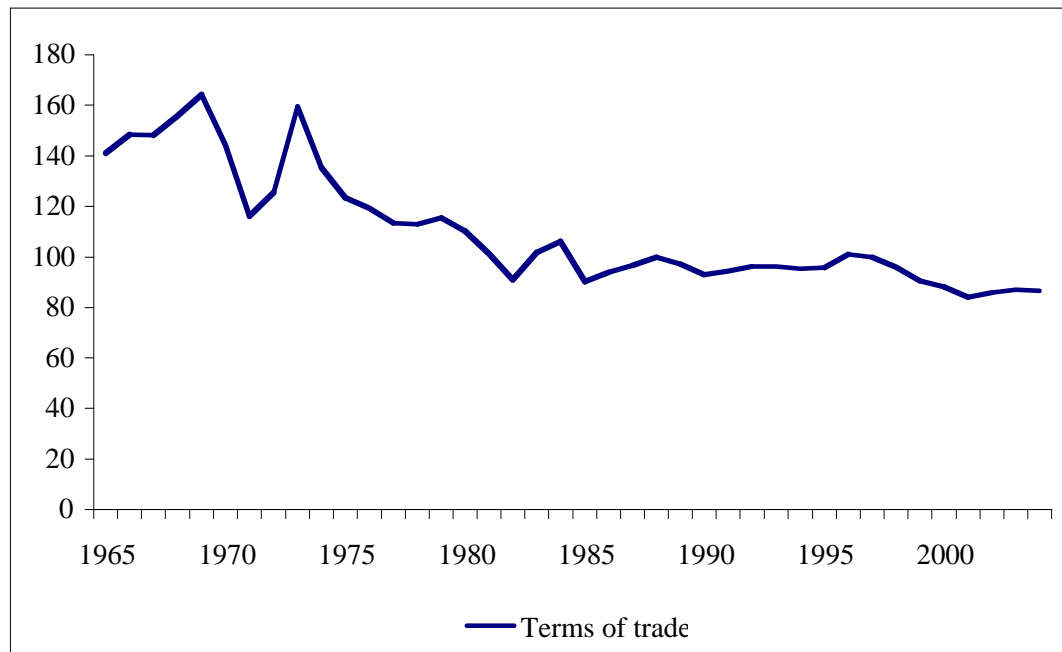
[a] The external terms of trade are calculated here as the ratio of average unit value of exports (value relative to volume) to the average unit value of imports.

Source: World Bank (various issues)

Appendix Figure A4: Prices and nominal rates of assistance[a] at the farm level, Thailand, 1968 to 2004

(percent)

(a) Rice
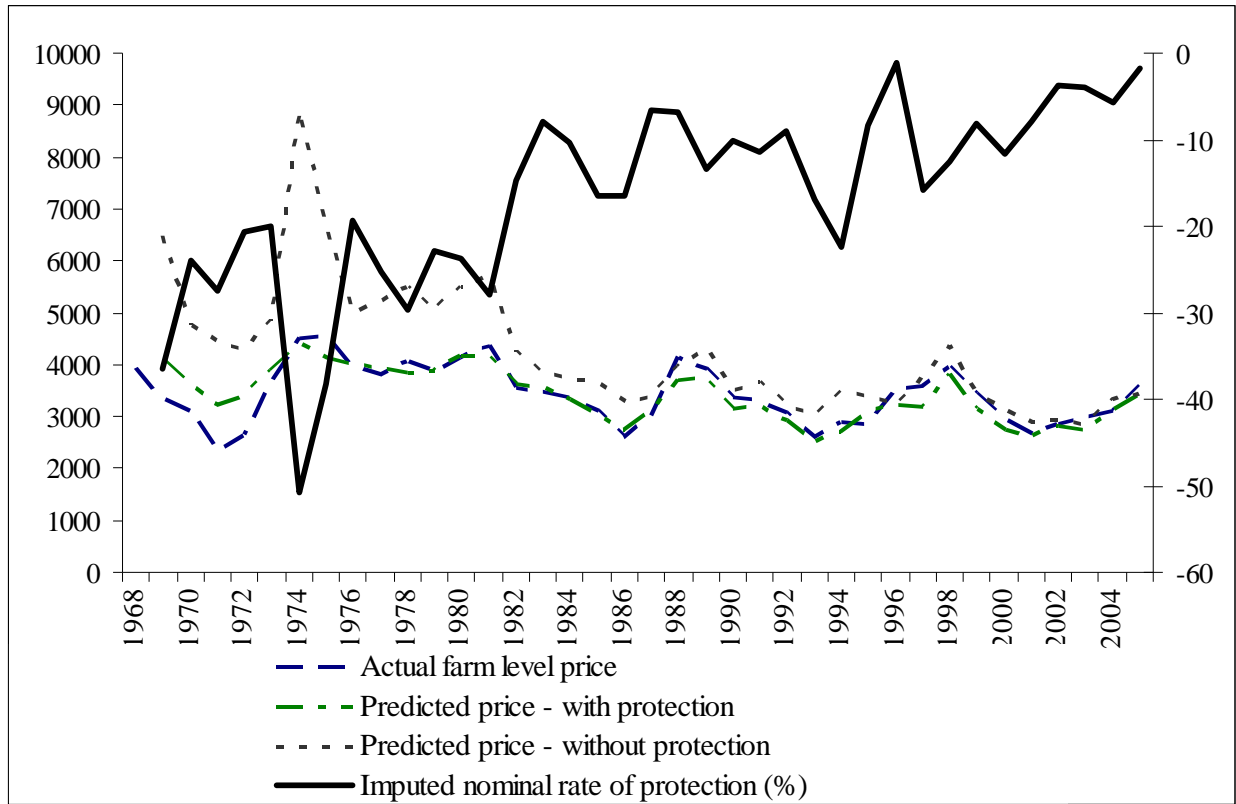
Appendix Figure A4 (continued): Prices and nominal rates of assistance[a] at the farm level, Thailand, 1968 to 2004

(percent)

(b) Maize
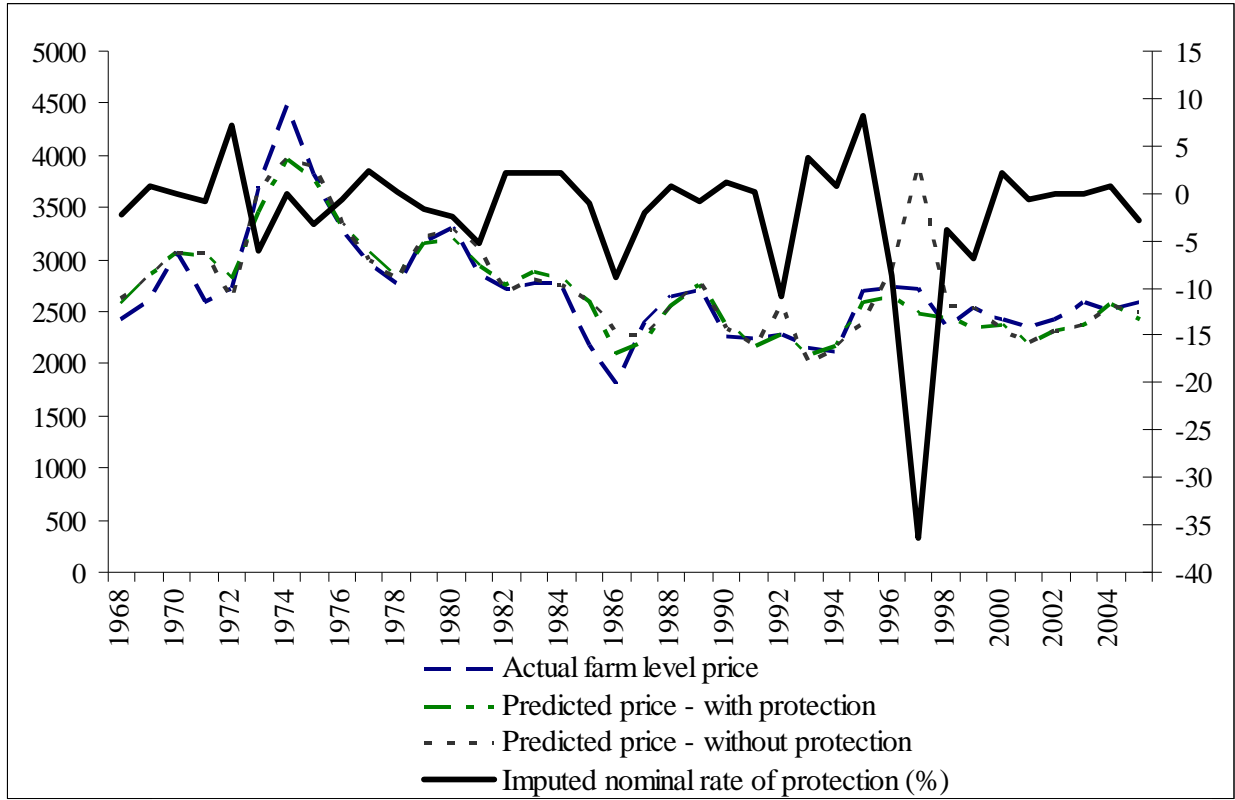
Actual farm level price
Predicted price - with protection
Predicted price - without protection
Imputed nominal rate of protection (%)

Appendix Figure A4 (continued): Prices and nominal rates of assistance[a] at the farm level,
Thailand, 1968 to 2004

(percent)

(c) Cassava
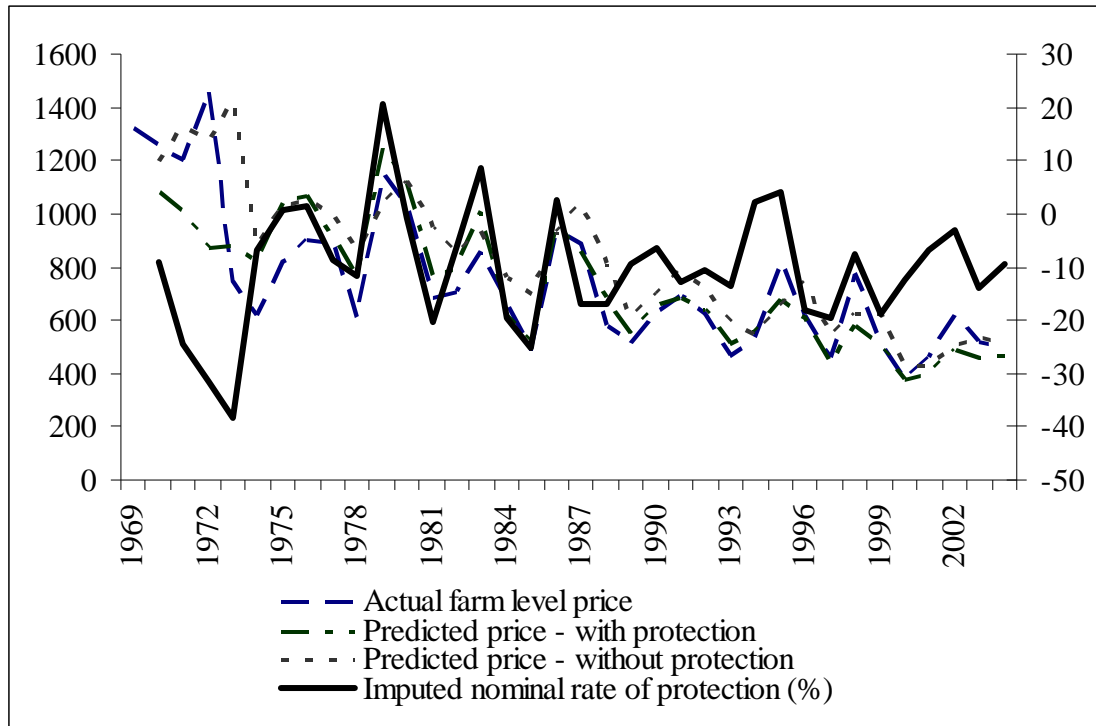
Appendix Figure A4 (continued): Prices and nominal rates of assistance[a] at the farm level,
Thailand, 1968 to 2004

(percent)

(d) Soybean
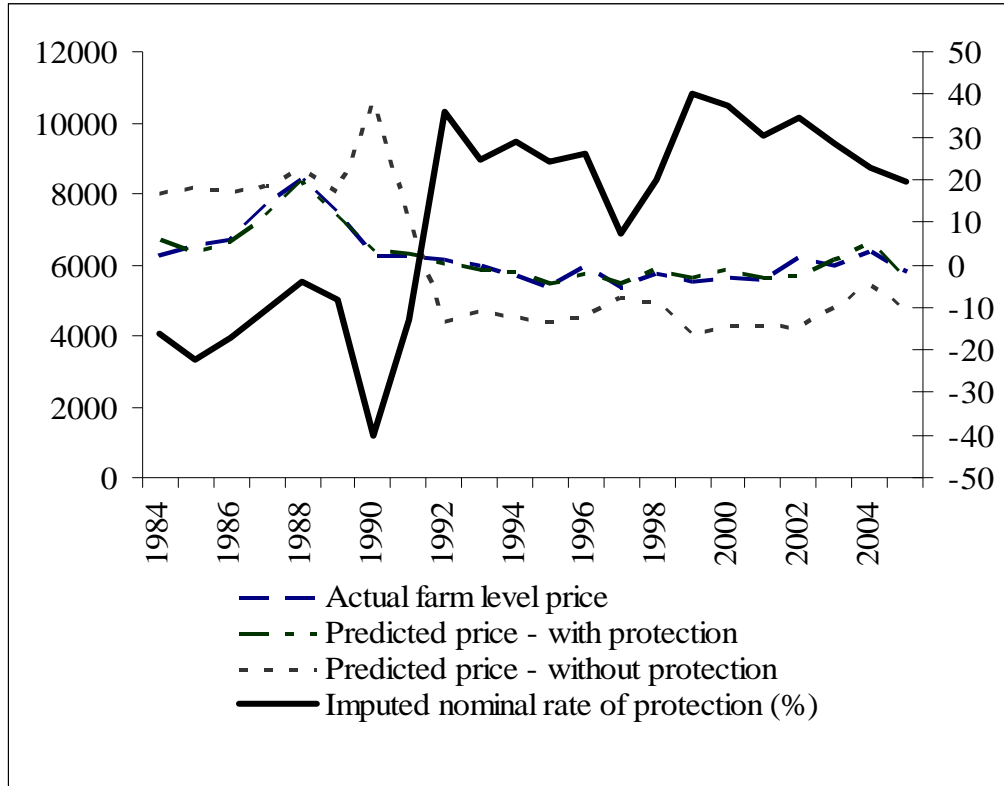
Appendix Figure A4 (continued): Prices and nominal rates of assistance[a] at the farm level, Thailand, 1968 to 2004

(percent)

(e) Sugar
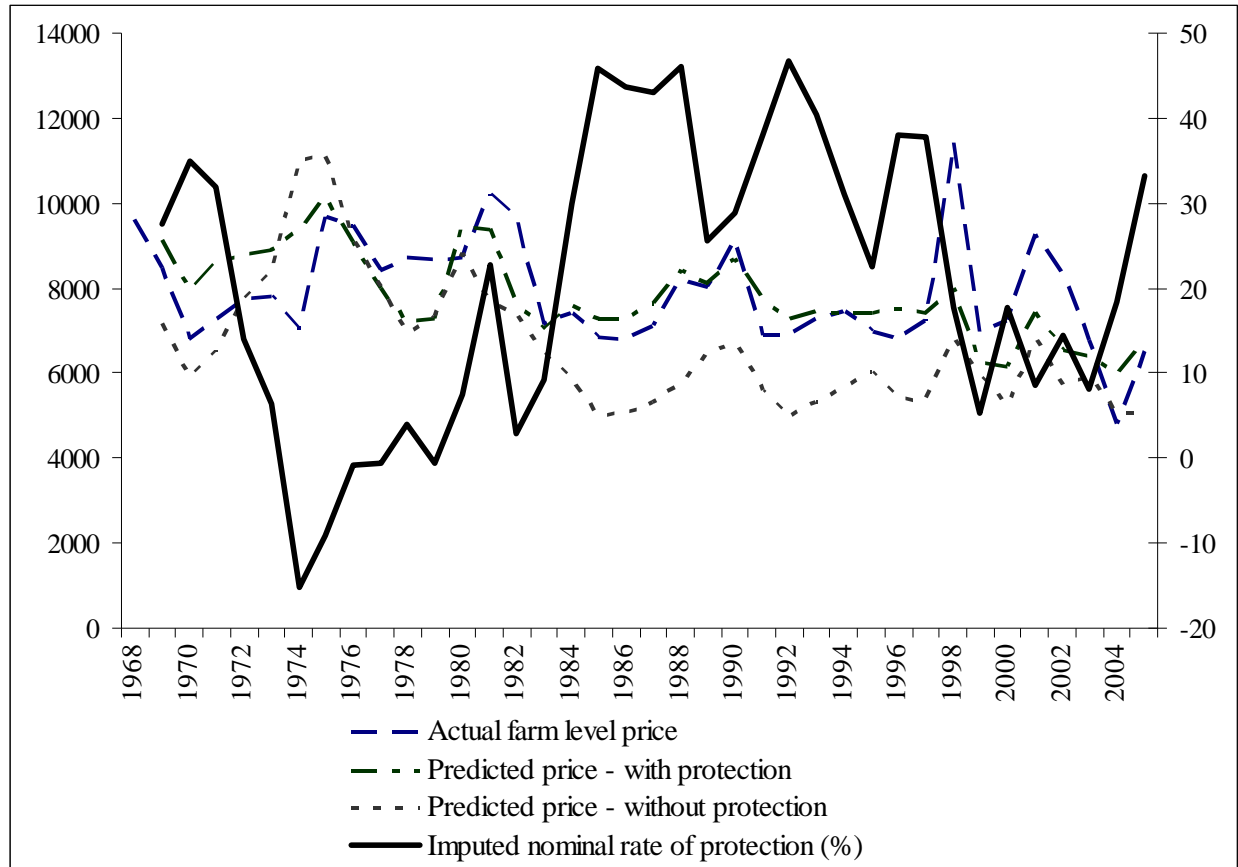
Appendix Figure A4 (continued): Prices and nominal rates of assistance[a] at the farm level, Thailand, 1968 to 2004

(percent)

(f) Palmoil
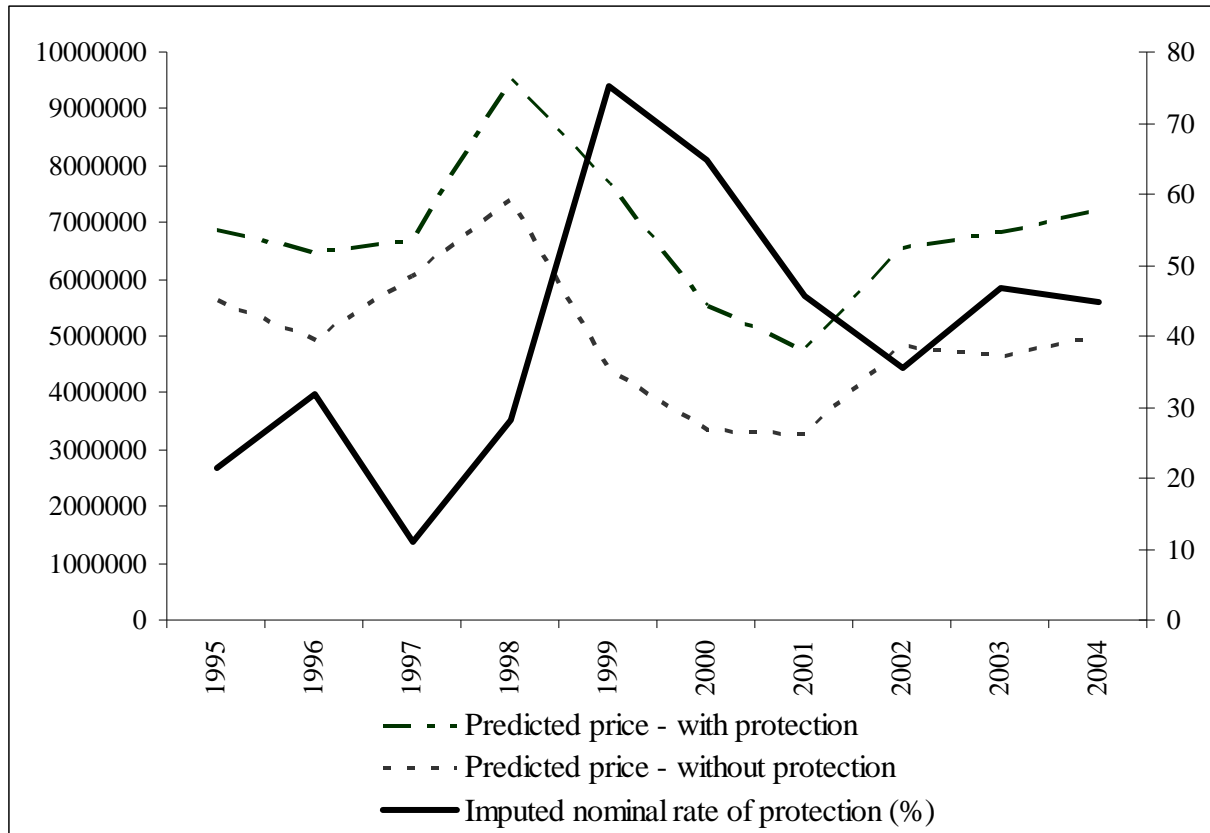
- Predicted price - with protection
- Predicted price - without protection
- Imputed nominal rate of protection (%)

Appendix Figure A4 (continued): Prices and nominal rates of assistance[a] at the farm level, Thailand, 1968 to 2004

(percent)

(g) Rubber
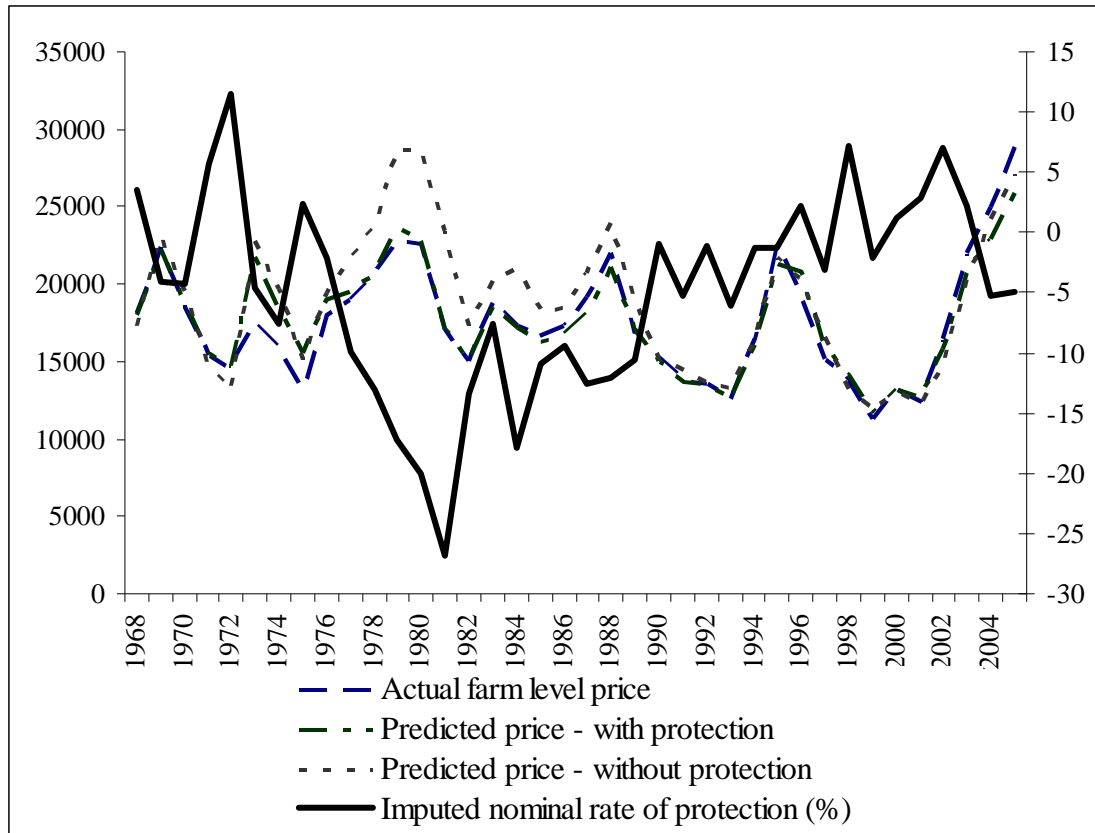
Appendix Figure A4 (continued): Prices and nominal rates of assistance[a] at the farm level, Thailand, 1968 to 2004

(percent)

(h) Urea fertilizer

Actual farm level price
Predicted price - with protection
Predicted price - without protection
Imputed nominal rate of protection (%)
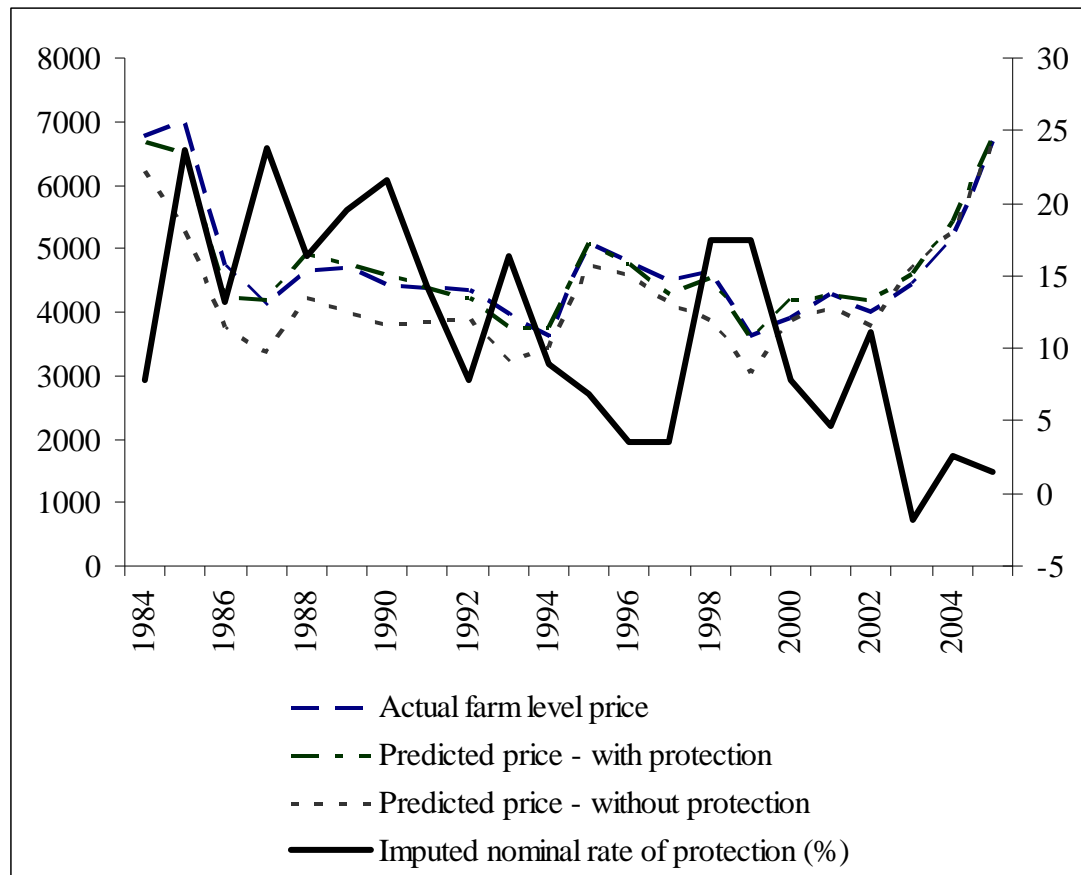
[a] Imputed nominal rate of assistance is calculated as 100*(Predicted price with protection - Predicted price without protection)/ Predicted price without protection.

Source: Authors' calculations, based on methodology and data discussed in the text.

Appendix Figure A5: Production shares at distorted prices, Thailand, 1966 to 2003

(percent)
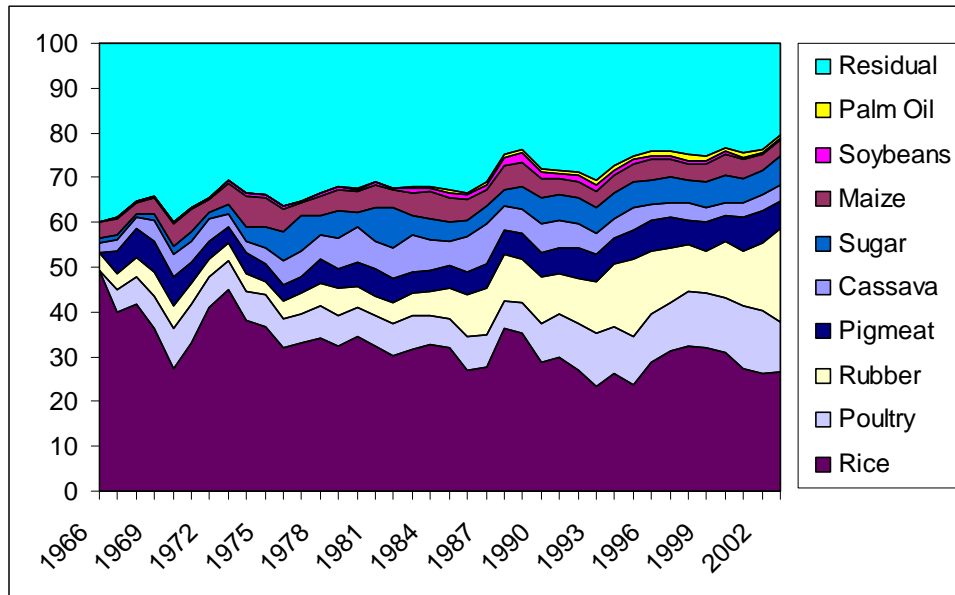
Source: calculations using FAOSTAT data

Appendix Table A1: Value added shares of industry output, Thailand, 1975 to 2000
(percent)

Industry	1975	1980	1985	1990	1995	2000
Paddy	85.8	85.2	78.3	77.5	76.8	69.6
Maize	77.8	75.6	62.2	60.9	61.6	60.5
Other cereals	83.0	80.7	58.9	64.0	71.6	72.7
Cassava	87.1	84.1	69.7	74.7	73.4	64.6
Beans & nuts	86.1	85.8	67.5	70.1	73.1	57.6
Vegetables	83.7	82.4	71.7	76.3	73.5	64.3
Fruits	87.1	182.5	76.5	78.1	78.4	65.9
Sugar cane	80.7	80.0	63.1	70.6	68.2	64.4
Coconut	91.2	92.9	87.8	89.0	84.1	89.8
Palm nut and oil palm	91.9	90.8	76.9	71.2	70.9	61.6
Rubber	92.5	92.6	85.6	83.0	83.4	84.8
Other crops	83.1	84.3	71.7	70.8	72.3	65.5
Cattle and buffalo	86.0	87.9	81.5	81.5	75.6	80.1
Swine	41.1	41.2	20.1	20.3	19.6	28.1
Poultry	34.5	40.9	31.6	29.6	31.6	38.1
Other livestock	45.2	45.7	40.0	40.3	34.7	38.7
Total agriculture	78.4	83.9	67.5	67.2	67.2	62.9

Source: National Economic and Social Development Board (various years)

Appendix Table A2: Imported intermediate inputs as a share of total intermediate inputs[a], by agricultural industry, Thailand, 1975 to 2000

(percent)

Industry	**1975**	**1980**	**1990**	**1995**	**2000**
Paddy	17.7	19.6	28.3	27.4	36.2
Maize	2.2	2.5	9.6	13.4	35.7
Other cereals	0.6	0.4	0.3	1.0	2.5
Cassava	5.1	3.4	15.6	13.0	0.2
Beans & nuts	6.7	6.9	14.2	12.3	0.6
Vegetables	19.9	27.2	25.8	25.8	16.6
Fruits	24.2	23.9	31.6	25.0	24.4
Sugar cane	16.0	17.3	20.6	21.2	16.6
Coconut	17.9	19.2	18.3	41.0	0.0
Palm nut and oil palm	16.2	17.3	5.6	21.9	0.5
Rubber	23.7	26.6	47.2	46.3	45.5
Other crops	23.3	23.0	25.8	27.7	14.3
Cattle and buffalo	1.4	0.9	4.9	5.3	2.7
Swine	0.3	0.6	2.7	6.1	0.1
Poultry	1.6	1.4	3.4	6.1	0.7
Other livestock	0.6	0.6	2.5	5.8	1.0
Total agriculture	9.8	10.6	15.4	17.6	16.8

[a] The Thai input-output table for 1985 does not distinguish between imported and domestically produced intermediate inputs and so does not support the calculations reported in the table.

Source: National Economic and Social Development Board (various years)

Appendix Table A3: Sales to intermediate users as a share of industry total sales, Thailand, 1975 to 2000

(percent)

Industry	1975	1980[c]	1985	1990	1995	2000
Paddy [a,b]	94.0	94.3	99.0	98.2	97.6	100
Maize	16.5	14.2	97.6	44.0	61.7	93.6
Other cereals	36.4	59.1	53.4	100	99.9	95.2
Cassava	97.9	99.6	97.7	96.2	95.9	98.1
Beans & nuts	29.9	23.0	49.5	65.5	70.1	81.6
Vegetables	11.2	7.2	18.4	22.6	25.9	24.6
Fruits	5.7	4.6	16.0	20.9	20.5	35.8
Sugar cane	96.9	82.9	99.9	100	100	100
Coconut	14.9	13.0	37.2	54.3	57.8	68.5
Palm nut and oil palm	95.9	97.7	98.7	93.4	92.7	88.8
Rubber	100.0	100.0	87.3	71.9	67.3	86.4
Other crops	69.9	68.6	77.8	79.7	74.9	81.5
Cattle and buffalo	94.3	95.2	98.5	92.3	100	100
Swine	100	99.9	100	95.3	99.4	99.3
Poultry	64.2	72.1	82.5	75.5	87.1	91.1
Other livestock	12.2	10.0	31.8	33.1	33.0	39.5
Total agriculture	57.3	55.2	71.0	67.0	68.8	70.0

[a] The input-output tables classify unmilled rice (paddy) as an output of the agricultural sector and milled rice as an output of the manufacturing sector.
[b] Milled rice excluded.
[c] Data for 1980 refer to milled cereal.

Source: National Economic and Social Development Board (various years)

Appendix Table A4: Industry sales to export users as a share of industry total sales [a], Thailand, 1975 to 2000

(percent)

Industry	1975	1980	1985	1990	1995	2000
Paddy	0.0	0.1	0.0	0.0	0.0	0.0
Maize	77.6	79.2	0.0	34.7	2.8	1.7
Other cereals	53.7	32.9	43.5	7.8	3.0	5.2
Cassava	0.0	0.0	0.0	2.2	0.0	0.0
Beans & nuts	31.5	34.4	38.6	24.5	11.1	7.9
Vegetables	0.5	0.9	2.0	1.7	3.0	2.6
Fruits	1.2	1.5	5.2	4.5	8.0	8.0
Sugar cane	0.0	0.0	0.0	0.0	0.0	0.0
Coconut	0.2	0.1	2.5	1.8	2.2	7.2
Palm nut and oil palm	4.1	2.3	1.1	4.9	4.4	8.9
Rubber	0.0	0.0	0.0	6.3	32.4	19.3
Other crops	10.4	12.5	14.0	12.3	17.3	11.2
Cattle and buffalo	4.9	0.0	0.0	0.0	0.0	0.0
Swine	0.0	0.0	0.0	0.0	0.0	0.0
Poultry	0.3	0.0	0.0	0.0	0.0	0.0
Other livestock	1.2	0.2	0.5	1.2	1.9	1.9
Total agriculture	7.6	6.1	4.1	4.5	7.4	4.9
Rice milling	15.1	36.7	32.6	35.5	39.8	51.7
Refined sugar	56.5	22.4	36.3	47.0	48.3	39.1

[a] The input-output tables classify unmilled rice (paddy) as an output of the agricultural sector and milled rice as an output of the manufacturing sector.

Source: National Economic and Social Development Board (various years)

Appendix Table A5: Imports' share of total usage, [a] Thailand, 1975 to 2000
(percent)

Industry	1975	1980	1985	1990	1995	2000
Paddy	0.0	0.0	0.0	0.0	0.0	0.0
Maize	0.0	0.0	0.0	0.1	6.9	7.8
Other cereals	34.6	33.7	39.6	71.0	79.9	81.2
Cassava	0.0	0.0	0.0	0.0	0.0	0.0
Beans & nuts	0.2	2.8	1.1	4.0	16.9	52.3
Vegetables	0.9	0.6	0.7	0.5	1.0	0.6
Fruits	0.5	0.2	1.7	3.4	6.9	3.7
Sugar cane	0.0	0.0	0.0	0.0	0.0	0.0
Coconut	0.0	6.5	0.2	0.2	0.2	0.5
Palm nut and oil palm	0.0	0.2	0.1	0.4	0.1	1.5
Rubber	0.0	0.0	0.0	0.0	0.0	0.1
Other crops	23.1	24.8	33.0	47.0	45.4	44.5
Cattle and buffalo	0.3	0.0	0.1	2.4	0.9	2.9
Swine	0.0	0.1	0.5	0.2	0.1	0.0
Poultry	0.6	1.3	0.6	1.1	1.0	0.2
Other livestock	0.2	0.2	2.0	10.3	8.7	7.6
Total agriculture	2.2	2.3	3.5	5.7	6.3	7.2
Rice milling	0.0	0.0	0.2	0.1	0.2	0.0
Refined sugar	0.1	10.1	0.5	0.5	0.5	0.7

[a] The input-output tables classify unmilled rice (paddy) as an output of the agricultural sector and milled rice as an output of the manufacturing sector.

Source: National Economic and Social Development Board (various years)

Appendix Table A6: Trade classification of products for calculating nominal rates of assistance,[a] Thailand

Commodity	Domestic price	Border price
Rice	Domestic price	Export price
Maize	Domestic price	Export price
Cassava	Domestic price	Export price
Sugar	Grower price	Export price
Rubber	Domestic price	Export price
Soybean	Domestic price	Export price (up to 1991)
		Import price (after 1991)
Palmoil	Domestic price	Export price
Fertilizer (urea)	Wholesale price	Import price

[a] NRP is calculated as NRP $= 100(P^D - P^B)/ P^B$, where P^D denotes the domestic price and P^B denotes the border price.

Source: Authors' classification

Appendix Table A7: Transport and handling costs between border and wholesale level of agricultural products, Thailand

(percentage of gross value)

Commodity	Transport and handling cost (%)
Rice	5.0
Maize	2.5
Cassava	1.4
Soybeans	1.4
Sugar	2.3
Rubber	4.8
Fertilizer	5.2
Palmoil	1.3

Source: Thailand, Ministry of Commerce, Bangkok.

Appendix Table A8: Price comparisons and trade status, rice,[a,b] Thailand, 1968 to 2005

| Year | Rice : Nominal Price (Paddy basis) | | Trade |
	Domestic price (baht/ton) (1)	Border price (baht /ton) (2)	
1968	1,231	3,034	X
1969	1,381	2,618	X
1970	1,182	2,053	X
1971	1,011	1,784	X
1972	1,168	2,068	X
1973	1,650	2,750	X
1974	2,348	6,517	X
1975	2,269	4,364	X
1976	2,282	2,963	X
1977	2,309	3,582	X
1978	2,498	4,222	X
1979	2,751	3,887	X
1980	3,405	5,071	X
1981	3,628	5,865	X
1982	3,212	3,954	X
1983	3,228	3,789	X
1984	3,041	3,713	X
1985	2,757	3,622	X
1986	2,428	3,165	X
1987	3,027	3,570	X
1988	3,971	4,658	X
1989	4,286	4,969	X
1990	3,632	4,186	X
1991	3,978	4,620	X
1992	3,647	4,225	X
1993	3,082	3,959	X
1994	3,562	5,034	X
1995	4,561	5,081	X
1996	4,897	5,524	X
1997	5,029	6,174	X
1998	6,971	7,910	X
1999	5,252	5,953	X
2000	4,404	5,065	X
2001	4,309	4,758	X
2002	4,710	5,111	X
2003	4,648	5,037	X
2004	5,659	6,058	X
2005	6,597	7,071	X

[a] To make the old and new series consistent, we have to redefine the product composition as follows. According to Siamwalla and Setboonsarng (1989), a ton of paddy is composed of 450 kg white rice 5 percent, 150 kg broken rice A1 extra, 30 kg broken rice C1 extra, and 30 kg broken rice C3. Nonetheless, broken rice C1 and C3 are no longer reported by Department of Internal Trade, Ministry of Commerce. We use the new definition is one ton of paddy is defined as 450 kgs of white rice 5 percent, plus 210 kgs of broken rice A1 special. This new definition is applied for the series 1968-2005. The correlation coefficients are greater than 95 percent.
[b] X=Net export; M = Net Import; and N= Non-trade/Balanced Trade.
Source: Thailand, Ministry of Commerce, Department of Internal Trade; Board of Trade of Thailand.

Appendix Table A9: Price comparisons and trade status for maize[a], Thailand, 1960 to 2005

Year	Border price (baht/ton) (1)		Farm Price[c] (baht/ton) (2)	Domestic price[b] (baht/ton) (3)	Quantity of export (ton) (4)	Quantity of import (ton) (5)	Trade[i]
	Import price[e]	Export price[d]					
1960	n.a.[h]	1,067	n.a.	n.a.	463,500	n.a.	X
1961	n.a.	1,127	n.a.	n.a.	538,874	n.a.	X
1962	0	1,101	n.a.	n.a.	448,785	0	X
1963	n.a.	1,092	n.a.	n.a.	706,844	n.a.	X
1964	n.a.	1,142	n.a.	n.a.	1,059,289	n.a.	X
1965	n.a.	1,257	n.a.	n.a.	764,161	n.a.	X
1966	n.a.	1,193	n.a.	n.a.	1,157,610	n.a.	X
1967	n.a.	1,225	820	1,162	1,036,224	n.a.	X
1968	n.a.	1,023	740	970	1,406,799	n.a.	X
1969	n.a.	1,135	810	1,117	1,402,301	n.a.	X
1970	n.a.	1,263	950	1,229	1,302,900	n.a.	X
1971	n.a.	1,247	800	1,202	1,715,733	n.a.	X
1972	n.a.	1,095	890	1,164	1,669,700	n.a.	X
1973	n.a.	1,976	1,440	1,784	1,240,873	n.a.	X
1974	n.a.	2,623	2,100	2,555	2,080,794	n.a.	X
1975	n.a.	2,656	1,860	2,483	1,968,665	n.a.	X
1976	n.a.	2,292	1,660	2,217	2,268,774	n.a.	X
1977	n.a.	2,124	1,600	2,131	1,441,984	n.a.	X
1978	n.a.	2,163	1,630	2,114	1,856,849	n.a.	X
1979	n.a.	2,765	2,040	2,638	1,888,743	n.a.	X
1980	n.a.	3,196	2,400	3,022	2,066,564	n.a.	X
1981	n.a.	3,243	2,230	2,960	2,420,049	n.a.	X
1982	n.a.	2,850	2,250	2,850	2,661,180	n.a.	X
1983	n.a.	3,129	2,370	3,129	2,498,543	n.a.	X
1984	n.a.	3,085	2,410	3,085	2,960,905	n.a.	X
1985	n.a.	2,950	1,930	2,839	2,614,796	n.a.	X
1986	n.a.	2,570	1,630	2,235	3,734,000	n.a.	X
1987	n.a.	2,630	2,260	2,500	1,465,557	n.a.	X
1988	n.a.	3,210	2,650	3,155	1,087,885	n.a.	X
1989	n.a.	3,800	2,890	3,666	1,062,739	n.a.	X
1990	n.a.	3,260	2,550	3,220	1,226,000	n.a.	X
1991	n.a.	3,130	2,670	3,054	1,215,000	n.a.	X
1992[f]	3,835	3,500	2,840	3,408	135,000	440,000	M
1993	4,900	3,080	2,760	3,140	179,000	9,000	X
1994	8,300	3,540	2,860	3,483	125,000	9,805	X
1995	4,048	4,760	3,850	4,570	96,190	276,000	M
1996	5,348	5,069	4,060	4,896	50,443	307,000	M
1997	8,020	5,003	4,180	4,703	51,460	235,000	M
1998	5,174	5,207	3,950	5,052	112,700	228,000	M
1999	4,930	4,665	4,100	4,626	64,900	109,350	M
2000	4,470	4,760	3,980	4,710	19,944	338,720	M
2001	19,380	4,509	3,940	4,356	490,851	6,647	X
2002	21,820	4,856	4,090	4,734	146,050	4,916	X
2003	10,710	5,060	4,420	4,930	189,418	7,868	X
2004	4,800	5,730	4,450	5,636	871,792	75,754	X
2005	n.a.	5,824	4,800	5,475	58,662	58,626	N

The header spans "Maize : Nominal Price (Maize grain basis)"

[a] Despite unspecified type of maize used in Siamwalla and Setboonsarng (1989), we use grained maize at the grade of 14 percent moisture. Its time pattern is similar to Siamwalla and Setboonsarng (1989). Import and export price are adjusted for the same basis.

[b] Domestic price is the wholesale prices in Bangkok Metropolis.

[c] Farm price is the official reported price.

[d] Export price is fob price of maize.

[e] Import price is cif price of maize.

[f] During 1992-1999 import price and quantity are roughly estimated, using FOA data.

[g] * represents the number is negligible.

[h] n.a. is not available.

[i] Trade definition: X=Net export; M = Net Import; and N= Non-trade/Balanced Trade.

Source:(1) Bank of Thailand Quarterly Bulletin, Bank of Thailand.
(2) and (3) Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Appendix Table A10: Price comparisons and trade status for cassava, Thailand, 1060 to 2004

Cassava : Nominal Price (Cassava pellet basis [a])

Year	Domestic price[b] (baht/ton) (1)	Border price[c] (baht/ton) (2)	Farm price[d] (baht/ton) (3)	Trade[f]
1960	n.a.	n.a.	n.a[e].	X
1961	n.a.	n.a.	n.a.	X
1962	n.a.	n.a.	n.a.	X
1963	n.a.	n.a.	n.a.	X
1964	n.a.	n.a.	n.a.	X
1965	n.a.	n.a.	n.a.	X
1966	n.a.	n.a.	n.a.	X
1967	n.a.	n.a.	450	X
1968	n.a.	n.a.	480	X
1969	699	819	410	X
1970	762	859	390	X
1971	817	1,013	370	X
1972	828	1,110	480	X
1973	1,033	1,288	290	X
1974	1,195	1,433	290	X
1975	1,571	1,857	400	X
1976	1,688	1,937	460	X
1977	1,543	1,884	480	X
1978	1,450	1,692	360	X
1979	2,493	2,427	740	X
1980	2,524	2,731	750	X
1981	1,907	2,519	540	X
1982	2,110	2,419	580	X
1983	2,720	2,778	730	X
1984	1,730	2,380	580	X
1985	1,520	1,965	430	X
1986	2,722	2,847	840	X
1987	2,582	3,207	840	X
1988	2,186	2,632	580	X
1989	1,913	2,341	540	X
1990	2,373	2,713	710	X
1991	2,625	3,131	820	X
1992	2,570	2,927	770	X
1993	2,154	2,580	600	X
1994	2,438	2,571	710	X
1995	3,115	3,168	1,160	X
1996	2,937	3,314	910	X
1997	2,224	2,803	710	X
1998	3,173	3,410	1,300	X
1999	2,689	2,900	830	X
2000	2,045	2,367	610	X
2001	2,231	2,451	770	X
2002	2,721	2,688	1,040	X
2003	2,603	2,740	890	X
2004	2,720	2,888	880	X

[a] We use cassava pellet for the basis for the price comparison because it has the highest proportion in cassava export during 2001-2004.

[b] Domestic price is the average wholesale prices of cassava pellets.

[c] Border price is the F.O.B. price of cassava pellets, i.e. the ratio between export value and its quantity.

[d] Farm price is the official reported price that the farmer of raw cassava received.

[e] n.a. is not available.

[f] Trade definition: X=Net export; M = Net Import; and N= Non-trade/Balanced Trade.

Source:
(1) Bank of Thailand Quarterly Bulletin, Bank of Thailand.
(2) And (3) Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Appendix Table A11: Price comparisons and trade status for soybeans, Thailand, 1960 to 2005

	Soybean : Nominal Price (Mixed grade soybean grain basis)						
Year	Border price (baht/ton) (1)		Farm price [d] (baht/ton) (2)	Domestic price [a] (baht/ton) (3)	Quantity of export (ton) (4)	Quantity of import (ton) (5)	Trade [e]
	Import price [c]	Export price [b]					
1960	0	n.a.	n.a.	n.a.	n.a.	0	X
1961	0	2,493	n.a.	n.a.	2,090	0	X
1962	0	2,611	n.a.	n.a.	1,910	0	X
1963	0	2,296	n.a.	n.a.	4,400	0	X
1964	0	2,153	n.a.	n.a.	4,320	0	X
1965	0	2,804	n.a.	n.a.	1,610	0	X
1966	0	2,608	n.a.	n.a.	5,608	0	X
1967	0	2,565	n.a.	n.a.	5,897	0	X
1968	0	2,716	n.a.	n.a.	3,486	0	X
1969	0	2,645	n.a.	n.a.	4,973	0	X
1970	0	2,576	n.a.	n.a.	6,290	0	X
1971	0	2,800	n.a.	n.a.	6,099	0	X
1972	0	3,187	n.a.	n.a.	7,240	0	X
1973	0	5,535	n.a.	n.a.	13,715	0	X
1974	0	5,458	n.a.	n.a.	8,612	0	X
1975	0	5,561	n.a.	n.a.	24,055	0	X
1976	0	5,858	n.a.	n.a.	8,132	0	X
1977	6,376	7,175	n.a.	n.a.	11,506	4,003	X
1978	5,495	6,333	n.a.	n.a.	8,099	10,808	X
1979	7,000	7,026	n.a.	n.a.	9,715	5	X
1980	6,577	8,231	n.a.	n.a.	3,394	15,297	X
1981	7,000	8,917	n.a.	n.a.	2,531	15	X
1982	5,541	8,801	n.a.	n.a.	1,295	3,218	X
1983	23,000	8,958	n.a.	n.a.	1,035	1	X
1984	4,981	8,752	5,430	6,916	995	107	X
1985	20,000	9,264	5,820	6,659	2,342	1	X
1986	0	9,326	6,030	7,279	1,983	0	X
1987	25,070	10,211	7,250	8,742	142	1	X
1988	7,992	11,688	8,410	10,933	16	33,277	X
1989	220,667	11,273	7,890	10,010	11	9	N
1990	185,750	17,149	7,020	8,902	74	16	N
1991	237,853	11,410	7,440	9,496	529	34	X
1992	6,311	11,672	7,600	9,407	781	158,047	M
1993	7,121	14,834	7,630	9,505	471	44,689	M
1994	7,179	12,567	7,640	9,985	312	97,998	M
1995	7,417	14,882	7,650	9,855	279	203,157	M
1996	8,169	12,838	8,860	11,040	222	418,811	M
1997	9,908	18,094	8,250	10,975	329	869,397	M
1998	10,392	10,881	9,710	13,205	797	687,255	M
1999	7,892	13,095	8,870	12,185	781	1,007,984	M
2000	8,690	17,099	9,190	13,115	617	1,320,402	M
2001	9,092	21,887	9,320	12,855	335	1,363,224	M
2002	9,124	17,417	10,390	13,395	835	1,528,557	M
2003	10,864	21,241	10,210	15,020	572	1,689,649	M
2004	13,200	23,844	11,260	17,275	975	1,435,803	M
2005	11,591	31,071	10,720	14,680	1,223	1,607,784	M

[a] Domestic price is the average wholesale prices of mixed grade soybean grain. We adjust this data from high grade soybean.

[b] Export price is fob price of mixed grade soybean.

[c] Import price is cif price of mixed grade soybean.

[d] Farm price is the official-reported price received by the farmer of soybean (mixed).

[e] Trade definition: X=Net export; M = Net Import; and N= Non-trade/Balanced Trade.

Source:(1), (2) and (3) Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.
(4) and (5) FOA ,United Nations (UN).

Appendix Table A12: Import quotas for soybeans, Thailand, 1995 to 2005

Year	Soybean					
	Quota				Non quota	
	WTO Obligation		Applied Rate		WTO Obligation (%) [a]	Applied Rate (%)
	tariff rate (%)	import quota (ton) [a]	tariff rate (%)	import quota (ton) [b]		
1995	20	10,402	5	278,947	88.1	88.1
1996	20	10,402	5	426,460	88.1	87.2
1997	20	10,402	0	unlimited	88.1	86.3
1998	20	10,402	0	unlimited	88.1	88.1
1999	20	10,402	0	unlimited	88.1	88.1
2000	20	10,402	0	unlimited	88.1	88.1
2001	20	10,402	0	unlimited	88.1	88.1
2002	20	10,806	0	unlimited	81.8	81.8
2003	20	10,864	0	unlimited	80.9	80.9
2004	20	10,922	0	unlimited	80.0	80.0
2005	20	10,922	0	unlimited	80.0	80.0

[a] the official figures in 1998-2001 are not available. To the best for our knowledge so far, there has not considerable change in these figures since 1997 so that we use the 1997 figure as the estimates.
[b] Unlimited import quota (from 2002 onward) is allocated among 6 Associations and 6 food processors.
1. Soybean and Rice Bran Oil Processor Association
2. Thai Feed Mill Association
3. Broiler Raiser for Exporting Association
4. The Feedstuff Users Promotion Association
5. Thai Livestock Association
6. Thai Broiler Processing Exporters Association
7. Thai Theparos Food Products Public Company Limited
8. Lactasoy Company Limited
9. Green Spot (Thailand) Limited
10. Dairy Plus Co. Ltd.
11. Serm Suk YHS Beverage Co., Ltd.
12. Korat Jeesae Partnership Limited

Source: Department of Internal Trade, Ministry of Commerce

Appendix Table A13: Price comparisons and trade status for sugar,[a] Thailand, 1060 to 2005

	Sugar : Nominal Price (Raw sugar basis)				
Year [b]	**Border price (baht/ton) (1)**	**Grower price (baht/ton) (2)**	**Miller price (baht/ton) (3)**	**Consumer price (baht/ton) (4)**	**Trade** [d]
1960	1,398	n.a[c].	4,628	n.a.	X
1961	1,952	n.a.	4,231	n.a.	X
1962	1,161	3,413	3,450	3,810	X
1963	2,648	3,251	4,752	4,900	X
1964	3,222	3,236	5,394	5,140	X
1965	1,184	2,690	2,453	2,540	X
1966	1,651	2,410	2,784	3,050	X
1967	2,176	2,384	3,650	3,480	X
1968	2,054	2,919	4,178	4,030	X
1969	2,369	2,630	3,662	3,560	X
1970	1,708	2,115	2,730	2,880	X
1971	2,182	2,229	3,108	3,520	X
1972	3,263	2,545	3,452	4,210	X
1973	4,306	3,043	4,176	4,110	X
1974	8,762	3,309	5,515	4,420	X
1975	10,676	4,721	6,597	4,470	X
1976	6,069	4,808	5,595	5,220	X
1977	4,647	4,528	4,677	4,760	X
1978	3,818	5,150	4,212	5,020	X
1979	4,025	5,603	4,679	5,590	X
1980	6,499	6,315	8,631	10,110	X
1981	6,932	8,023	9,191	10,190	X
1982	5,841	7,949	6,540	10,720	X
1983	4,037	6,119	5,833	10,910	X
1984	4,194	6,421	6,829	10,960	X
1985	3,330	6,069	6,452	10,970	X
1986	3,610	6,133	6,571	10,980	X
1987	4,190	6,714	7,521	10,970	X
1988	5,120	8,216	9,539	10,980	X
1989	6,420	8,500	9,421	10,988	X
1990	7,293	10,221	11,360	10,988	X
1991	5,127	8,200	9,619	10,988	X
1992	4,991	8,532	9,024	10,990	X
1993	5,570	9,314	9,769	10,990	X
1994	6,430	10,076	10,174	10,989	X
1995	7,395	9,956	10,675	10,995	X
1996	6,690	10,084	11,367	10,997	X
1997	7,090	11,162	11,556	10,997	X
1998	11,234	19,242	14,622	11,100	X
1999	5,842	11,263	8,880	10,993	X
2000	5,863	11,849	8,632	11,415	X
2001	9,368	15,470	12,558	11,763	X
2002	6,414	13,994	10,014	11,754	X
2003	6,890	11,598	9,830	11,762	X
2004	6,248	8,498	8,827	11,761	X
2005	8,560	11,994	11,637	11,750	X

[a] Since 1982, Thai Cane and Sugar Industry has adopted the 70:30 revenue sharing formula, i.e. 70 percent of net revenue from selling cane products go to cane farmer and the rest go to sugar millers.
[b] We use the end of plantation year as a proxy for the calendar year. For example, 1985/86 of plantation year is the 1986 calendar year.
[c] n.a. is not available.
[d] Trade definition: X=Net export; M = Net Import; and N= Non-trade/Balanced Trade.

Source:
The data during 1985-2005 are obtained from:
(1) FOB price of raw sugar obtained from Office of the Cane and Sugar Board, Ministry of Industry.
(2) It is represented by the ratio of sugar cane's price divided by the conversion/extraction ratio from sugar cane to raw sugar. Both data are obtained from Office of the Cane and Sugar Board, Ministry of Industry.
(3) We use 1984 price from Siamwalla and Setboonsarng (1989) as the starting point and then adjust by annual growth calculated from annual change in remuneration for miller's production and selling.
(4) The wholesale price of white sugar at Bangkok market is obtained from Office of Agricultural Economics, Ministry of Agriculture and Cooperatives. Note that the white sugar price is chosen because of updating the original series from Siamwalla and Setboonsarng (1989).

Appendix Table A14: Price comparisons and trade status for palmoil, [a] Thailand, 1961 to 2004

Palmoil : Nominal Price (Crude & refined palmoil basis)

Year	Border price (baht/ton) (1)		Farm price [d] (baht/ton) (2)	Domestic price (baht/ton) (3)		Quantity of export (ton) (4)	Quantity of import (ton) (5)
	Import price [c,e]	Export price [b,e]		Crude	Refined		
1961	6,997	0	n.a.	n.a.	n.a.	0	15
1962	6,947	0	n.a.	n.a.	n.a.	0	33
1963	6,450	0	n.a.	n.a.	n.a.	0	42
1964	10,161	0	n.a.	n.a.	n.a.	0	41
1965	8,101	0	n.a.	n.a.	n.a.	0	36
1966	8,120	0	n.a.	n.a.	n.a.	0	46
1967	6,644	0	n.a.	n.a.	n.a.	0	72
1968	4,899	0	n.a.	n.a.	n.a.	0	183
1969	5,980	0	n.a.	n.a.	n.a.	0	91
1970	6,589	0	n.a.	n.a.	n.a.	0	54
1971	6,342	0	n.a.	n.a.	n.a.	0	99
1972	4,587	0	n.a.	n.a.	n.a.	0	146
1973	9,406	0	n.a.	n.a.	n.a.	0	78
1974	11,322	1,168	n.a.	n.a.	n.a.	178	18
1975	12,698	624	n.a.	n.a.	n.a.	2,158	98
1976	9,377	697	n.a.	n.a.	n.a.	2,073	7,046
1977	10,317	386	n.a.	n.a.	n.a.	124	4,855
1978	12,229	909	n.a.	n.a.	n.a.	2,668	6,406
1979	14,131	98	n.a.	n.a.	n.a.	219	13,909
1980	13,791	0	1,290	n.a.	n.a.	0	58,703
1981	12,200	0	1,240	n.a.	n.a.	0	26,936
1982	10,268	507	1,190	n.a.	n.a.	231	9,203
1983	9,922	839	1,430	n.a.	n.a.	360	12,792
1984	17,409	1,312	1,720	n.a.	n.a.	4,741	7,572
1985	20,968	1,239	1,510	n.a.	n.a.	13,549	3,333
1986	0	531	1,120	n.a.	n.a.	4,587	0
1987	0	655	2,290	n.a.	n.a.	558	0
1988	9,792	700	2,860	16,150	22,370	1	5,407
1989	0	2,057	1,850	11,940	22,370	53	0
1990	0	1,976	1,890	12,490	18,450	79	0
1991	0	2,037	1,830	12,260	18,620	99	0
1992	10,467	1,107	1,800	14,840	18,620	1,440	9,725
1993	0	0	1,790	13,170	22,510	0	0
1994	0	1,286	1,710	13,690	19,630	9,386	0
1995	15,296	1,694	2,050	15,870	22,610	6,157	14,976
1996	13,693	2,173	2,030	15,400	22,310	643	24,772
1997	18,290	1,835	2,170	16,600	24,030	52,690	17,379
1998	26,430	2,513	3,370	26,470	38,930	44,695	8,471
1999	n.a.	1,348	2,210	18,990	30,670	24,329	n.a.
2000	0	1,011	1,660	12,920	21,870	20,234	0
2001	0	1,002	1,190	10,860	19,190	160,811	0
2002	20,290	1,559	2,300	17,290	25,880	49,744	90
2003	21,550	1,527	2,340	18,260	27,980	76,667	2
2004	0	1,700	3,110	20,130	30,600	3,036	0

[a] We collected two series of domestic prices, the average wholesale prices of crude and refined palmoil.
[b] Export price is fob price of palmoil (crude plus refined palmoil).
[c] Import price is cif price of palmoil (crude plus refined palmoil).
[d] Farm price is the official reported price that the farmer of oil palm fruits attaching to the bunch received.
[e] Zero figures on import and export prices are because of a zero trade value. In the case of imports, official claime this was a result of import restrictions.
[f] Trade definition: X=Net export; M = Net Import; and N= Non-trade/Balanced Trade.

Source: (1), (4) and (5) Office of Agricultural Economics, Ministry of Agriculture and Cooperatives and FOA, United Nations (UN).
(2) and (3) Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Appendix Table A15: Import quotas for palmoil, Thailand, 2000 to 2005

Year	Palmoil		Non Quota[a] (%)
	Quota		
	tariff rate (%)	import quota (ton)	
2000	20	4,757	147.8
2001	20	4,809	146.2
2002	20	4,834	144.6
2003	20	4,860	143.0
2004	20	4,860	143.0
2005	20	4,860	143.0

[a] Non quota percent means the *ad valorem* tariff rate for imports exceeding the quota. For example, suppose Thailand imports 6000 tons in 2005. The first 4860 tons are subject to the 20 percent tariff rate and the rest (6,000-4,860= 1,140 tons) are subject to the 143 percent tariff rate.

Source: Department of Internal Trade, Ministry of Commerce.

Appendix Table A16: Price comparisons and trade status for rubber, Thailand, 1960 to 2005

Year	Rubber : Nominal Price (Raw rubber sheet basis)			
	Domestic price [a] (baht/ton) (1)	Border price [b] (baht/ton) (2)	Farm price [a] (baht/ton) (3)	Trade [c]
1960	12,601	14,352	n.a.	X
1961	9,336	10,649	n.a.	X
1962	8,463	9,968	n.a.	X
1963	7,891	9,286	n.a.	X
1964	7,584	8,596	n.a.	X
1965	7,930	8,588	n.a.	X
1966	7,446	8,292	n.a.	X
1967	5,851	6,555	5,100	X
1968	6,237	6,304	5,490	X
1969	7,995	8,745	6,940	X
1970	6,580	7,197	5,720	X
1971	5,295	5,292	4,740	X
1972	5,300	4,968	4,770	X
1973	9,680	10,834	6,860	X
1974	9,553	13,024	7,380	X
1975	8,310	9,589	6,420	X
1976	10,841	13,358	9,150	X
1977	11,756	14,512	10,190	X
1978	13,850	17,368	12,210	X
1979	17,520	22,780	14,680	X
1980	18,940	26,377	16,350	X
1981	14,840	22,320	13,400	X
1982	13,430	16,574	12,420	X
1983	17,750	20,252	16,080	X
1984	16,447	21,315	15,070	X
1985	15,820	18,716	14,820	X
1986	16,630	19,030	15,610	X
1987	18,930	22,440	18,000	X
1988	23,810	27,550	21,980	X
1989	19,940	22,885	17,840	X
1990	18,326	19,661	17,150	X
1991	17,550	19,265	16,350	X
1992	18,060	19,139	16,870	X
1993	17,118	19,198	16,050	X
1994	23,910	25,478	22,110	X
1995	34,470	36,273	31,890	X
1996	34,718	34,226	28,660	X
1997	27,040	31,148	23,290	X
1998	25,730	26,227	23,060	X
1999	19,800	21,869	18,050	X
2000	23,200	24,799	21,520	X
2001	22,530	23,020	20,760	X
2002	29,130	28,733	27,570	X
2003	40,140	39,959	37,660	X
2004	46,240	49,215	44,130	X
2005	55,180	57,130	53,570	X

[a] Domestic and Farm prices are based on the grade 3 raw (unsmoked) rubber sheets.

[b] Border price is the fob of grade 3 raw (unsmoked) rubbers sheets.The export price of processed grade 3 (smoked) rubber sheets is converted to equivalent price of raw rubber sheets by subtracting average value added of smoked rubbers sheet price.
[c] Trade definition: X=Net export; M = Net Import; and N= Non-trade/Balanced Trade.

Source: (1) Bank of Thailand Quarterly Bulletin, Bank of Thailand.
(2) and (3) Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Appendix Table A17: Price comparisons and trade status for urea fertilizer, [b] Thailand, 1984 to 2006

Urea Fertilizer: Nominal Price (N-P-K formula is 46-0-0)

Year	Border price[a] (baht/ton)	Domestic price (baht/ton)		Trade
		Wholesale	Local / Retail	
1984	4,745	5,417	5,887	M
1985	4,050	5,409	6,197	M
1986	2,791	3,358	4,265	M
1987	2,612	3,500	3,862	M
1988	3,551	4,408	4,657	M
1989	3,539	4,533	4,971	M
1990	3,525	4,633	4,985	M
1991	3,783	4,625	5,180	M
1992	4,041	4,617	5,375	M
1993	3,356	4,167	5,098	M
1994	3,790	4,379	4,900	M
1995	5,756	6,554	7,200	M
1996	5,795	6,354	7,090	M
1997	5,327	5,833	6,954	M
1998	5,409	6,788	7,770	M
1999	3,962	5,017	5,832	M
2000	5,289	6,069	6,369	M
2001	5,691	6,336	7,139	M
2002	5,260	6,238	6,719	M
2003	6,832	7,008	7,593	M
2004	8,060	8,700	9,148	M
2005	11,007	11,729	12,349	M
2006 [c]	10,325	11,513	12,625	M

[a] Border price means the cif price of urea fertilizer.
[b] Thailand is an importer of urea fertilizer throughout the period shown.
[c] The data in 2006 are based on the first four months of that year.

Source: Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Appendix Table A18: Nominal rate of assistance at the wholesale level, by agricultural commodity,
and fertilizer consumer tax equivalent (CTE), Thailand, 1970 to 2005
(percent)

Year	Rice	Maize	Cassava	Soybean	Sugar	Rubber	Fertilizer CTE
1970	-40.1	-0.2	-8.6	-19.9	63.6	-4.0	8.5
1971	-41.0	-1.1	-16.9	-19.9	45.8	5.1	8.5
1972	-41.2	9.0	-23.2	-19.9	8.3	12.1	8.5
1973	-37.6	-7.4	-17.3	-19.9	-0.7	-6.1	8.5
1974	-62.5	0.0	-14.0	-19.9	-35.6	-22.9	8.5
1975	-45.9	-4.1	-12.8	-19.9	-36.8	-9.0	8.5
1976	-19.8	-0.8	-10.2	-19.9	-5.6	-14.7	8.5
1977	-32.9	2.9	-15.6	-19.9	3.0	-14.9	8.5
1978	-38.4	0.2	-11.6	-19.9	12.9	-16.2	8.5
1979	-26.3	-2.1	5.9	-19.9	19.0	-19.2	8.5
1980	-30.1	-3.0	-4.7	-19.9	35.9	-24.6	8.5
1981	-35.6	-6.4	-22.0	-19.9	35.7	-30.2	8.5
1982	-15.5	2.6	-10.1	-19.9	14.6	-14.9	8.5
1983	-11.3	2.6	0.9	-19.9	47.9	-7.9	8.5
1984	-14.7	2.6	-25.1	-19.9	66.6	-18.9	8.5
1985	-20.8	-1.3	-20.3	-27.1	98.3	-11.2	27.0
1986	-20.1	-10.8	-1.4	-20.9	86.3	-8.2	14.4
1987	-11.7	-2.5	-17.0	-13.2	83.7	-11.4	27.4
1988	-11.3	0.8	-14.4	-5.2	90.7	-9.2	18.0
1989	-10.2	-1.0	-15.8	-10.0	50.2	-8.5	21.7
1990	-9.7	1.3	-9.8	-47.4	59.4	-2.1	24.9
1991	-10.4	0.1	-13.6	-15.6	92.0	-4.3	16.2
1992	-10.2	-13.3	-9.5	47.0	85.0	-0.9	8.6
1993	-19.0	4.6	-13.9	31.7	79.5	-6.3	18.0
1994	-26.3	0.9	-2.2	37.2	61.9	-1.4	9.8
1995	-6.6	10.1	1.3	31.1	47.8	-0.2	8.2
1996	-7.7	-10.7	-8.6	33.3	73.9	6.6	4.2
1997	-15.2	-42.8	-18.2	9.3	66.8	-8.8	4.1
1998	-8.3	-4.8	-4.1	25.3	33.2	3.1	19.3
1999	-8.2	-8.5	-4.4	52.3	55.6	-4.9	20.4
2000	-9.5	2.8	-10.9	48.9	50.7	-1.7	9.1
2001	-5.7	-0.9	-6.2	39.5	37.2	2.8	5.8
2002	-4.1	0.0	4.4	44.8	59.8	6.5	12.7
2003	-4.0	-0.1	-2.1	36.4	46.0	5.5	-2.5
2004	-2.8	0.9	-2.9	29.1	44.6	-1.3	2.6
2005	-2.9	-3.6	-2.9	24.9	39.1	1.5	1.3

Source: Authors' calculations.

Appendix Table A19: Nominal rate of assistance at the farm level, by agricultural commodity, excluding fertilizer subsidy,[a] Thailand, 1970 to 2005
(percent)

Year	Rice	Maize	Cassava	Soybean	Sugar	Rubber
1970	-23.9	-0.1	-9.1	-16.3	34.8	-4.2
1971	-27.5	-0.9	-24.3	-16.3	32.0	5.7
1972	-20.7	7.2	-31.5	-16.3	13.9	11.6
1973	-19.9	-6.0	-38.4	-16.3	6.4	-4.6
1974	-50.7	0.0	-6.9	-16.3	-15.2	-7.6
1975	-38.2	-3.3	0.8	-16.3	-9.2	2.4
1976	-19.3	-0.6	1.5	-16.3	-0.8	-2.1
1977	-25.2	2.4	-8.7	-16.3	-0.5	-9.9
1978	-29.7	0.2	-11.5	-16.3	4.0	-13.0
1979	-22.9	-1.7	20.5	-16.3	-0.5	-17.2
1980	-23.7	-2.4	-0.7	-16.3	7.4	-20.1
1981	-27.9	-5.2	-20.1	-16.3	22.7	-26.8
1982	-14.6	2.1	-5.9	-16.3	2.9	-13.4
1983	-7.8	2.1	8.4	-16.3	9.1	-7.6
1984	-10.4	2.1	-19.5	-16.3	30.0	-17.8
1985	-16.5	-1.0	-25.1	-22.4	45.8	-11.0
1986	-16.5	-8.8	2.5	-17.1	43.7	-9.3
1987	-6.7	-2.0	-16.9	-10.7	43.1	-12.5
1988	-6.9	0.7	-16.9	-4.1	46.2	-12.0
1989	-13.5	-0.8	-9.5	-8.1	25.6	-10.6
1990	-10.1	1.1	-6.6	-40.2	28.8	-1.0
1991	-11.5	0.1	-13.0	-12.7	37.9	-5.2
1992	-8.9	-10.9	-10.5	36.1	46.7	-1.1
1993	-17.0	3.7	-13.5	24.6	40.5	-6.1
1994	-22.3	0.8	2.4	28.8	30.9	-1.3
1995	-8.3	8.1	4.1	24.2	22.6	-1.3
1996	-1.1	-8.7	-17.9	25.9	38.1	2.2
1997	-15.9	-36.4	-19.7	7.4	37.8	-3.1
1998	-12.5	-3.9	-7.4	19.8	17.7	7.1
1999	-8.0	-6.9	-18.6	40.0	5.3	-2.2
2000	-11.6	2.2	-12.4	37.5	17.8	1.1
2001	-7.9	-0.7	-6.7	30.5	8.7	2.9
2002	-3.7	0.0	-3.2	34.5	14.4	7.1
2003	-4.0	0.0	-13.8	28.2	8.1	2.2
2004	-5.8	0.7	-9.5	22.7	18.3	-5.3
2005	-1.7	-2.9	-9.5	19.5	33.1	-4.9

[a] See text for explanation of estimation at the farm level.
Source: Authors' calculations.

Appendix Table A20: Nominal rate of assistance at the farm level, covered agricultural products including fertilizer subsidy,[a] Thailand, 1970 to 2004

(percent)

	Rice	Maize	Cassava	Sugar	Rubber	Poultry	Soybean	Palmoil	Pigmeat	All covered
1970	-26	-2	-10	33	-5	n.a.	n.a.	n.a.	-5	**-20**
1971	-29	-3	-25	30	5	-37	n.a.	n.a.	16	**-24**
1972	-22	5	-33	12	11	-43	n.a.	n.a.	-17	**-23**
1973	-21	-8	-39	5	-5	-32	n.a.	n.a.	-35	**-22**
1974	-52	-2	-8	-17	-8	-19	n.a.	n.a.	18	**-41**
1975	-40	-5	0	-11	2	30	n.a.	n.a.	-7	**-28**
1976	-21	-3	0	-3	-3	24	n.a.	n.a.	-9	**-12**
1977	-26	0	-10	-2	-11	3	n.a.	n.a.	19	**-16**
1978	-31	-2	-13	2	-14	8	n.a.	n.a.	-13	**-22**
1979	-24	-4	19	-2	-18	15	n.a.	n.a.	19	**-13**
1980	-25	-4	-2	6	-21	45	n.a.	-25	83	**-12**
1981	-29	-7	-22	21	-28	12	n.a.	-33	60	**-17**
1982	-16	0	-7	1	-14	34	n.a.	-20	19	**-7**
1983	-9	0	7	7	-8	27	n.a.	-19	68	**0**
1984	-12	0	-21	28	-19	16	-18	-31	29	**-7**
1985	-20	-7	-29	41	-14	16	-27	-22	-5	**-13**
1986	-18	-12	0	41	-11	-9	-20	12	-5	**-11**
1987	-11	-9	-21	38	-15	-13	-16	68	3	**-10**
1988	-9	-4	-20	43	-14	-13	-7	71	53	**-5**
1989	-17	-6	-13	21	-13	-17	-12	32	58	**-9**
1990	-14	-5	-11	24	-4	-5	-44	67	14	**-7**
1991	-14	-4	-16	35	-7	-12	-16	39	-6	**-8**
1992	-10	-13	-12	45	-2	-17	35	18	15	**-4**
1993	-20	0	-17	37	-8	-10	21	22	-20	**-10**
1994	-24	-1	1	29	-2	-11	27	-14	5	**-9**
1995	-10	6	3	21	-2	17	22	-13	60	**3**
1996	-2	-10	-19	37	2	18	25	-3	32	**5**
1997	-17	-37	-20	37	-4	8	7	-18	3	**-8**
1998	-16	-7	-11	14	4	23	17	-19	19	**-4**
1999	-11	-10	-22	2	-6	23	37	-11	67	**-1**
2000	-13	1	-14	16	-1	21	36	-11	-10	**-3**
2001	-9	-2	-8	8	1	15	30	-38	-16	**-3**
2002	-6	-2	-5	12	4	33	33	-9	21	**5**
2003	-3	0	-13	9	3	13	28	-15	-3	**1**
2004	-6	0	-10	18	-6	n.a.	22	n.a.	n.a.	**-2**

[a] Nominal rate of assistance at farm level for that industry minus the product of the cost share of fertilizer for that industry and the consumer tax equivalent for fertilizer (Appendix Table A18); averaged using value of production at undistorted prices as weights (Appendix Table A23)
Source: Authors' calculations.

Appendix Table A21: Value shares of primary production of covered products at farmgate undistorted prices, Thailand, 1970 to 2005

(percent)

	Rice	Maize	Cassava	Sugar	Rubber	Poultry	Soybean	Palmoil	Pigmeat	Total covered	Non-covered
1970	44	4	3	1	3	n.a.	n.a.	n.a.	4	**60**	40
1971	40	4	3	1	3	9	n.a.	n.a.	3	**63**	37
1972	39	2	6	1	3	9	n.a.	n.a.	4	**65**	35
1973	43	5	4	2	4	7	n.a.	n.a.	5	**69**	31
1974	50	4	1	2	2	4	n.a.	n.a.	2	**66**	34
1975	47	5	2	3	2	3	n.a.	n.a.	3	**65**	35
1976	39	4	4	5	3	3	n.a.	n.a.	3	**63**	37
1977	38	2	6	7	4	5	n.a.	n.a.	3	**64**	36
1978	42	3	4	3	4	4	n.a.	n.a.	4	**66**	34
1979	39	4	5	6	7	4	n.a.	n.a.	3	**67**	33
1980	41	4	7	3	6	3	n.a.	0	3	**67**	33
1981	42	4	6	5	5	4	n.a.	0	3	**68**	32
1982	35	4	7	8	5	4	n.a.	0	4	**67**	33
1983	36	5	7	4	6	5	n.a.	0	3	**67**	33
1984	35	6	8	4	6	4	1	1	4	**68**	32
1985	34	6	6	3	7	4	1	1	5	**67**	33
1986	30	5	7	2	10	6	2	0	5	**67**	33
1987	28	3	10	3	11	6	1	1	5	**69**	31
1988	36	5	7	3	13	6	2	1	3	**75**	25
1989	38	5	6	4	11	6	2	1	3	**76**	24
1990	29	4	7	5	11	7	3	1	5	**72**	28
1991	30	4	7	4	9	9	1	1	6	**72**	28
1992	27	4	6	4	11	11	1	1	6	**71**	29
1993	24	3	5	4	12	11	1	1	7	**69**	31
1994	29	4	4	4	14	9	1	2	6	**73**	27
1995	28	4	5	5	18	8	1	2	4	**75**	25
1996	28	5	5	4	16	9	1	2	6	**76**	24
1997	31	6	4	4	12	9	1	2	7	**76**	24
1998	36	4	5	4	10	9	1	3	4	**75**	25
1999	33	5	4	6	10	10	1	2	4	**75**	25
2000	31	5	3	6	13	10	1	2	6	**77**	23
2001	27	4	4	5	12	12	0	2	9	**75**	25
2002	27	4	4	5	16	11	0	3	6	**76**	24
2003	25	4	4	6	21	10	0	3	6	**80**	20

[a] At farmgate undistorted prices

Source: Authors' calculations.

Appendix Table A22: Nominal rates of assistance to all,[a] tradables agricultural industries, to non-agricultural industries, and relative rate of assistance,[b] Thailand, 1970 to 2005

(percent)

	Total ag NRA				Ag tradables NRA	Non-ag tradables NRA	RRA
	Covered products		Non-covered products	All products (incl NPS)			
	Inputs	Outputs					
1970	-2	-18	-9	-15	-18	16	-29
1971	-2	-22	-3	-16	-18	16	-30
1972	-2	-21	-13	-19	-22	16	-33
1973	-2	-20	-19	-21	-23	16	-34
1974	-2	-39	-8	-30	-34	16	-43
1975	-2	-26	-12	-23	-26	16	-36
1976	-2	-10	-7	-10	-12	16	-24
1977	-2	-14	0	-10	-12	16	-24
1978	-2	-20	-12	-18	-21	16	-32
1979	-2	-11	2	-8	-9	16	-22
1980	-1	-11	21	-1	-1	16	-15
1981	-1	-16	11	-8	-9	15	-21
1982	-2	-5	3	-4	-4	14	-16
1983	-1	1	18	6	7	13	-6
1984	-1	-6	4	-3	-4	12	-14
1985	-4	-9	-7	-11	-13	11	-22
1986	-2	-9	-5	-9	-10	11	-19
1987	-5	-5	0	-7	-8	11	-17
1988	-3	-2	16	0	0	11	-10
1989	-4	-5	13	-4	-4	11	-14
1990	-4	-3	4	-4	-4	10	-13
1991	-3	-5	-3	-7	-8	10	-16
1992	-1	-3	4	-2	-2	10	-11
1993	-3	-7	-7	-9	-10	10	-18
1994	-2	-7	-2	-7	-8	10	-16
1995	-1	4	18	7	7	9	-2
1996	-1	6	11	6	7	9	-2
1997	-1	-7	-2	-7	-8	9	-15
1998	-3	-1	4	-2	-2	9	-10
1999	-3	2	19	4	4	8	-4
2000	-2	-1	-3	-3	-3	8	-11
2001	-1	-2	-5	-4	-4	8	-11
2002	-2	7	8	6	7	8	-1
2003	0	1	0	0	0	8	-7
2004	0	-2	7	-1	-1	8	-8

a. NRAs including assistance to nontradables and non-product specific assistance.
b. The Relative Rate of Assistance (RRA) is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.
Source: Authors' calculations.