

China's WTO Accession and Its Trade with the Southeast Asian Economies

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March 30, 2003
(Preliminary. Please do not quote.)

Abstract

This paper analyzes China's foreign trade with Southeast Asia and the United States. Using a simple three-country, four-good framework, this paper examines how trade liberalization by China, which is one of the conditions for China's accession into the WTO, may affect the trade volumes among China, the United States and Southeast Asian economies, as well as the prices of the tradable goods in the world market. Possible impacts on the welfare of various countries are also examined.

Thanks for due to Jong-Wha Lee and Kenzo Abe for very useful comments and suggestions. For possible updated versions of this paper, please visit <http://faculty.washington.edu/karyiu/>

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1 Introduction

China's eventual accession to the WTO not only signifies China's commitment to integrating its economy with the rest of the world, but also means significant liberalization of many of its industries in foreign trade and foreign investment.

In addition to a reduction of trade restrictions on imported goods, China's WTO accession is characterized by at least three other features. First, the agreements China signed with other countries have very little to mention about the export side of China. After all, China's trade restrictions are mainly on its imports, with very little restrictions on its exports. Second, the agreements are more on what China has to do instead of what other countries have to do in order for China to become a new member of this organization. Third, even though China negotiated with other countries individually and signed an agreement with each country, the "most-favored nation" clause of the WTO requires that China extends its most favorable treatment to all other members, even if the treatment appears only in one of the agreements China signs.

While many researchers have started assessing the impacts of China's WTO accession on the world trade and domestic variables of many countries, there appears to be a pessimistic view among people in the Southeast Asian (SEA) nations that their economies could be hurt. For these economies, China is regarded as a potential economic threat. On the one hand, China is a close competitor of these Asian countries in the world markets because their countries have similar factor endowment ratios, export similar products, and compete with each other in similar markets. On the other hand, because of its size, the emergence of China as an active trading country will bring a lot of changes to other countries, and for many countries it was worried that bad effects may outweigh good effects.

For example, it had been pointed out that China and the SEA countries export mainly labor-intensive products to countries like the United States (US), and because China has lower labor costs, the opening of the Chinese economy will allow China to allocate more of its resources to its exportable industries, enabling it to increase its exports and expands its market shares in the US markets. A similar argument has already been used to claim that the emergence of China as an open economy starting from the late seventies and China's significant devaluation of its currency in the early nineties was one reason why the SEA countries experienced strong competition from China

in the world markets that later led to the financial crisis in 1997.¹ For the same reason, it has been feared that as China enters the WTO and liberalizes trade, its products in the world market will become so competitive that the SEA countries will be hurt.

However, there are points missing in the above arguments. First, trade liberalization of China on its import side does not necessarily imply that China will export more to countries like the United States. Second, because of the size of the country, trade liberalization by China could have sufficient impacts on trade between many countries, including those involving SEA countries. How the exports of these countries to other countries such as the United States may be affected is not clear. It does not follow that the exports of SEA countries will be squeezed out of the US markets. After all, the US consumption demand is not fixed. It may be possible that China's trade liberalization can lead to an increase in the import of goods from China and Thailand. Third, trade liberalization by China could also affect the trade between China and SEA countries. These changes may have important impacts on the welfare of these countries.

It is clear that to more accurately assess the impacts of China's WTO accession on these SEA countries requires a full model that takes into account all the direct and indirect effects on world prices. This paper is an attempt in this direction. However, this paper is not an empirical estimation. Because to do so will require a lot of data and information, which is beyond the scope of this paper. Rather, this paper proposes a theoretical framework to show what may have been missing in the worries about the welfare impacts on these SEA countries. The theoretical framework and the results derived are meant to be suggestive, and can be used as guidelines for empirical studies in the future.

Section 2 of this paper provides a simple three-country, four-good framework to show a possible equilibrium of the world markets with trade between the following three countries (or groups of countries): China, Thailand, and the United States. Some simplifications are made to ensure manageability of the framework, but it has enough of features for the purpose of this paper. Section 3 analyzes several properties of the world equilibrium of the framework. Simple graphical techniques are developed to illustrate the equilibrium point. Section 4 gives a theoretical analysis of the effects of trade liberalization by China on Thailand. Conditions for a drop or a rise in Thailand's

¹See, for example, Choi (2001) and Findlay (1998).

welfare are derived. Possible inconsistency between the impacts of marginal changes and those of finite changes is examined. Section 5 considers a special case in which more insights into these issues can be derived. Section 6 gives some concluding remarks.

2 A Simple Model

We consider a simple framework consisting of three countries and four goods. The countries are conveniently called China (C), Thailand (T), and the United States (U), and the goods are labelled W, X, Y, and Z. Within the ranges of prices considered in the present paper, China produces goods X and Y and consumes goods W and Z; Thailand produces goods X and Z and consumes goods W and Y; the United States is endowed with a fixed amount of good W while consumes good X. All economies are characterized by the usual neoclassical assumptions, including constant-returns technologies and perfect competition. The patterns of production and consumption of the countries imply that good X is exported by China and Thailand to the United States, good W in an opposite direction, and good Y (Z) flowing from (to) China to (from) Thailand.

The patterns of trade of the countries are illustrated in Figure 1. Let us define E_j^i , $i = c, t, u$; $j = w, x, y$, and z to be the export of good j by country i , and M_j^i ($\equiv -E_j^i$) to be the import of good j by country i . China currently imposes an ad valorem, non-prohibitive tariff of rate $t > 0$ on the goods imported from the United States, but it has no restrictions on its exports or on its import from Thailand. The United States and Thailand, on the other hand, adopt a free-trade policy. All transport costs are neglected.

The framework is meant to be as simple as possible, but it is constructed to capture the following features:

1. Both China and Thailand export a common good to the United States.
2. China and Thailand have mutual trade.
3. Resource allocation in the United States is of secondary importance in the present analysis.
4. The main policy requirement for China's accession to the WTO is that China needs to liberalize its trade but the United States and Thailand are not subject to the same requirement.

5. China's trade restrictions are more on the import side, and the current concern is more on how China's less restrictive trade with the United States may affect some other Asian economies.
6. By the "most-favored nation" clause, China is required to treat all WTO members equally in terms of foreign trade. In the present model, this means that China will have to lower its tariff on the goods from the United States to the same level as that on the goods from Thailand, i.e., zero.

Note that goods X, Y, and Z flow freely in the world. Let us denote these prices under free trade by p_x , p_y , and p_z , respectively. Because of the tariff imposed by China, we define p_w as the domestic price of good W while p_w^* as the corresponding world price. In equilibrium, we have

$$p_w = p_w^*(1 + t). \quad (1)$$

Note that tp_w^* is the per unit tariff revenue collected by the Chinese government, which is assumed to be distributed in a lump-sum fashion to local consumers. For convenience, good X is chosen as the numeraire and its price is set to be unity, $p_x = 1$.

2.1 Variables of China

We now derive the export supply schedules of the economies. We first begin with China. Denote its GDP function (in terms of good X) by $g^c(p_y)$.² It is well known that the price derivative of the GDP function is equal to the competitive output, $g_y^c > 0$, where the subscript denotes a derivative. Since there is no domestic consumption of goods X and Y, the domestic production is exported, meaning that $E_y^c(p_y) = g_y^c(p_y)$ and $E_x^c(p_y) = g^c(p_y) - p_y g_y^c(p_y)$. Use a second subindex to denote a partial derivative of the export supply functions; for example, $E_{xy}^c \equiv dE_x^c/dp_y$. Assuming a strictly convex production possibility set, we have $E_{xy}^c < 0$ and $E_{yy}^c > 0$. In the presence of tariffs, China's national income is equal to its GDP plus the tariff revenue, i.e.,

$$I^c(p_w^*, p_y, p_z, t) = g^c(p_y) + tp_w^* M_w^c, \quad (2)$$

where M_w^c is China's import of good W.

²For the properties of the GDP function, see, for example, Wong (1995, Chapter 2).

There exists a well-behaved social utility function in terms of the two consumption goods, W and Z. Since China does not produce goods W and Z, its import demand for each of these goods is equal to its (Marshallian) demand, and can be expressed as a function of the prices of the consumption goods and national income:

$$M_j^c = M_j^c(p_w, p_z, I^c(p_w^*, p_y, p_z, t)). \quad (3)$$

Again use a second subscript to denote a partial derivative of the import demand functions. Assuming the absence of inferior goods, $M_{jj}^c < 0$, $M_{jk}^c > 0$, and $M_{jI}^c > 0$, for $j \neq k$.³ With the collected tariff revenue distributed to the consumers in a lumpsum fashion, the national income in (3) is equal to the national expenditure, which is defined as

$$I^c = p_w M_w^c + p_z M_z^c. \quad (4)$$

Note that $p_i M_{iI}^c$ is marginal propensity to consume good i , $i = w, z$. Condition (4) implies that $p_w M_{wI}^c + p_z M_{zI}^c = 1$.

To economize the use of notation, domestic functions are expressed in terms of world prices. Substitute p_w and p_z in (1) into (3) to give

$$M_j^c = M_j^c(p_w^*(1+t), p_z, I^c(p_w^*(1+t), p_y, p_z, t)). \quad (5)$$

Noting that national income depends on the import levels of goods W and Z, equation (5) gives an implicit function of the import demand for good j . Differentiate the condition totally, making use of (2) and (4), the dependence of each import demand on the prices and the tariff rate can be expressed as

$$dM_w^c = \phi_{ww} dp_w^* + \phi_{wy} dp_y + \phi_{wz} dp_z + \phi_{wt} dt \quad (6)$$

$$dM_z^c = \phi_{zw} dp_w^* + \phi_{zy} dp_y + \phi_{zz} dp_z + \phi_{zt} dt, \quad (7)$$

³With the absence of inferiority, the demand curve is downward sloping. Moreover, with only two consumption goods, they are substitutes.

where

$$\begin{aligned}
\phi_{ww} &= [M_{ww}^c(1+t) + M_{wI}^c M_w t] / \delta < 0 \\
\phi_{wy} &= M_{wI}^c g_y^c / \delta > 0 \\
\phi_{wz} &= M_{wz}^c / \delta > 0 \\
\phi_{wt} &= [M_{ww}^c + M_{wI}^c M_w^c] p_w^* / \delta < 0 \\
\phi_{zw} &= M_{zw} + t M_{zI}^c [M_w + p_w^* M_{ww}^c (1+t)] / \delta > 0 \\
\phi_{zy} &= M_{zI}^c g_y^c / \delta > 0 \\
\phi_{zz} &= M_{zz}^c + t p_w^* (M_{zI}^c M_{wz}^c - M_{wI}^c M_{zz}^c) / \delta < 0 \\
\phi_{zt} &= M_{zw}^c p_w^* + p_w^* M_{zI}^c (M_w^c + t p_w^* M_{ww}^c) / \delta > 0 \\
\delta &= 1 - t p_w^* M_{wI}^c > 0.
\end{aligned}$$

Note that the sign of δ comes from the property that the sum of the marginal propensities to consume the two imported goods is equal to unity. The signs of ϕ_{ww} , ϕ_{zw} , ϕ_{zz} , and ϕ_{zt} are based on the assumption that the initial tariff rate is not high whereas the sign of ϕ_{wt} is based on the assumption that the demand function is homogeneous of degree zero. Using these derivatives, China's import of the two goods can be described by the following functions, $j = w, z$:

$$M_j^c = \tilde{M}_j^c(p_w^*, p_y, p_z, t), \quad (8)$$

which have derivatives given in conditions (6) and (7).

2.2 Variables of Thailand and the United States

The corresponding functions of Thailand can be defined in a similar way. Its GDP function is $g^t(p_z)$, which is the same as its national income because of the absence of any taxes, $I^t(p_z) = g^t(p_z)$. It consumes two goods, W (imported from the United States) and Y (from China). The (Marshallian) consumption demands for the goods can be derived from a well-behaved social utility function. With no domestic production of these two goods, its import demands are the same as its consumption demands, and can be expressed as

$$M_j^t = M_j^t(p_w^*, p_y, I^t(p_z)),$$

where $j = w, y$. Again, with no inferior goods, $M_{jj}^t < 0$ and $M_{jk}^t > 0$ for $j \neq k$. Without domestic consumption, goods X and Z are produced and

exported to the United States and China, respectively. Their export supply functions can be expressed as

$$E_k^t = E_k^t(p_z),$$

where $k = x, z$. Assuming a strictly convex production possibility set, $E_{xz}^t < 0$ and $E_{zz}^t > 0$.

For the United States, we assume that it is endowed with a fixed amount of good W, \bar{W} .⁴ Its national income is equal to $I^u = p_w^* \bar{W}$. There is no domestic demand for good W so that \bar{W} is the country's export. It imports good X from China and Thailand, with a demand given by M_x^u . Its budget constraint dictates the amount of the good it imports:

$$M_x^u = p_w^* \bar{W}. \quad (9)$$

With only one consumption good, X, the United States' consumption level is a good measure of its social utility level.

3 Equilibrium of the World Markets

We now examine the equilibrium of the system. There are four markets in the world, W, X, Y, and Z. By the Walras Law, equilibrium of any three markets implies equilibrium of the fourth one. Thus the world equilibrium can be expressed by

$$E_x^c(p_y) + E_x^t(p_z) = M_x^u \quad (10)$$

$$M_y^t(p_w^*, p_y, I^t(p_z)) = E_y^c(p_y) \quad (11)$$

$$\tilde{M}_z^c(p_w^*, p_y, p_z, t) = E_z^t(p_z). \quad (12)$$

Equations (10) to (12) give the equilibrium of the markets of goods X, Y, and Z, respectively. By the budget constraint of the United States, (9), equation (10) reduces to

$$E_x^c(p_y) + E_x^t(p_z) = p_w^* \bar{W}. \quad (13)$$

Equations (11) to (13) can be used to solve for the equilibrium values of the three relative prices, p_w^* , p_y , and p_z . Once these values are determined,

⁴In the present paper, the United States is a pure exchange economy because resource allocation in the US economy is not the focus of this paper.

equation (1) gives the domestic prices of China. The production, consumption, and trade of the countries can be determined by making use of the demand and supply functions introduced earlier. The utility levels achieved by China and Thailand can be expressed in terms of their indirect trade utility functions:

$$V^c = V^c(p_w^*, p_y, p_z, b) \quad (14)$$

$$V^t = V^t(p_w^*, p_y, p_z), \quad (15)$$

where $b = tp_w^* M_w^c$ is the tariff revenue collected by China. The consumption level of good X by the United States is a good measure of the country's social utility level.

3.1 Properties of the Equilibrium

To analyze an equilibrium of the world markets described above, we focus on two of the prices, p_y and p_z , by eliminating p_w^* .⁵ Solve equation (13) to express p_w^* in terms of the other prices, i.e.,

$$p_w^* = \mu(p_y, p_z). \quad (16)$$

To get the derivatives of this function, totally differentiate (10) and rearrange terms to give:

$$\begin{aligned} \mu_y &= E_{xy}^c / \bar{W} < 0 \\ \mu_z &= E_{xz}^t / \bar{W} < 0, \end{aligned}$$

where $E_{xy}^c < 0$ and $E_{xz}^t < 0$, as explained before. Substitute $p_w^* = \mu(p_y, p_z)$ into (11) and (12), and define the excess supply functions of goods Y and Z as:

$$\Theta(p_y, p_z) = E_y^c(p_y) - M_y^t(\mu(p_y, p_z), p_y, I^t(p_z)) \quad (17)$$

$$\Phi(p_y, p_z, t) = E_z^t(p_z) - \tilde{M}_z^c(\mu(p_y, p_z), p_y, p_z, t). \quad (18)$$

By conditions (11) and (12), equilibrium of these two markets can be described by

$$\Theta(p_y, p_z) = 0 \quad (19)$$

$$\Phi(p_y, p_z, t) = 0. \quad (20)$$

⁵The focus on just two prices allows us to develop a simple graphical apparatus to analyze the relations between the variables and the impacts of a shock.

Taking t as given, equations (19) and (20) are illustrated in Figure 2 by schedules YY and ZZ, respectively. An intersecting point between the two schedules gives the equilibrium values of the two world prices, p_y and p_z . One possible equilibrium point is depicted by point E in Figure 2.

To determine the properties of schedule YY, we totally differentiate equation (11) and arrange terms to give the following derivatives

$$\begin{aligned}\Theta_y &\equiv \partial\Theta/\partial p_y = E_{yy}^c - M_{yw}^t\mu_y - M_{yy}^t > 0 \\ \Theta_z &\equiv \partial\Theta/\partial p_z = -(M_{yw}^t\mu_z + M_{yt}^t g_z^t).\end{aligned}$$

The sign of Θ_y implies own-market stability of the good-Y market.⁶ The sign of Θ_z is generally ambiguous, but we can say that if goods W and Y are weak (strong) substitutes in Thailand, $\Theta_z < (>) 0$.⁷ The slope of the schedule is equal to

$$\left.\frac{dp_z^*}{dp_y}\right|_{YY} = -\frac{\Theta_y}{\Theta_z}. \quad (21)$$

If goods W and Y are weak (strong) substitutes in Thailand, then the schedule is positively (negatively) sloped. Furthermore, the region on the right- (left-)hand side of schedule YY represents excess supply of (demand for) good Y in the world market.

The properties of schedule ZZ can be derived in the same way. Totally differentiate (12) and rearrange terms to give

$$\begin{aligned}\Phi_y &= -(\phi_{zw}\mu_y + \phi_{zy}) \\ \Phi_z &= E_{zz}^t - \phi_{zw}\mu_z - \phi_{zz} > 0 \\ \Phi_t &= -\phi_{zt} < 0.\end{aligned}$$

The sign of Φ_y implies own-market stability.⁸ The sign of Φ_y is in general ambiguous. If goods W and Z are weak (strong) substitutes in China, then $\Phi_y < (>) 0$. Using the derivatives of the function, the slope of schedule ZZ is equal to

$$\left.\frac{dp_z}{dp_y}\right|_{ZZ} = -\frac{\Phi_y}{\Phi_z}. \quad (22)$$

⁶See the stability conditions derived in Appendix A.

⁷Goods W and Y are weak (strong) substitutes in consumption if M_{yw}^t is sufficiently small (large).

⁸See Appendix A.

If goods W and Z are weak (strong) substitutes, then the schedule is positively (negatively) sloped. The region above (below) schedule ZZ represents an excess supply of (demand for) good Z in the world market.

Since the slopes of the two schedules are ambiguous, we have to determine which of them is steeper if their slopes have the same sign. This is done by examining the stability of the equilibrium. We postulate that a price adjusts downward (upward) in the presence of an excess supply of (demand for) its own good, i.e.,

$$\dot{p}_y = -A\Theta(p_y, p_z) \quad (23)$$

$$\dot{p}_z = -B\Phi(p_y, p_z, t), \quad (24)$$

where A and B are positive constants. As shown in Appendix A, a stable equilibrium requires that if both schedules have the same slope, schedule YY is steeper than schedule ZZ at least in the region close to the equilibrium point.

Figure 2 shows the case in which goods W and Y are weak substitutes in Thailand while goods W and Z are weak substitutes in China. Both schedules YY and ZZ are positively sloped, with schedule YY being steeper.

4 Trade Liberalization by China

As mentioned earlier, when China enters the WTO, one of the conditions is that China is required to lower its tariff rates on a number of goods imported from abroad. In the present model, we represent such liberalization policy of China by a reduction in the tariff rate, t .

4.1 Price Effects

Totally differentiate functions Θ and Φ and rearrange terms to give

$$\begin{bmatrix} \Theta_y & \Theta_z \\ \Phi_y & \Phi_z \end{bmatrix} \begin{bmatrix} dp_y \\ dp_z \end{bmatrix} = - \begin{bmatrix} 0 \\ \Phi_t \end{bmatrix} dt. \quad (25)$$

Denote the determinant of the above matrix by $D \equiv \Theta_y\Phi_z - \Theta_z\Phi_y$. For a stable equilibrium so that schedule YY is steeper than schedule ZZ, $D > 0$.

Solving (25), we have

$$\frac{dp_y}{dt} = \frac{\Theta_z \Phi_t}{D} \quad (26)$$

$$\frac{dp_z}{dt} = -\frac{\Theta_y \Phi_t}{D} > 0. \quad (27)$$

Condition (27) implies that an increase in China's tariff rate will raise the equilibrium p_z . However, by (26), the effect on p_y will depend on the sign of Θ_z . In the case in which goods W and Y are weak substitutes in Thailand, $\Theta_z < 0$ so that schedule YY is positively sloped, then an increase in China's trade restriction will push up p_y as well.

In the present paper, we are interested in the effects of trade liberalization by China, i.e., a decrease in t . So if both goods W and Y are weak substitutes in Thailand, trade liberalization by China will lower both p_y and p_z .

The results can be illustrated graphically. Consider again Figure 2. The above analysis shows that a reduction in China's tariff rate will shift schedule ZZ *down* to, say, Z'Z'. The new equilibrium point, E', will represent lower prices of the goods.

Making use of (16), we can get the effect on p_w^* :

$$\frac{dp_w^*}{dt} = \mu_y \frac{dp_y}{dt} + \mu_z \frac{dp_z}{dt}. \quad (28)$$

When both goods W and Y are weak substitutes in Thailand, the RHS of (28) is negative, meaning that China's trade liberalization will raise the world price of good W.

Lemma 1 *If the consumption goods are weak substitutes in Thailand, trade liberalization by China will lead to a drop in the prices of goods Y and Z but a rise in the price of good W.*

Once the changes in prices are known, the impacts of China trade liberalization on other variables can be obtained in a simple way. For example, the decrease in both p_y and p_z means that Thailand and China will shift their resources toward the production of good X. This means that both countries will export more of good X to the United States. With less resources for the production of good Y (in Thailand) and good Z (in China), both Thailand and China will have less trade between them.

Lemma 2 *If the consumption goods are weak substitutes in Thailand, trade liberalization by China will lead to an increase in the export in good X by China and Thailand to the United States.*

This lemma is interesting because it shows the cases in which China's trade liberalization will lead to an increase in China's and Thailand's export of the same good to the United States. We will show some specific examples in which this case exists.

4.2 Welfare Effects

Recall that the social utility level of Thailand can be represented by its indirect trade utility function, $V^t(p_w^*, p_y, p_z)$. To evaluate the effects of China's trade liberalization on Thailand's welfare, totally differentiate it to yield

$$dV^t = \lambda^t (E_z^t dp_z - M_w^t dp_w^* - M_y^t dp_y), \quad (29)$$

where λ^t is the marginal utility of income of Thailand. Assuming non-satiation, λ^t is positive. Condition (29) describes the effects of the terms of trade on welfare: a country will enjoy a higher welfare if on the average the prices of its exportables increase while those of its importables decrease. Making use of (16), equation (29) can be expressed in an alternative way:

$$dV^t = \lambda^t [(E_z^t - M_w^t \mu_z) dp_z - (M_y^t + M_w^t \mu_y) dp_y]. \quad (30)$$

It has been shown that in the case in which goods W and Y are weak substitutes in Thailand, trade liberalization by China will lead to a reduction in both p_y and p_z . The resulting change in Thailand's welfare, however, is ambiguous.

By making use of (30), the impact of a change in China's external tariff rate on Thailand's welfare is given by

$$\frac{dV^t}{dt} = \lambda^t \left[(E_z^t - M_w^t \mu_z) \frac{dp_z}{dt} - (M_y^t + M_w^t \mu_y) \frac{dp_y}{dt} \right]. \quad (31)$$

By arranging the terms in (31), a necessary and sufficient condition for an improvement of Thailand's welfare due to a small liberalization of China's trade ($dV^t/dt < 0$) is

$$(E_z^t - M_w^t \mu_z) \frac{dp_z}{dt} - (M_y^t + M_w^t \mu_y) \frac{dp_y}{dt} < 0 \quad (32)$$

Lemma 3 *Condition (32) is a necessary and sufficient condition for an improvement of Thailand's welfare due to a small liberalization of China's trade.*

Condition (32) can be interpreted in several ways. Let us redefine the indirect trade utility function of Thailand as:

$$V^t = V^t(\mu(p_y, p_z), p_y, p_z) \equiv \eta^t(p_y, p_z).$$

Its derivatives are

$$\begin{aligned}\eta_y^t &= -\lambda^t(M_y^t + M_w^t\mu_y) \\ \eta_z^t &= \lambda^t(E_z^t - M_w^t\mu_z) > 0.\end{aligned}$$

The sign of η_y^t is ambiguous. It is positive if $M_y^t < -M_w^t\mu_y$. Graphically, combinations of (p_y, p_z) that correspond to a particular welfare level are represented by iso-welfare contours in Figure 3. The slope of a representative contour is equal to

$$\left. \frac{dp_z}{dp_y} \right|_{VT} = -\frac{\eta_y^t}{\eta_z^t}, \quad (33)$$

which is positively sloped if and only if $\eta_y^t < 0$. Furthermore, note that by (26) and (27),

$$\frac{dp_y/dt}{dp_z/dt} = -\frac{\Theta_z}{\Theta_y},$$

which is the slope of schedule YY in Figure 2. Thus, if $dp_y/dt > 0$ so that schedule YY is positively sloped (when the Thailand consumption goods are weak substitutes), the necessary and sufficient condition (32) for an improvement of Thailand welfare as a result of China trade liberalization reduces to

$$-\frac{\eta_y^t}{\eta_z^t} > -\frac{\Theta_z}{\Theta_y}. \quad (34)$$

If, however, $dp_y/dt < 0$, schedule YY is negatively sloped and condition (32) reduces to

$$-\frac{\eta_y^t}{\eta_z^t} < -\frac{\Theta_z}{\Theta_y}. \quad (35)$$

The following proposition is obtained by combining conditions (34) and (35):

Proposition 1 *A small trade liberalization by China is beneficial to Thailand if the Thailand consumption goods are weak substitutes and if condition (34) holds (or if the Thailand consumption goods are strong substitutes and if condition (35) holds). If in the neighborhood of the initial trade point both schedule YY and an iso-welfare contour have slopes of the same sign, then a small trade liberalization by China is beneficial to Thailand if the iso-welfare contour is steeper than schedule YY.*

The two cases corresponding to conditions (34) and (35) are shown in panels (a) and (b) of Figure 3, respectively (schedule ZZ being omitted for simplicity). Panel (a) shows the case in which the initial iso-welfare contour is steeper than schedule YY, resulting in an improvement in Thailand's welfare after a small liberalization of China trade: $V_2^t > V_1^t$. Panel (b) shows the case with a detrimental China trade liberalization.

The necessary and sufficient condition (32) can be expressed in terms of Thailand's import of Chinese goods. If, for example, $dp_y/dt > 0$, then condition (32) reduces to

$$M_y^t > -(E_y^t - M_w^t \mu_z) \frac{\Theta_y}{\Theta_z} - M_w^t \mu_y. \quad (36)$$

Alternatively, if $dp_y/dt < 0$, condition (32) reduces to

$$M_y^t < -(E_y^t - M_w^t \mu_z) \frac{\Theta_y}{\Theta_z} - M_w^t \mu_y. \quad (37)$$

Conditions (36) and (37) give the following proposition:

Proposition 2 *If both goods W and Y are weak substitutes for Thailand, the necessary and sufficient condition for a small trade liberalization by China to benefit Thailand is condition (36). In this case, if Thailand has a small import from China, condition (w4) is violated and China's travel liberalization can hurt Thailand. If both goods W and Y are strong substitutes for Thailand, the necessary and sufficient condition for a small trade liberalization by China to benefit Thailand is condition (37).*

So far, we have been concentrating on small changes in China tariff rates. However, when China becomes a new member of the WTO, it is expected to make substantial reduction in some of its tariffs. In the present framework, schedule YY and an iso-welfare contour of Thailand may not be straight lines.

As a result, marginal changes and finite changes could give different results, and thus we need to be careful in interpreting the results given above, which are based on derivatives.

Let us consider Figure 4, which shows two iso-welfare contours and schedule YY. A small trade liberalization by China may lead to a lower Thailand welfare level, as shown in the diagram, $V_2^t > V_1^t$. If the tariff rate is reduced further, then Thailand's welfare could rise, and it can be to such an extent that at the final trade equilibrium E'' Thailand's welfare is higher than the initial one.

The above analysis serves as a warning to the use of marginal changes, which in general are easier to carry out. However, to analyze finite changes in general requires much more information.

5 A Special Case

In order to get more insights into the above analysis, we consider a special case in this section. We assume that the social utility functions of China and Thailand are of the Cobb-Douglas type; i.e.,

$$u^c = (C_w^c)^\gamma (C_z^c)^{1-\gamma} \quad (38)$$

$$u^t = (C_w^t)^{\gamma^*} (C_y^t)^{1-\gamma^*}, \quad (39)$$

where C_i^j is the consumption of good i by country j , $i = W, Y, Z$, and $j = c$ (China), t (Thailand), and $0 < \gamma, \gamma^* < 1$. It is well known that γ or γ^* represents the corresponding country's share of income spent on good W. Let us focus first on China. Making use of (38), the Marshallian demands for the goods, which are the same as the import demands, are

$$M_w^c = \frac{\gamma}{(1+t)p_w^*} I^c \quad (40)$$

$$M_z^c = \frac{1-\gamma}{p_z} I^c. \quad (41)$$

Using China income's function given by (2), the two demand functions reduce to

$$M_w^c = \frac{\gamma g^c}{\varepsilon p_w^*} \quad (42)$$

$$M_z^c = \frac{(1 - \gamma)(1 + t) g^c}{\varepsilon p_z}, \quad (43)$$

where $\varepsilon = 1 + t - \gamma t$. Similarly, the demand for the goods by Thailand are given by

$$M_w^t = \frac{\gamma^* g^t}{p_w^*} \quad (44)$$

$$M_y^t = \frac{1 - \gamma^*}{p_y} g^t. \quad (45)$$

Using Thailand's demand function in condition (45), equilibrium condition (11) becomes

$$g_y^c(p_y) = \frac{1 - \gamma^*}{p_y} g^t(p_z). \quad (46)$$

This is the equation of schedule YY in Figure 2 in this special case. Differentiate both sides of (46) to yield

$$(g_y^c + p_y g_{yy}^c) dp_y = (1 - \gamma^*) g_z^t dp_z. \quad (47)$$

Rearranging the terms in (47), we get the slope of schedule YY:

$$\left. \frac{dp_z}{dp_y} \right|_{YY} = \frac{g_y^c + p_y g_{yy}^c}{(1 - \gamma^*) g_z^t} > 0. \quad (48)$$

The sign of the YY schedule indicates that goods W and Y are weak substitutes in consumption for Thailand.

Using China's demand function in (43), equilibrium condition (12) reduces to

$$g_z^t(p_z) = \frac{(1 - \gamma)(1 + t)}{\varepsilon p_z} g^c(p_y). \quad (49)$$

Differentiate both sides of (49) to give

$$(g_z^t + p_z g_{zz}^t) dp_z = \frac{(1 - \gamma)(1 + t)}{\varepsilon} g_y^c dp_y + \frac{(1 - \gamma)(1 + t + \gamma)}{\varepsilon^2} g^c dt. \quad (50)$$

At any given level of t , equation (49) can be illustrated by a schedule like ZZ in Figure 2. Its slope is given by

$$\left. \frac{dp_z}{dp_y} \right|_{ZZ} = \frac{(1-\gamma)(1+t)}{\varepsilon} \frac{g_z^c}{g_z^t + p_z g_{zz}^t} > 0. \quad (51)$$

Comparing conditions (49) and (51), we can see that schedule YY is steeper than schedule ZZ, as shown in the diagram.

Lemma 4: *If the social utility functions of the countries are of the Cobb-Douglas type, the two consumption goods are weak substitutes and schedules YY and ZZ are positively sloped. Schedule YY is steeper than schedule ZZ.*

Furthermore, condition (50) implies that a drop in t will cause a downward shift of schedule ZZ. Combining conditions (47) and (50), we have

$$\begin{aligned} & \begin{bmatrix} g_y^c + p_y g_{yy}^t & -(1-\gamma^*)g_z^t \\ -(1-\gamma)(1+t)g_y^c/\varepsilon & g_z^t + p_z g_{zz}^t \end{bmatrix} \begin{bmatrix} dp_y \\ dp_z \end{bmatrix} \\ & = \begin{bmatrix} 0 \\ (1-\gamma)(1+t+\gamma)/\varepsilon^2 \end{bmatrix} dt. \end{aligned} \quad (52)$$

Solving these two equations, we have

$$\frac{dp_y}{dt} = \frac{(1-\gamma)(1-\gamma^*)(1+t+\gamma)}{\varepsilon D'} g_z^t > 0 \quad (53)$$

$$\frac{dp_z}{dt} = \frac{(1-\gamma)(1+t+\gamma)}{\varepsilon^2 D'} (g_y^c + p_y g_{yy}^t) > 0, \quad (54)$$

where $D' > 0$ is the determinant of the matrix in (52). Conditions (53) and (54) show that trade liberalization by China causes a drop in both p_y and p_z , and, from (28), a rise in p_w^* ,

$$\frac{dp_w^*}{dt} = \frac{E_{xy}^c}{\bar{W}} \frac{dp_y}{dt} + \frac{E_{xz}^t}{\bar{W}} \frac{dp_z}{dt} < 0, \quad (55)$$

where conditions (53) and (54) have been used.

Lemma 5: *If the social utility functions of China and Thailand are of the Cobb-Douglas type, China's trade liberalization will lower the prices of goods Y and Z but raise that of good W.*

Using Thailand's social utility function in (39), its indirect trade utility function is given by

$$V^t = \left(\frac{\gamma^*}{p_w^*}\right)^{\gamma^*} \left(\frac{1-\gamma^*}{p_y}\right)^{1-\gamma^*} g^t(p_z).$$

It is more convenient to express the indirect trade utility in log form:

$$\log V^t = B - \gamma^* \log p_w^* - (1 - \gamma^*) \log p_y + \log g^t, \quad (56)$$

where $B = \gamma^* \log \gamma^* + (1 - \gamma^*) \log(1 - \gamma^*)$. Differentiate both sides of (56) to give

$$\frac{1}{V^t} dV^t = -\frac{\gamma^*}{p_w^*} dp_w^* - \frac{(1 - \gamma^*)}{p_y} dp_y + \frac{g_z^t}{g^t} dp_z,$$

which can be computed using conditions (53), (54), and (55).

6 Concluding Remarks

In this paper, we analyzed some possible effects of the accession of China into the WTO. We constructed a simple, general-equilibrium framework to examine the interactions between China, the SEA countries, and the rest of the world. Although the analysis is only a theoretical one, we did point out that a complete estimation of the effects as China becomes a WTO member requires a full understanding of the markets. As China liberalizes its restrictions on the import of foreign products, how other markets may be affected is quite complicated, and there is no simple answer to whether the exports of the SEA countries will be squeezed out of the US markets. The theoretical framework serves to provide some guidelines on how these effects can be measured, although it is beyond the scope of this paper to take up this task.

The present paper also analyzes the possible impacts of trade liberalization by China on the welfare of a representative SEA country. We showed that the impacts are more complicated than what is commonly assumed, as they depend on how a reduction in China's tariff may affect various world prices, especially those of the tradable goods among the SEA countries, China, and countries like the United States. We argued that there are situations in which the SEA countries may benefit from China's WTO accession.

The last part of this paper considers a special case in which we are able to get more insight into the impacts of China's trade liberalization in this three-country framework. China and Thailand are assumed to have Cobb-Douglas type social utility functions. This assumption simplifies the countries' import demand functions.

In this paper, we provided a simple theoretical framework to examine some possible effects of China's accession to the World Trade Organization. To maintain manageability, some simple assumptions were made and obviously some of the features of trade among these countries have not been included in this paper. These could be the topics for future research. For the time being, we can mention two important features of the economic relations between China and other Asian economies.

1. Intra-industry Trade between China and other Asian Economies. As China liberalizes trade, trade between China and other Asian economies will go up, and part of the trade will be in the form of intra-industry trade. In the presence of economies of scale, an increase in the production of these goods caused by a rise in intra-industry trade is regarded as beneficial to both trading partners, and as long as such trade does not lead to a substantial drop in the number of varieties, consumers in both countries will gain.⁹
2. Direct Investment from Other Countries to China. As China becomes a new member of the World Trade Organization, it is required to reduce not only the restrictions on import of foreign goods, but also the restrictions on inflow of foreign capital. This allows capital from other Asian economies to flow to China. This means that these Asian economies can invest more in China and make use of the cheaper labor costs in China.

⁹For more discussion about the welfare impacts of intra-industry trade, see Wong (1995, Chapter 9).

Appendix A

We now derive the stability conditions based on the price adjustment equations (23) and (24). Linearize the two price adjustment functions in the region close to the equilibrium point to give

$$\begin{bmatrix} d\dot{p}_y \\ d\dot{p}_z^* \end{bmatrix} = \begin{bmatrix} -A\Theta_y & -A\Theta_z \\ -B\Phi_y & -B\Phi_z \end{bmatrix} \begin{bmatrix} dp_y \\ dp_z^* \end{bmatrix}. \quad (57)$$

For a stable equilibrium, the matrix in (57) has to be negative definite, i.e.,

$$\Theta_y\Phi_z - \Theta_z\Phi_y > 0 \quad (58)$$

$$\Theta_y, \Phi_z > 0. \quad (59)$$

Condition (58) implies that if $\Theta_z > 0$ so that schedule YY is negatively sloped, then

$$-\frac{\Theta_y}{\Theta_z} < -\frac{\Phi_y}{\Phi_z}, \quad (60)$$

or that if $\Theta_z < 0$ so that schedule YY is positively sloped then

$$-\frac{\Theta_y}{\Theta_z} > -\frac{\Phi_y}{\Phi_z}. \quad (61)$$

Conditions (60) and (61) imply that if the two schedules are of the same slope, schedule YY has to be steeper than schedule ZZ for a stable equilibrium, at least in the region close to the equilibrium. The conditions further imply that the equilibrium, if its exists, is stable and unique if they are of different slopes.

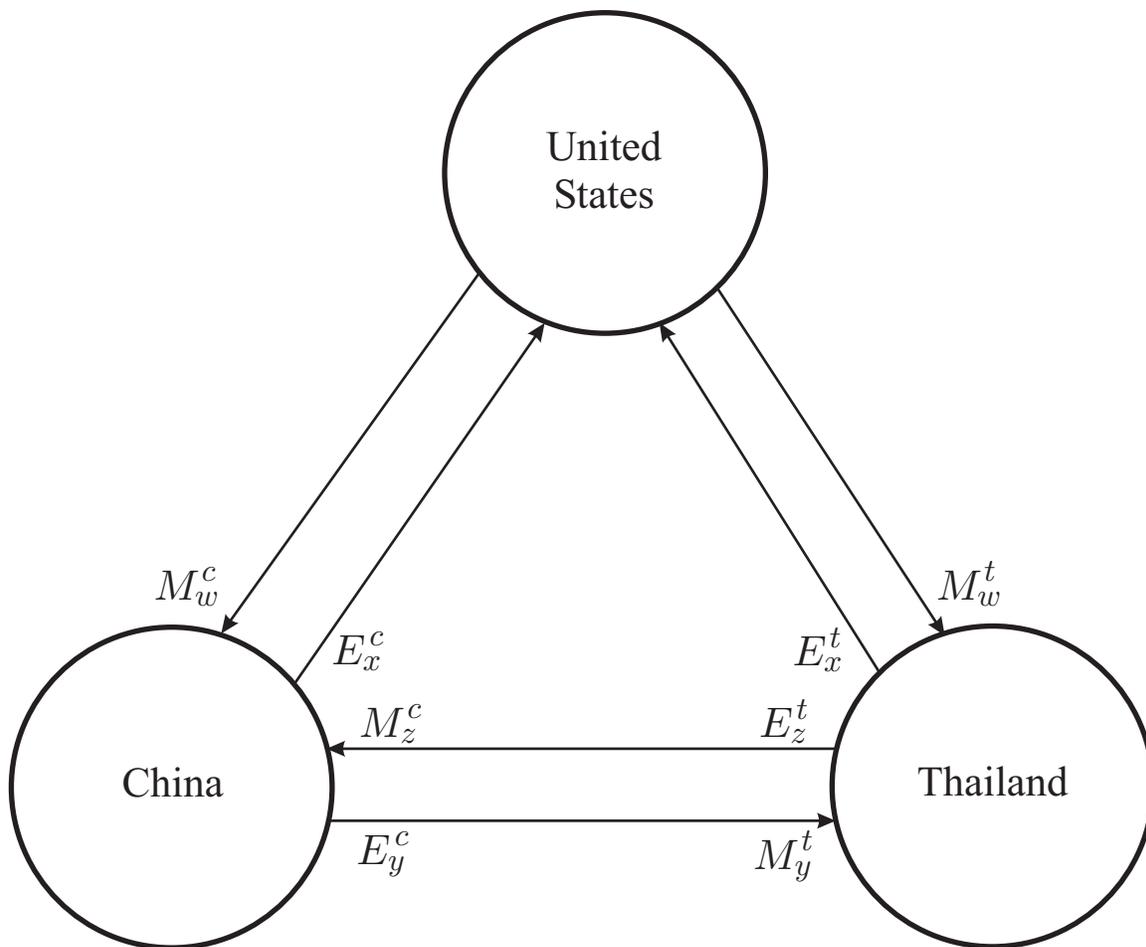


Figure 1

The Three-Country, Four-Good Framework

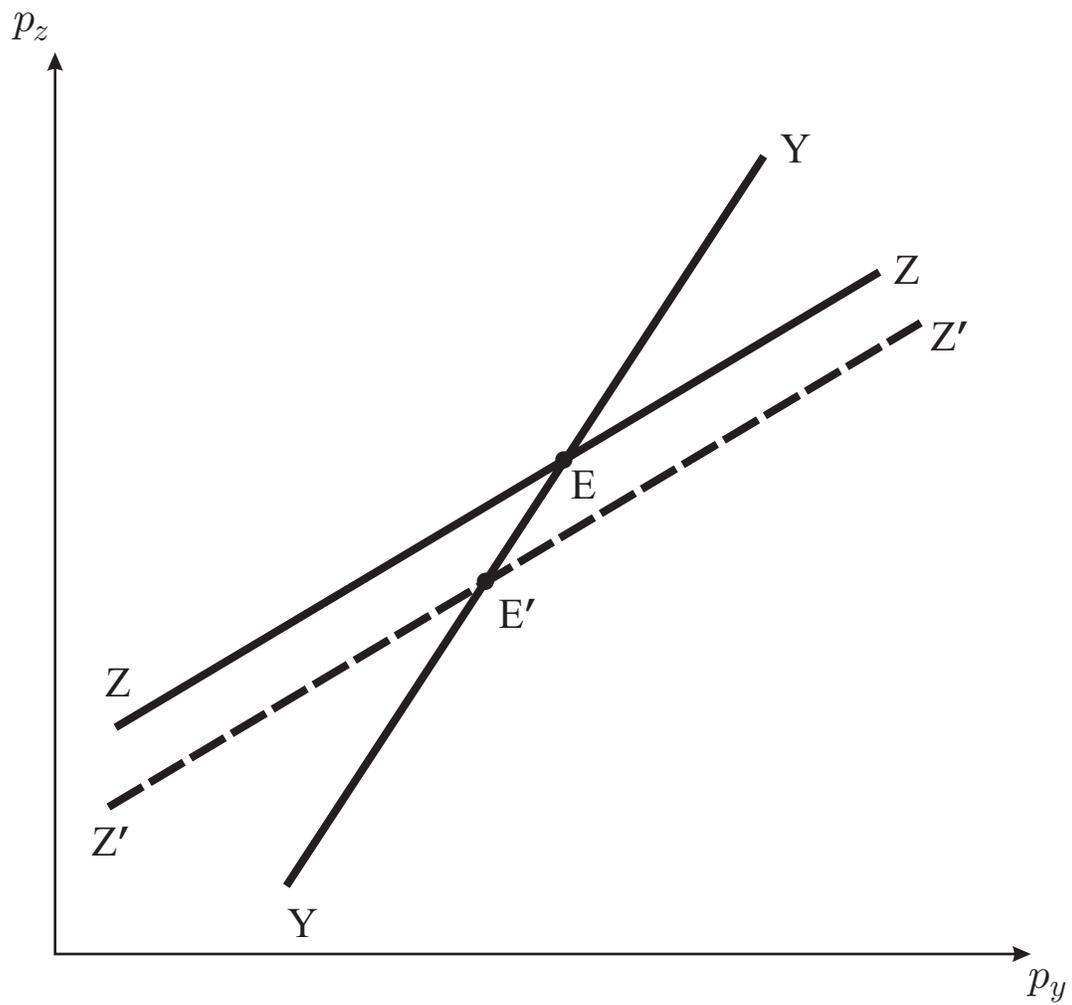


Figure 2

Price Effects of China's Trade Liberalization

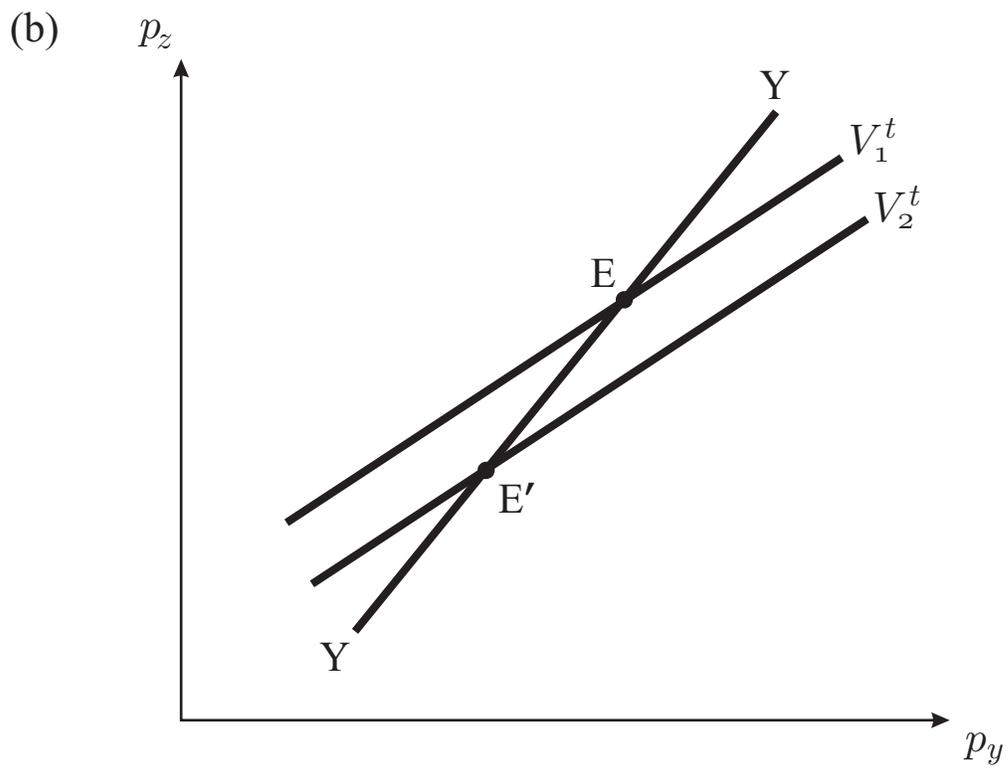
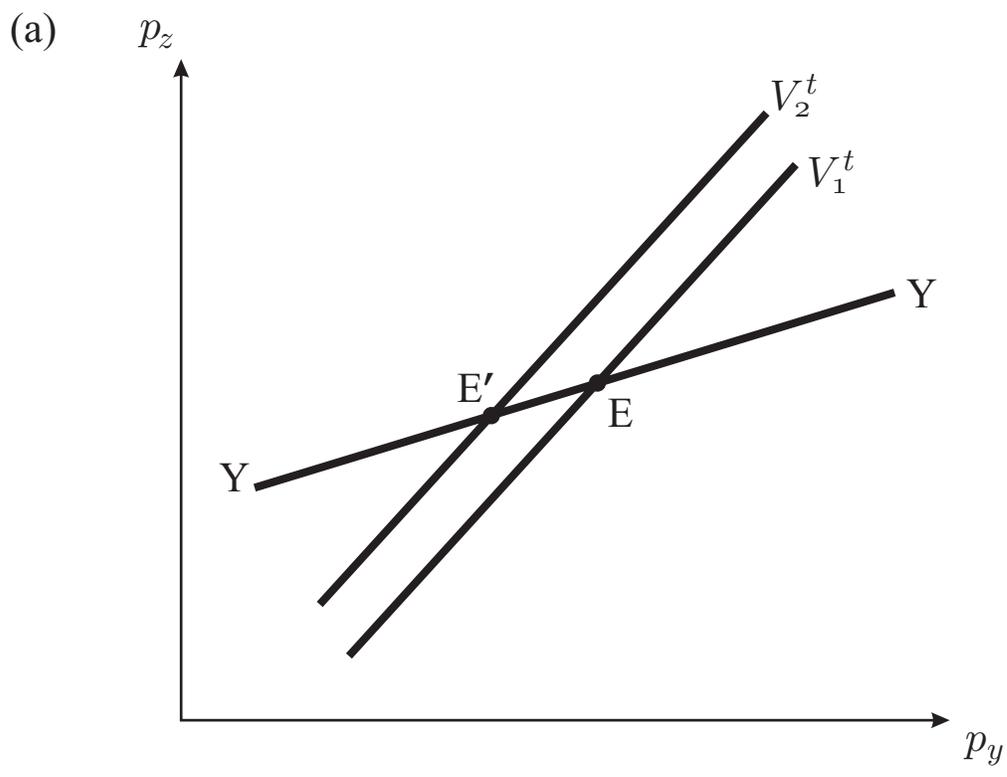


Figure 3

China's Trade Liberalization and Thailand's Welfare

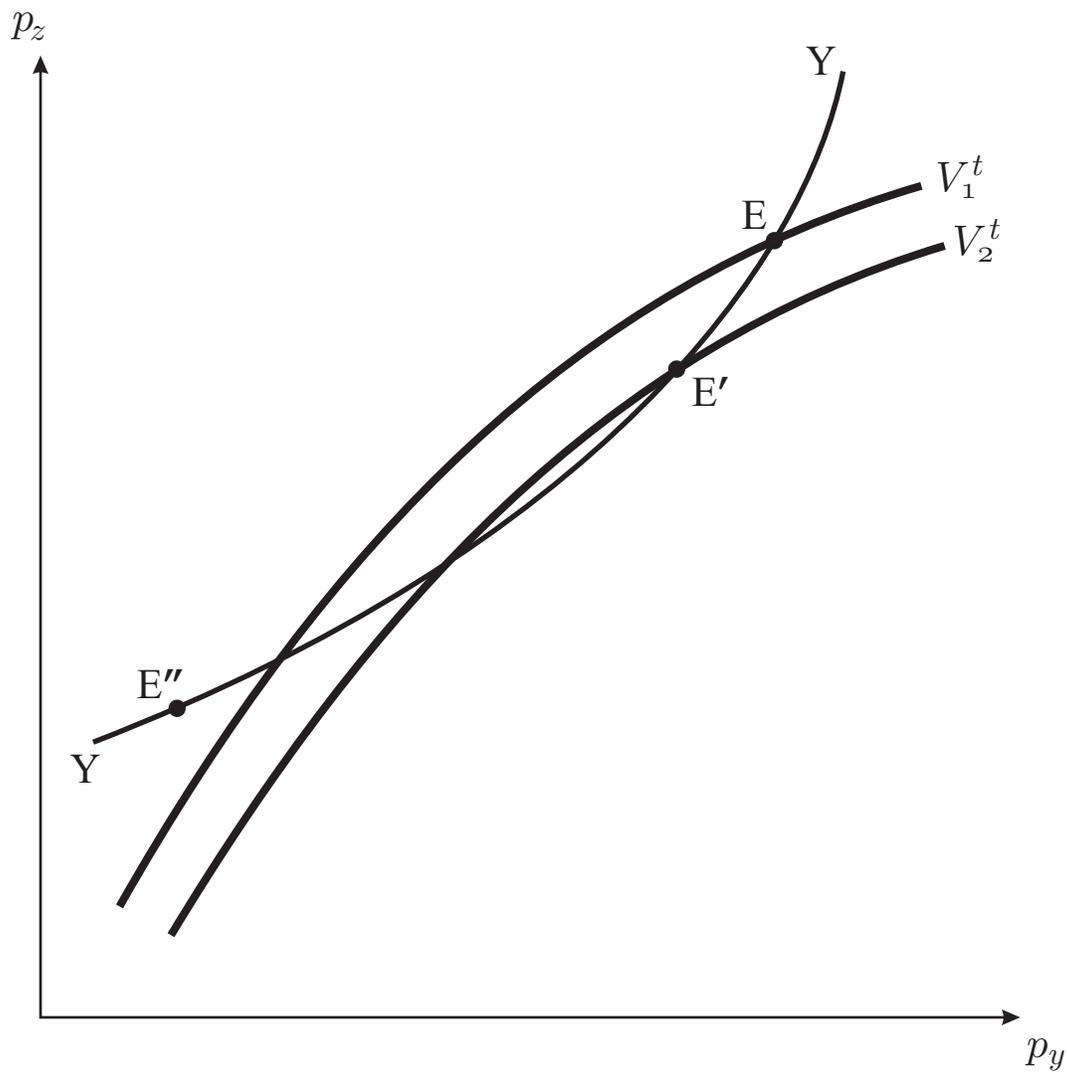


Figure 4

Welfare Impacts of China's Marginal and Finite Trade Liberalization

References

- [1] Choi, E. Kwan, 2001. "Neighbor-Immiserizing Growth: the Asian Crisis," *Japanese Economic Review*, 52 (4).
- [2] Findlay, Ronald, 1998. "Asian Economic Crisis: Toward A Long-Run Real-Side Explanation" presented at the Asian Crisis conference held at the University of Washington, December 1988.
- [3] Wang, Zhi and Edward G. Schuh, 2002. "The Emergence of a 'Greater China' and its Impact on World Trade – A Computable General Equilibrium Analysis," *Journal of Comparative Economics*, forthcoming.
- [4] Wong, Kar-yiu, 1995. *International Trade in Goods and Factor Mobility*, Cambridge, Mass.: MIT Press.