55941

Agricultural Trade Reform and Poverty in Thailand: A General Equilibrium Analysis

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Abstract

A general equilibrium modeling approach is used to estimate the effects within Thailand of unilateral and global trade liberalization, including effects on poverty incidence. It is concluded that across the board trade liberalization is poverty-reducing within Thailand, whether other countries participate in the liberalization or not. This poverty reduction occurs among both farm and non-farm households and this qualitative outcome is not dependent on the particular poverty line used in the analysis. Liberalization in agricultural products alone raises poverty incidence among farm households, while reducing it slightly among non-farm households.

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As Thailand has industrialized, successive Thai governments have become increasingly interested in intervening on behalf of producers in the key declining sector, namely agriculture.[2] Agricultural producers and processors are the intended beneficiaries of these interventions. 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. 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 were abolished in 1986. Similarly, rubber exports, taxed prior to 1990, have not been taxed since then. Cassava exports have continued to be taxed to a minor extent by the system of export quotas. Taxes on imports of fertilizer, a major input into agricultural production, have been steadily phased out since the early 1990s. Maize exports have been consistently untaxed, as have chicken exports, a commodity not covered by the present analysis due to lack of suitable price data. Most of this is a story of eliminating the price distortions formerly acting against agricultural export industries.

Four commodities depart from this general story of liberalized agricultural markets. Soybean was an export prior to 1992 and has been a net import since then, with 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 has received a nominal rate of protection of between 30 and 40 percent. Sugar is an

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export commodity for Thailand but the domestic sugar industry is protected by a 'home price' system which taxes domestic consumers and transfers the revenue to producers. Nominal rates of protection have averaged over 60 per cent. The political power of the highly capital intensive sugar milling industry is the explanation for this pattern of protection. The case of palm oil is qualitatively similar to sugar, but the rates of protection are somewhat lower. And Thailand's small dairy industry is protected from competition from imported milk powder. It is not been possible to obtain the data required to quantify dairy protection for the purposes of this study, but informed sources report that the rate of protection is comparable with sugar. The prospects for further trade liberalization in Thailand are not encouraging, unless this occurs through bilateral preferential trading arrangements such as the scheme proposed with the United States.[3]

Almost all of Thailand's poor people reside in rural areas and most are directly involved in agricultural production (Warr 2004). The Thai public is well-disposed to finding ways to alleviate rural poverty, and Thai governments have responded to this sentiment. Interventions on behalf of rural people have been important, but Thailand is unusual in that, except for the cases discussed above, these interventions have seldom taken the form of intervening in agricultural commodity markets. The strong export-orientation of Thai agriculture is an important contributor to this outcome. Instead, 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 of intervention in support of rural areas. Unfortunately, with the exception of the investment in rural infrastructure, these transfers have seldom been directed in any systematic way at raising the productivity of rural people or at assisting them to find better economic opportunities outside agriculture. Their long-term contribution to alleviating rural poverty will probably be small.

This chapter uses the *JamlongThai* general equilibrium model of the Thai economy (Warr 2008b), in conjunction with the LINKAGE global economic model (van der Mensbrugghe 2005), to analyze the effects on poverty incidence in Thailand of agricultural and other policies at home and abroad. *JamlongThai* is structurally similar in most respects to the *Wayang* model of the Indonesian economy, described in detail in Warr (2010), and the simulations performed with this model are also similar to those described for the Indonesian case study. To avoid

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

unnecessary repetition of explanatory material, discussion that would otherwise be the same for the two studies is not included in the present chapter.

The next section describes the *JamlongThai* general equilibrium model of the Thai economy, the principal analytic tool used in this study. The following section describes the simulations performed with this model in combination with the global LINKAGE model. The simulations involve both unilateral agricultural and trade policy reform in Thailand and reform by the rest of the world, so as to assess the relative importance of own-country versus rest-of-world policies on Thai households. The results are presented with a focus on the implications for poverty incidence within Thailand. The final section concludes.

A General Equilibrium Model of the Thai Economy: *JamlongThai*

JamlongThai (Thai General Equilibrium Model) is a 65 sector, 200 household general equilibrium model of the Thai economy, constructed for the analysis of the effect of trade policy and other policy shocks on poverty incidence in Thailand. Unless otherwise stated, the database of the model refers to the year 2000. *JamlongThai* shares many structural features with the highly influential ORANI general equilibrium model of the Australian economy (Dixon *et al.* 1982) and the GTAP general equilibrium model of the global economy (Hertel 1997), which also belong to this Johansen (1960) category of economywide models. The specific structure of *JamlongThai* draws on a revised version of the *ORANI* model, called *ORANI-G* (Horridge 2004) and the *PARA* and *Wayang* general equilibrium models of the Thai and Indonesian economies, respectively, described in detail in Warr (2001, 2005). However, this general structure is adapted to reflect the specific objectives of the present study and important features of the Thai economy.

Industries

The model contains 65 industries, of which 24 are in agriculture. Each industry produces a single output, and the set of commodities therefore coincides with the set of industries. Exports are not identical with domestically sold commodities. In each industry, the two are produced by a

transformation process with a constant elasticity of transformation.[4] The core of the production side of the model is a 65 sector input-output table for Thailand, aggregated from the 180 sector IO table produced by the Thai government's National Economic and Social Development Board (2004). At the time of the study, the latest input-output table available for Thailand related to the year 2000 and this data set was used for the present study.

The cost structure of the Thai economy, with an emphasis on the agricultural sectors, is summarized in table 1. It should be noted that the agricultural sector uses almost no skilled (educated) labor, but that it is intensive in the use of unskilled labor. Unskilled and skilled labor are fully mobile across all industries.

Households

The model contains ten major household categories, based on the Socio-Economic Survey classifications used by the National Statistical Office (2003). Table 1 summarizes these ten household categories, which are classified according to the occupation of the head of the household. Four are farm households: farmer – Northeast, farmer – North, farmer – other region, and farm worker. Six are non-farm: entrepreneur - with paid employees, entrepreneur - without paid employees, professional, clerical employee, production and construction and general laborer, and economically inactive. Each of these categories is divided into 20 groups of equal population size, sorted by household income per person.[5] This makes a total of 200 household sub-categories.

The incomes of each of these 200 household sub-categories depend on their ownership of factors of production, the returns to those factors, and their non-factor incomes, mainly consisting of transfers from others. Since our focus is on income distribution, the sources of income of the various households are of particular interest. These differ significantly among the ten household categories. The data are extracted from the 2000 household income and expenditure survey, the Socio-Economic Survey (SES) of the National Statistical Office (2003). A Social Accounting Matrix (SAM) was constructed for Thailand based on data from the 2000

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[4] This treatment differs from that used in the Indonesian case study (Warr 2010), in which the commodities exported and sold domestically are identical but where the quantity of exports of import competing industries is fixed exogenously.

[5] The population sizes of the 10 major categories are not the same, but *within* each of these 10 categories the population sizes of the 20 sub-categories are the same.

SES, the 2000 input-output table described above, the Thai National Accounts and Thai trade data, all for 2000. The database for the *JamlongThai* model draws upon this SAM.

The consumer demand equations for the various household types are based on a Cobb-Douglas demand system, using data on expenditure shares extracted from the SES 2000 survey. Within each of the 10 major categories, the 20 sub-categories thus differ according to their per capita expenditures, their budget shares in consumption, and their sources of factor and non-factor incomes.

Table 2 summarizes the sources of factor incomes of the 10 major household categories, and table 3 summarizes their importance in the overall population, and in overall poverty incidence within Thailand, using the Thai government's official poverty line.

Simulations

The effects of agricultural trade policy reform are simulated using the *JamlongThai* model of the Thai economy, combined with the LINKAGE model of the world economy (van der Mensbrugghe 2005). The simulations involve both unilateral agricultural and trade policy reform in Thailand and reform by the rest of the world, so as to assess the relative importance of own-country versus rest-of-world policies on Thai households. They also compare agriculture-only reform with reform in all goods markets, in order to gauge the relative contribution of agricultural policies to the measured impacts on Thai households.

Three sets of policy reforms are considered below: unilateral reform in Thailand (Simulation A), global reform excluding Thailand (Simulation B), and their combination (i.e., global reform including Thailand, Simulation C).

The structure of these simulations is identical to that described for Indonesia in Warr (2010) and it is therefore important that the reader refer to that paper for the details. 'By 'reform' we mean the complete elimination of all tariffs, the tariff equivalent of any non-tariff barriers, export taxes and export subsidies, and domestic agricultural policies in so far as they alter producer or consumer prices of farm products in various countries. Each of the above simulations is conducted twice: once where the reductions to protection for Thailand and the rest of the world apply to all commodities (labeled Simulations A1, B1 and C1) and once where they

apply only to agricultural commodities including lightly processed food (labeled Simulations A2, B2 and C2).

The initial rates of industry assistance in Thailand used in the simulations are derived from the data base of the LINKAGE model and are shown in table 4. These rates were reduced to zero in Simulations A and C. Simulations B and C take the changes to import prices for Thailand and the shifts to Thailand's export demand equations that are generated by simulations from the LINKAGE model. These LINKAGE model simulations, conducted by van der Mensbrugghe, Valenzuela and Anderson (2009), estimate the changes to these import prices and export demand shifters that result from liberalization in all countries except Thailand and these results are then applied as shocks to the *JamlongThai* model. These changes to border prices, derived from the LINKAGE model, are shown in table 5.

Results from liberalizing markets for all goods

While the emphasis in this study is on the effects on poverty and income inequality, an understanding of them requires looking first at the macroeconomic effects.

Macroeconomic effects

The simulated macroeconomic effects of trade reform in all goods markets are summarized in table 6 (Simulations A1 to C1). Real GDP rises in Thailand under all three of the reform scenarios. Aggregate real household consumption also rises. The increase in both real GDP and aggregate real household consumption in Simulation A1 far exceed that in Simulation B1. Unilateral liberalization is more beneficial to Thailand, in macroeconomic terms, than the liberalization of all other counties combined.

By turning to the effects of these reforms on real factor returns, clues to the income distributional impacts of the reforms can be discerned. In the case of Simulation A1 (unilateral liberalization) real factor returns, deflated by the CPI, rise in the cases of unskilled labor, skilled labor and non-agricultural capital. The returns to agricultural capital and land decline with

liberalization, indicating that the structure of protection favors industries that are intensive in the use of agricultural capital and land. Another way of viewing this result is that the structure of protection in Thailand is such as to lower the real returns to skilled and unskilled labor, as well as non-agricultural capital, and to raise the real return to agricultural capital and land. Removing the protection has the opposite effect.

Simulation C1 is approximately the sum of simulations A1 and B1 and is dominated by the effects of unilateral liberalization. Real household expenditure increases under all three reform scenarios for all household categories except household 7 – professionals. This negative effect, under Simulation B1, is small relative to the gains achieved by most other household categories.

Effects on poverty incidence and inequality

Poverty effects are summarized in table 7. The measured level of poverty incidence depends on the poverty line used in the calculations, and this can also be true of the simulated changes in poverty incidence that result from particular economic shocks. We present effects on poverty incidence using two different poverty lines: the Thai government's national poverty line, and the international $2 a day poverty line at purchasing power parity.[6] In the case of each of these poverty lines, we use a calibration method, as follows. First, we begin with the *ex ante* distribution of expenditures of households contained in the model's data base.

Second, the published level of poverty incidence using the poverty line concerned is used to find that value of the poverty line, measured in domestic Thai currency, which generates that particular level of poverty incidence from the data on household expenditures contained within the model data base. These published levels of poverty incidence come from the website of the Thai government's National Economic and Social Development Board (2008) in the case of the national poverty line, and from the World Bank (2008) in the case of the $2 a day poverty line. This then becomes the base level of the poverty line used in subsequent calculations.

Third, the *ex post* levels of real expenditure for each household are simulated within the model, reflecting the effects of the shocks applied to the model. These calculations of real expenditures are performed using the household's individual consumer price index as the deflator, reflecting that particular household's consumption bundle.

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[6] Poverty incidence at the $1 a day level is extremely low in Thailand and could not be measured with accuracy using the methods of this study.

Fourth, these *ex post* real expenditures are then compared with the poverty line just described to obtain *ex post* levels of poverty incidence. Finally, the changes in poverty incidence reported in tables 7 and 9 are the *ex post* levels of poverty incidence minus the *ex ante* levels corresponding to each of the two poverty lines described above. A positive number thus indicates an increase in the simulated level of poverty incidence as a result of the shocks concerned.

In addition to effects on poverty incidence, we also report simulated effects on inequality in the distribution of household real expenditures, using the Gini coefficient as the measure. The Gini coefficient takes values between zero and one, with higher values reflecting greater inequality. These coefficients are estimated by constructing Lorenz curves from the distributions *of ex ante* and *ex post* real expenditures and then calculating the Gini coefficients corresponding to these distributions. These results are also presented in table 7.

Unilateral liberalization (Simulation A1) delivers reduced poverty to all household categories and for both farm and non-farm households in aggregate. The benefits in terms of poverty reduction in Thailand that derive from global across the board liberalization (Simulation C1) arise primarily from Thailand's own liberalization. Only one fifth of the total reduction in poverty incidence can be attributed to the effects of liberalization elsewhere (Simulation B1). Liberalization, both in Thailand and in the rest of the world, increases inequality within Thailand somewhat. Skilled labor gains proportionately more than unskilled labor. But in absolute terms, Thailand's poor households have a strong stake in trade liberalization, especially within their own country and regardless of whether or not other countries participate.

Results from liberalizing only agricultural markets

The macroeconomic effects of liberalization confined to just agricultural products are summarized in table 8. The simulated effects are quite different from those arising from liberalization in markets for all goods. Unilateral agricultural liberalization in Thailand raises real household consumption and marginally raises the consumer price index. It reduces the real value of unskilled labor marginally and increases skilled wages significantly. It also reduces the return to agricultural capital, along with the return to land. Thailand's agricultural industries use

much lower shares of skilled labor than the rest of the economy, and much higher shares of unskilled labor. Reduced agricultural protection reduces the size of the agricultural sector and raises the size of the non-agricultural sector. In the process it raises real skilled wages and lowers real unskilled wages, along with real returns to agricultural capital and land.

Unilateral agricultural liberalization in Thailand raises poverty incidence among farm households (table 9), because it reduces the real return to unskilled labor (slightly), deflated by the CPI, and also (more significantly) the real returns to agricultural capital and land. Agricultural liberalization in the rest of the world raises the international prices of Thailand's agricultural exports (table 4). This raises the real return to labor in Thailand, both skilled and unskilled, and raises the return to land. Farm level poverty in Thailand declines, along with poverty among non-farm households. Measured solely by the yardstick of poverty incidence within Thailand, these results suggest Thailand has a stake in agricultural liberalization but only if other countries participate as well.

Conclusions

The comparative static analysis of this study indicates that across the board trade liberalization is poverty-reducing in Thailand, whether other countries participate in the liberalization or not. This poverty reduction occurs among both farm and non-farm households and this qualitative outcome is not dependent on the particular poverty line used in the analysis. The reduction in farm and non-farm poverty incidence occurs despite some increase in inequality within Thailand. Liberalization raises real skilled wages relative to real unskilled wages and this effect increases inequality. Both Thailand's own liberalization and that of the rest of the world reduce poverty among farm and non-farm households, but the largest benefits from across-the-board liberalization, measured in terms of effects on poverty, arise from Thailand's own liberalization.

If the trade liberalization is confined to just agricultural products, the results are somewhat different. A similar increase in inequality occurs, but unilateral agricultural liberalization in Thailand raises poverty incidence among farm households while reducing it slightly among non-farm households. This negative effect on rural households arises from a reduction in real

unskilled wages. When the rest of the world also liberalizes agricultural trade, this increase in farm level poverty in Thailand disappears. Thailand's farm poor thus have an interest in agricultural liberalization, provided the rest of the world also liberalizes, but not otherwise.

Comparison with results for Indonesia

The analyses of trade liberalization in Thailand in this chapter and the comparable study for Indonesia in Warr (2010) use very similar modeling frameworks, but the structure of agricultural trade and agricultural protection in these two countries is quite different. Direct comparison of the simulated effects of liberalized trade policies is therefore possible and insightful.

Unilateral liberalization of all commodities reduces poverty incidence in both countries, among both farm and non-farm households. In both countries, both skilled and unskilled real wages rise as a result of this liberalization, but the magnitude of the rise in unskilled wages is greater in Thailand. This reveals a key difference in the effects of the overall structure of distortions to incentives in the two countries. In Thailand, industry assistance policies work more strongly against the interests of unskilled workers, by favoring industries that are less intensive in the use of this factor. The result is that in Thailand, across-the-board liberalization has a much larger poverty-reducing effect than it does in Indonesia, although it reduces poverty incidence in both countries and in all socio-economic groups.

Rest-of-world liberalization in all commodities is poverty-reducing in both countries, and in all socio-economic groups, but the magnitude of this effect is larger in Indonesia. Rest of the world liberalization raises agricultural product prices relative to manufactured goods prices. Indonesia's poor are more dependent on agricultural production, and the magnitude of the poverty reduction that occurs from rest-of-world liberalization is greater in Indonesia.

When liberalization occurs in agricultural products only, returns to agricultural capital and land decline in both countries. In Indonesia unskilled wages also decline significantly whereas in Thailand this effect is negligible. The divergence in outcomes reflects a difference in the structure of agricultural assistance in the two countries. Indonesia's agricultural distortions are more biased towards unskilled labor intensive agricultural industries, of which rice – highly protected in Indonesia but not in Thailand – is the most important example. On the other hand, because rice is a staple consumer good for Indonesia's poor, a reduction in agricultural assistance benefits many poor households, rural as well as urban. The outcome of unilateral

agricultural liberalization is, in both countries, a reduction in urban poverty incidence and an increase in rural poverty incidence. The net effect is a small overall reduction in national poverty incidence in Indonesia and a small overall increase in Thailand. Rest-of-world liberalization in agricultural products only is poverty-reducing among all socio-economic groups in both countries.

Overall, key results common to both countries are:

- The poor have a strong interest in across the board liberalization, both in their own country and in the rest of the world, and this applies to both the rural and urban poor;

- The urban poor have an interest in unilateral agricultural liberalization, but not the rural poor;

- Agricultural liberalization in the rest of the world is poverty reducing among all socio-economic groups, both rural and urban.

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Table 1: Cost shares of major factors of production, paddy and other industries, Thailand, 2000

(per cent of total costs)

Cost components:	Paddy	Other agriculture	Non-agriculture	All industries
Skilled	0.0	0.0	10.5	9.9
Unskilled	24.9	15.0	4.6	5.2
Mobile capital	2.1	5.1	29.3	28.0
Land	45.7	44.1	0.0	2.3
Intermediate inputs	27.3	35.8	55.7	54.6
Total	100.0	100.0	100.0	100.0

Source: Data base of *ThaiJamlong* model, based on Thailand's input-output table for 2000, National Economic and Social Development Board (2004) and agricultural cost survey data, Ministry of Agriculture and Cooperatives (2008).

Table 2: Sources of factor incomes of broad household groups, Thailand, 2000

Household category		Skilled	Unskilled	Mobile capital	Land	Total factor income
HH1	Farm – Northeast	15.5	28.0	42.8	13.6	100.0
HH2	Farm – North	6.3	15.5	44.0	34.2	100.0
HH3	Farm – Other	10.1	12.9	47.5	29.6	100.0
HH4	Farm worker – all regions	9.6	78.3	6.0	6.1	100.0
HH5	Entrepreneur –paid employees	2.2	0.7	97.0	0.1	100.0
HH6	Entrepreneur – no paid employees	1.6	1.6	96.6	0.2	100.0
HH7	Professional	71.2	4.8	20.1	3.9	100.0
HH8	Clerical employee	47.5	27.7	21.3	3.5	100.0
HH9	Production and construction	31.6	51.8	13.5	3.1	100.0
HH10	Economically inactive	7.8	4.6	38.2	50.1	100.0

Source: database of *ThaiJamlong* model, based on *Socio-economic Survey*, 2000 (National Statistical Office 2003).

Table 3: Characteristics of major household categories, Thailand, 2000

Household category code	Household category description	Total population (million)	Share of total population (%)	Poverty incidence[a] (%)
HH1	Farm – Northeast	8,460	13.9	40.7
HH2	Farm – North	3,287	5.4	27.3
HH3	Farm – Other	4,920	8.1	14.5
HH4	Farm worker – all regions	4,565	7.5	29.3
HH5	Entrepreneur –paid employees	1,953	3.2	0.7
HH6	Entrepreneur – no paid employees	8,354	13.7	5.9
HH7	Professional	4,866	8.0	1.6
HH8	Clerical employee	7,934	13.0	2.5
HH9	Production and construction	8,967	14.7	7.7
HH10	Economically inactive	7,613	12.5	11.6
Total	Total population	60,916	100.0	14.4

[a] Headcount measure of poverty incidence using the national poverty line.

Source: Author's calculations from *Socio-economic Survey*, 2000 (National Statistical Office 2003).

Table 4: Industry assistance rates used in modeling, Thailand, 2004

(percent)

Commodity	Tariff	Export subsidy	Output subsidy
Paddy rice	12.5	0.0	-0.3
Wheat	26.8	0.0	-0.2
Other grains	26.5	0.0	-0.2
Vegetables and fruits	44.6	0.0	-0.1
Oil seeds	32.9	0.0	-0.1
Sugar cane	0.0	0.0	-0.1
Plant-based fibers	5.0	0.0	-0.2
Other crops	38.0	0.0	-0.1
Cattle sheep etc	9.6	0.0	-0.1
Other livestock	13.9	0.0	-0.1
Raw milk	0.0	0.0	-0.1
Wool	7.2	0.0	-0.1
Other primary products	2.4	-0.9	-2.4
Beef and sheep meat	49.3	0.0	-1.2
Other meat products	40.9	0.0	-1.2
Vegetable oils and fats	39.2	0.0	-1.2
Dairy products	18.1	0.0	-1.2
Processed rice	19.6	0.0	-0.5
Refined sugar	0.0	0.0	-5.0
Other food, beverages, tobacco	39.7	0.0	-19.9
Textile and wearing apparel	23.5	-0.6	-1.1
Other manufacturing	13.9	0.0	-3.3
Services	0.0	0.0	-3.7

Source: Valenzuela and Anderson (2008), based on the estimates compiled by Anderson and Valenzuela (2008).

Table 5: Exogenous border price shocks due to liberalization in the rest of the world, Thailand

(percent deviation from base)

	Export price shocks[a]		Import price shocks[b]	
	Reform of all goods	Agriculture - only reform	Reform of all goods	Agriculture - only reform
Paddy rice	7.3	5.7	0.0	0.0
Wheat	0.0	0.0	3.3	4.0
Other grains	6.4	4.8	4.9	4.5
Oil seeds	6.0	4.7	-6.0	-5.6
Sugar cane and beet	0.0	0.0	0.0	0.0
Plant-based fibers	6.8	5.2	6.4	7.9
Vegetables and fruits	7.2	5.6	1.8	1.1
Other crops	7.3	5.8	1.7	1.6
Cattle sheep etc	6.2	4.6	3.6	2.8
Other livestock	5.4	3.7	0.6	1.1
Raw milk	0.0	0.0	0.0	0.0
Wool	0.0	0.0	5.5	5.3
Beef and sheep meat	4.1	2.2	10.0	10.1
Other meat products	4.5	2.7	1.6	2.5
Vegetable oils and fats	2.6	0.9	0.7	1.2
Dairy products	4.4	2.6	12.2	12.5
Processed rice	6.6	4.9	1.4	0.5
Refined sugar	4.6	2.7	0.0	0.0
Other food, beverages, tobacco	3.5	1.7	0.9	-1.4
Other primary products	3.3	1.2	0.5	0.8
Textile and wearing apparel	3.2	1.4	-0.4	0.5
Other manufacturing	2.9	1.1	1.3	0.3
Services	3.3	1.2	-0.2	0.2
Agriculture and food	4.6	3.0	1.7	0.9
Agriculture	7.0	5.5	1.1	1.6
Processed foods	4.3	2.7	2.1	0.5
Other manufacturing	3.0	1.2	1.1	0.3
Non tradables	3.3	1.2	-0.2	0.2
Total	3.3	1.4	1.0	0.4
Merchandise trade	3.3	1.5	1.2	0.4

[a] Simulated as shocks to the inverse export demand equations for Thailand.

[b] Simulated as shocks to the exogenous import prices for Thailand.

Source: Linkage model simulations (see van der Mensbrugghe, Valenzuela and Anderson 2009).

Table 6: Aggregate simulation results for Thailand of prospective liberalization of all commodities

Macroeconomic aggregates (per cent change from base)	Sim A1: Unilateral liberalization	Sim B1: Rest-of-world liberalization	Sim C1: Global liberalization
Real GDP, expenditure side (GDP deflator)	0.27	0.04	0.30
Real household consumption (CPI deflator)	4.32	0.16	4.43
Import volume index, duty-paid weights	4.68	0.12	4.79
Export volume index	-0.04	0.01	-0.03
GDP price index, expenditure side	8.24	2.11	10.49
Consumer price index	7.69	2.64	10.45
Nominal change (Baht million)			
GDP	482,697	121,566	611,829
Consumption	397,015	90,448	493,626
Investment	7,775	19,905	28,127
Inventory	2,516	38	2,610
Government expenditure	75,390	11,175	87,466
Real return to factors (percent change from base, using CPI deflator)			
Unskilled labor	3.3	-0.5	2.8
Skilled labor	10.0	-0.8	9.1
Agricultural capital	-3.3	-0.3	-3.5
Non-agricultural capital	9.9	-0.3	9.5
Land	-3.8	-0.5	-4.2
Household real expenditures (percent change from base, using CPI deflator)			
HH1 Farm – Northeast	2.6	0.8	3.3
HH2 Farm – North	2.9	0.7	3.5
HH3 Farm – Other	4.4	0.6	4.9
HH4 Farm worker – all regions	1.1	0.5	1.6
HH5 Entrepreneur –paid employees	5.7	0.1	5.8
HH6 Entrepreneur – no paid employees	5.7	0.3	6.0
HH7 Professional	5.7	-0.4	5.3
HH8 Clerical employee	4.3	-0.1	4.1
HH9 Production and construction	2.7	0.1	2.7
HH10 Economically inactive	3.8	0.4	4.1

Source: Author's Thailand CGE model simulations.

Table 7: Poverty and inequality effects for Thailand of prospective liberalization of all commodities

| Group | *Ex ante* level | Change, *ex post – ex ante* | | |
		Sim A1: Unilateral liberalization	Sim B1: Rest-of-world liberalization	Sim C1: Global liberalization
Poverty incidence at national poverty line (%)				
HH1 Farm – Northeast	40.7	-6.2	-2.9	-9.1
HH2 Farm – North	27.3	-2.6	-1.3	-4.0
HH3 Farm – Other	14.5	-12.2	-5.8	-18.0
HH4 Farm worker – all regions	29.3	-3.4	-0.2	-3.6
HH5 Entrepreneur – paid employees	0.7	-0.7	0.0	-0.7
HH6 Entrepreneur – no paid employees	5.9	-11.5	-5.7	-17.2
HH7 Professional	1.6	-2.3	-1.0	-3.3
HH8 Clerical employee	2.5	-3.0	-1.0	-4.1
HH9 Production and construction	7.7	-9.0	-6.7	-15.7
HH10 Economically inactive	11.6	-4.9	-0.6	-7.5
Farm households	30.1	-3.5	-0.9	-4.4
Non-farm households	5.9	-3.3	-0.6	-3.9
All households	14.4	-3.4	-0.7	-4.1
Poverty incidence at $2 a day poverty line (%)				
Farm households	21.03	-1.55	-0.31	-1.86
Non-farm households	15.19	-1.10	-1.18	-2.28
All households	25.20	-1.84	-1.00	-2.84
Inequality (Gini coefficient)				
Urban households	0.152	0.006	0.006	0.012
Rural households	0.334	0.004	0.005	0.009
All households	0.339	0.005	0.007	0.012

Source: Author's Thailand CGE model simulations.

Table 8: Aggregate simulation results for Thailand of prospective liberalization of only agricultural commodities

Macroeconomic aggregates (percent change from base)	Sim A2: Unilateral liberalization	Sim B2: Rest-of-world liberalization	Sim C2: Global liberalization
Real GDP, expenditure side (GDP deflator)	0.01	0.03	0.04
Real household consumption (CPI deflator)	0.12	0.14	0.25
Import volume index, duty-paid weights	0.12	0.10	0.21
Export volume index	0.00	-0.01	-0.01
GDP price index, expenditure side	0.21	0.99	1.20
Consumer price index	0.12	1.25	1.37
Nominal change (Baht million)			
GDP	12,633	57,660	69,886
Consumption	7,733	44,919	52,352
Investment	2,587	7,767	10,304
Inventory	80	51	131
Government expenditure	2,232	4,923	7,099
Real return to factors (percent change from base, using CPI deflator)			
Unskilled labor	-0.07	0.25	0.18
Skilled labor	0.51	0.36	0.87
Agricultural capital	-1.34	0.20	-1.14
Non-agricultural capital	0.47	0.08	0.52
Land	-1.46	0.42	-1.04
Real household expenditures (percent change from base, using CPI deflator)			
HH1 Farm – Northeast	-0.16	0.47	0.32
HH2 Farm – North	-0.10	0.42	0.32
HH3 Farm – Other	0.07	0.37	0.44
HH4 Farm worker – all regions	-0.11	0.33	0.23
HH5 Entrepreneur –paid employees	0.20	0.14	0.33
HH6 Entrepreneur – no paid employees	0.24	0.26	0.48
HH7 Professional	0.26	-0.15	0.10
HH8 Clerical employee	0.15	0.00	0.15
HH9 Production and construction	0.03	0.10	0.12
HH10 Economically inactive	0.05	0.26	0.30

Source: Author's Thailand CGE model simulations.

Table 9: Poverty and inequality effects for Thailand of prospective liberalization of only agricultural commodities

Group	Ex ante level	Change, ex post – ex ante		
		Sim A2: Unilateral liberalization	Sim B2: Rest-of-world liberalization	Sim C2: Global liberalization
Poverty incidence at national poverty line (%)				
HH1 Farm – Northeast	40.7	0.3	-0.8	-0.5
HH2 Farm – North	27.3	0.1	-0.3	-0.2
HH3 Farm – Other	14.5	-0.1	-1.1	-1.1
HH4 Farm worker – all regions	29.3	1.0	-4.7	-3.7
HH5 Entrepreneur – paid employees	0.7	-0.4	-0.7	-1.1
HH6 Entrepreneur – no paid employees	5.9	-0.1	-0.2	-0.3
HH7 Professional	1.6	0.0	-0.6	-0.6
HH8 Clerical employee	2.5	0.1	-1.5	-1.4
HH9 Production and construction	7.7	0.2	-1.0	-0.8
HH10 Economically inactive	11.6	0.1	-0.5	-0.4
Farm households	30.1	0.3	-1.6	-1.3
Non-farm households	5.9	0.0	-0.8	-0.7
All households	14.4	0.1	-1.1	-0.8
Poverty incidence at $2 a day poverty line (%)				
Farm households	21.03	0.09	-0.31	-0.24
Non-farm households	15.19	-0.03	-0.14	-0.17
All households	25.20	0.04	-0.24	-0.28
Inequality (Gini coefficient)				
Urban households	0.152	0.001	0.006	0.007
Rural households	0.334	0.000	0.005	0.005
All households	0.339	0.001	0.007	0.008

Source: Author's Thailand CGE model simulations.