The Impacts of China's WTO Accession on the Southeast Asian Economies: A Theoretical Analysis

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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 accessoin into the WTO, may affect the trade volumes among China, the United States and the Southeast Asian economies, as well as the prices of the tradable goods in the world market. Possible impacts on the welfare of the Southeast Asia Economies are also examined.

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 production and consumption 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 damages may outweigh benefits.

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 expand 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 export of goods by 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 would require 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, instead of carrying out any empirical estimation, which requires a lot of information, this paper provides a theoretical analysis of the trade relations between China, SEA economies, and the rest of the world. It is hoped that the analysis will shed light on how China's WTO may affect the SEA economies. The theoretical framework and the results derived in this paper are meant to be suggestive, but the framework can be used as a guideline for future empirical studies.

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

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

welfare are derived. The model is extended to analyze finite changes, and possible inconsistency between the impacts of marginal changes and those of finite changes is examined. Section 5 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 its 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 so 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, we assume that China's tariff rate will drop down to zero.[2]

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

$$p_w = p_w^*(1+t). \tag{1}$$

The per unit tariff revenue collected by the Chinese government is equal to tp_w^*, 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 $g^c(p_y)$.[3] 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, $E_{xy}^c \equiv \mathrm{d}E_x^c/\mathrm{d}p_y$. Assuming a strictly convex production possibility set, we have $E_{xy}^c < 0$ and $E_{yy}^c > 0$. In the presence of a tariff, China's national income is equal to its GDP plus the tariff revenue, i.e.,

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

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

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[2] Note that China imports different goods from the United States and Thailand. So China may keep different tariff rates on the US and Thai imports.

[3] For 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:

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

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 $j \neq k$.[4] With the collected tariff revenue distributed to the consumers in a lump-sum fashion, the national income in (3) is equal to the national expenditure, which is defined as

$$I^c = p_w M_w^c + p_z M_z^c. \tag{4}$$

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 and China's tariff rate. Substitute p_w and p_z in (1) into (3) to give

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

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

$$\mathrm{d}M_w^c = \phi_{ww}\mathrm{d}p_w^* + \phi_{wy}\mathrm{d}p_y + \phi_{wz}\mathrm{d}p_z + \phi_{wt}\mathrm{d}t \tag{6}$$

$$\mathrm{d}M_z^c = \phi_{zw}\mathrm{d}p_w^* + \phi_{zy}\mathrm{d}p_y + \phi_{zz}\mathrm{d}p_z + \phi_{zt}\mathrm{d}t, \tag{7}$$

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[4]With the absence of inferior goods, the demand curve is downward sloping. Moreover, with only two consumption goods, they are substitutes.

where

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\begin{aligned}
\phi_{ww} &= \left[M^c_{ww}(1+t) + M^c_{wI}M^c_w t \right]/\delta < 0 \\
\phi_{wy} &= M^c_{wI}g^c_y/\delta > 0 \\
\phi_{wz} &= M^c_{wz}/\delta > 0 \\
\phi_{wt} &= \left[M^c_{ww} + M^c_{wI}M^c_w \right]p^*_w/\delta < 0 \\
\phi_{zw} &= (1+t)M^c_{zw} + tM^c_{zI}\left[M^c_w + p^*_w M^c_{ww}(1+t)\right]/\delta > 0 \\
\phi_{zy} &= M^c_{zI}g^c_y/\delta > 0 \\
\phi_{zz} &= M^c_{zz} + tp^*_w M^c_{zI}M^c_{wz}/\delta < 0 \\
\phi_{zt} &= M^c_{zw}p^*_w + p^*_w M^c_{zI}(M^c_w + tp^*_w M^c_{ww})/\delta > 0 \\
\delta &= 1 - tp^*_w M^c_{wI} > 0.
\end{aligned}
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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:

$$ M^c_j = \tilde{M}^c_j(p^*_w, p_y, p_z, t), \tag{8} $$

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

$$ M^t_j = M^t_j(p^*_w, p_y, I^t(p_z)), $$

where $j = w$, y. Again, with no inferior goods, $M^t_{jj} < 0$ and $M^t_{jk} > 0$ 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, $\bar{W}$.[5] 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:

$$M_x^u = p_w^* \bar{W}. \tag{9}$$

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

$$E_x^c(p_y) + E_x^t(p_z) = M_x^u \tag{10a}$$

$$M_y^t(p_w^*, p_y, I^t(p_z)) = E_y^c(p_y) \tag{10b}$$

$$\tilde{M}_z^c(p_w^*, p_y, p_z, t) = E_z^t(p_z). \tag{10c}$$

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

$$E_x^c(p_y) + E_x^t(p_z) = p_w^* \bar{W}. \tag{11}$$

Equations (10b) to (11) 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,

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[5]In 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:

$$V^c = V^c(p_w^*, p_y, p_z, b) \tag{12a}$$

$$V^t = V^t(p_w^*, p_y, p_z), \tag{12b}$$

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   The World 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^*.[6] Solve equation (11) to express p_w^* in terms of the other prices, i.e.,

$$p_w^* = \mu(p_y, p_z). \tag{13}$$

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

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

where $E_{xy}^c < 0$ and $E_{xz}^t < 0$, as explained before. Substitute $p_w^* = \mu(p_y, p_z)$ into (10b) and (10c), and define the excess supply functions of goods Y and Z respectively as:

$$\Theta(p_y, p_z) = E_y^c(p_y) - M_y^t(\mu(p_y, p_z), p_y, I^t(p_z)) \tag{14a}$$

$$\Phi(p_y, p_z, t) = E_z^t(p_z) - \tilde{M}_z^c(\mu(p_y, p_z), p_y, p_z, t). \tag{14b}$$

By conditions (10b) and (10c), equilibrium of these two markets can be described by

$$\Theta(p_y, p_z) = 0 \tag{15a}$$

$$\Phi(p_y, p_z, t) = 0. \tag{15b}$$

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[6]The focus on just two prices allows us to develop a simple graphical appartus to analyze the relations between the variables and the impacts of a shock.

Taking t as given, equations (15a) and (15b) are illustrated in Figure 2 by schedules YY and ZZ, respectively. The diagram has two panels, corresponding to two possible cases explained below. 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 (10b) and arrange terms to give the following derivatives

$$\Theta_y \equiv \partial\Theta/\partial p_y = E_{yy}^c - M_{yw}^t \mu_y - M_{yy}^t > 0 \tag{16a}$$
$$\Theta_z \equiv \partial\Theta/\partial p_z = -(M_{yw}^t \mu_z + M_{yI}^t g_z^t). \tag{16b}$$

The sign of Θ_y implies own-market stability of the good-Y market.[7] The derivative Θ_z, which in general has an ambiguous sign, can be disaggregated into two components: $-M_{yw}^t \mu_z$ and $-M_{yI}^t g_z^t$. The former is due to the substitution between goods Y and W in Thailand and the resulting change in the price of good W due to a change in p_z. The latter is due to the change in Thailand's GDP and the corresponding change in its demand for good Y. For a rise in p_z, the income effect will push up the excess supply of good Y, Θ, but a drop in p_y, while the substitution effect will pull down Θ but up p_y.

Definition 1. Goods W and Y are weak (strong) substitutes in consumption for Thailand at the equilibrium point if $M_{yw}^t < (>) - (M_{yI}^t g_z^t)/\mu_z$. The two goods are always weak (strong) substitutes in Thailand if the previous condition is satisfied at all possible prices.

If goods W and Y are weak (strong) substitutes in Thailand, then by (16b), $\Theta_z < (>) 0$. The slope of schedule YY is equal to

$$\left.\frac{\mathrm{d}p_z}{\mathrm{d}p_y}\right|_{YY} = -\frac{\Theta_y}{\Theta_z}. \tag{17}$$

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.

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[7]See the stability conditions derived in the appendix.

The properties of schedule ZZ can be derived in the same way. Totally differentiate (10c) and rearrange terms to give

$$\Phi_y \;=\; -(\phi_{zw}\mu_y + \phi_{zy}) \tag{18a}$$

$$\Phi_z \;=\; E^t_{zz} - \phi_{zw}\mu_z - \phi_{zz} > 0 \tag{18b}$$

$$\Phi_t \;=\; -\phi_{zt} < 0. \tag{18c}$$

The sign of Φ_z implies own-market stability.[8] Variables Φ_y, which has an ambiguous sign, is caused by two effects: the income effect and the substitution effect in China. The income effect is due to a drop in China's terms of trade and GDP as p_y rises, resulting in a decrease in the excess supply of good Z, Φ. The substitution effect comes from the fact that a rise in p_y causes a drop in p_w, encouraging the consumers in China to shift their consumption from good Z to good W, causing a rise in the excess supply of good Z.

Definition 2. Goods W and Z are weak (strong) substitutes in consumption for China at the equilibrium point if $\phi_{zw} < (>) - \phi_{zy}/\mu_z$. The two goods are always weak (strong) substitutes if the previous condition is satisfied at all possible prices.

If goods W and Z are weak (strong) substitutes in China, then by (18c) $\Phi_y < (>)\, 0$. Using the derivatives of the function, the slope of schedule ZZ is equal to

$$\left.\frac{\mathrm{d}p_z}{\mathrm{d}p_y}\right|_{ZZ} = -\frac{\Phi_y}{\Phi_z}. \tag{19}$$

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.

3.2 Stability of the Equilibrium

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

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[8]See the appendix.

own good, i.e.,

$$\dot{p}_y = -A\Theta(p_y, p_z) \tag{20a}$$

$$\dot{p}_z = -B\Phi(p_y, p_z, t), \tag{20b}$$

where A and B are positive constants. As shown in the appendix, 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 cases in which the two schedules have the same slope.[9] In panel (a), the consumption goods in Thailand and China are weak substitutes so that schedules YY and ZZ are positively sloped. By the stability condition, schedule YY is steeper. In panel (b), the consumption goods in both countries are strong substitutes, implying that both schedules are negatively sloped, with schedule YY being steeper to ensure stability of the equilibrium. In both panels, point E is the equilibrium, which is assumed to be unique.

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

$$\begin{bmatrix} \Theta_y & \Theta_z \\ \Phi_y & \Phi_z \end{bmatrix} \begin{bmatrix} \mathrm{d}p_y \\ \mathrm{d}p_z \end{bmatrix} = - \begin{bmatrix} 0 \\ \Phi_t \end{bmatrix} \mathrm{d}t. \tag{21}$$

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, $D > 0$.

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[9]The cases in which the two schedules have different slopes are not shown. As shown below, when there is a change in China's tariff rate, the equilibrium point will move along schedule YY. So the shape and slope of schedule YY will play the major role.

Solving (21), we have

$$\frac{\mathrm{d}p_y}{\mathrm{d}t} = \frac{\Theta_z \Phi_t}{D} \tag{22a}$$

$$\frac{\mathrm{d}p_z}{\mathrm{d}t} = -\frac{\Theta_y \Phi_t}{D} > 0. \tag{22b}$$

Condition (22b) implies that an increase in China's tariff rate will raise the equilibrium value of p_z. However, by (22a), 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. The two panels show the two cases, depending on whether goods W and Y are weak or strong substitutes. In both cases, p_z drops as a result of China's trade liberalization. In the case shown in panel (a), goods W and Y are weak substitutes, leading to a drop in p_y, while in panel (b), the goods are strong substitutes, and p_y rises.

Making use of (13), we can get the effect on p_w^*:

$$\frac{\mathrm{d}p_w^*}{\mathrm{d}t} = \mu_y \frac{\mathrm{d}p_y}{\mathrm{d}t} + \mu_z \frac{\mathrm{d}p_z}{\mathrm{d}t}. \tag{23}$$

When both goods W and Y are weak substitutes in Thailand, the RHS of (23) is negative, meaning that China's trade liberalization will raise the world price of good W. The above analysis shows that these three prices depend on the tariff rate chosen by China so that we can express them as functions of the tariff rate: $p_w^* = p_w^*(t)$, $p_y = p_y(t)$, and $p_z = p_z(t)$.

Lemma 1. *Trade liberalization by China always leads to a drop in the price of good Z. If the consumption goods are weak substitutes in Thailand, trade liberalization by China leads also to a drop in the price of good Y and a rise in the price of good W. If the consumption goods are strong substitutes in Thailand, trade liberalization by China leads to a rise in the price of good Y, but the change in the price of good W is ambiguous.*

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Once the changes in prices are known, the impacts of China trade liberalization on other variables can be obtained in a simple way. The following proposition can easily be proved by making use of Lemma 1 and the export functions.

Proposition 1. *Suppose that China lowers its tariff on the goods from the United States. Thailand will export less to China but more to the US. If the consumption goods are weak substitutes in Thailand, China will export less to Thailand but more to the United States. If the consumption goods are strong substitutes in Thailand, China will export more to Thailand but less to the United States.*

Some economic intuition can be given to Lemma 1 and Proposition 1. When China lowers its tariff on good W from the US, consumers will shift their consumption from good Z from Thailand to good W. This lowers the demand for good Z, putting a downward pressure on its price. For the change in the price of good Y, two effects can be identified: the income effect and the substitution effect. The income effect is due to the fact that Thailand experiences a deterioration in its terms of trade and GDP as a result of a drop in the price of its exportable, good Z. Thus it tends to lower its import demand for good Y, trying to pull down p_y. The substitution effect comes from the fact that a drop in p_z tends to push up p_w^*, causing the consumers in Thailand to shift their consumption toward good Y, putting an upward pressure on p_y. If goods W and Y are weak substitutes, the income effect dominates and so p_y drops as China liberalizes foreign trade. How p_w may change depends on how p_y has changed. In the case in which goods W and Y are weak substitutes, p_y drops and thus p_w rises.

The changes in China and Thailand as described in Proposition 1 are important. Since p_z drops as China lowers its tariff on the US good, Thailand will produce less good Z to be exported to China but allocate more of its resources in the sectors that produce goods for the US market. This point is not compatible with the usual argument that Thailand's products will be squeezed out of the US market. On the other hand, China's exports to Thailand and the US may go up or down, depending on the resulting changes in p_y. However, we note that if the consumption goods in Thailand are strong substitutes, China may export less to the US.

4.2 Welfare Effects

Recall that the social utility level of Thailand can be represented by its indirect trade utility function, $V^t(p_w^*, p_y, p_z)$. We now examine how Thailand's welfare may be affected by China's trade liberalization.

4.2.1 Marginal Trade Liberalization

Totally differentiate Thailand's indirect utility function to yield:

$$\mathrm{d}V^t = \lambda^t(E_z^t \mathrm{d}p_z - M_w^t \mathrm{d}p_w^* - M_y^t \mathrm{d}p_y), \tag{24}$$

where λ^t is the marginal utility of income of Thailand. Assuming non-satiation, λ^t is positive. Condition (24) describes the effects of the terms of trade on welfare. Thus a country enjoys a higher welfare if the prices of its exportables increase while those of its importables decrease. A weaker condition for welfare improvement is that the prices of the exportables on the average rise.

The previous section shows that the three prices are functions of the tariff rate chosen by China. So Thailand's welfare can also be expressed as a function of the tariff rate: $V^t = \tilde{V}^t(t) \equiv V^t(p_w^*(t), p_y(t), p_z(t))$. Making use of (13), equation (24) can be expressed in an alternative way:

$$\mathrm{d}V^t = \lambda^t[(E_z^t - M_w^t\mu_z)\mathrm{d}p_z - (M_y^t + M_w^t\mu_y)\mathrm{d}p_y]. \tag{25}$$

How p_y and p_z may change is given by (22) and Lemma 1.

By making use of (25), the impact of a change in China's external tariff rate on Thailand's welfare is given by

$$\frac{\mathrm{d}\tilde{V}^t}{\mathrm{d}t} = \lambda^t\left[(E_z^t - M_w^t\mu_z)\frac{\mathrm{d}p_z}{\mathrm{d}t} - (M_y^t + M_w^t\mu_y)\frac{\mathrm{d}p_y}{\mathrm{d}t}\right]. \tag{26}$$

By arranging the terms in (26), a necessary and sufficient condition for an improvement of Thailand's welfare due to a small liberalization of China's trade $(\mathrm{d}V^t/\mathrm{d}t < 0)$ is

$$(E_z^t - M_w^t\mu_z)\frac{\mathrm{d}p_z}{\mathrm{d}t} - (M_y^t + M_w^t\mu_y)\frac{\mathrm{d}p_y}{\mathrm{d}t} < 0. \tag{27}$$

Proposition 2. *Condition (27) is a necessary and sufficient condition for an improvement of Thailand's welfare due to a small liberalization of China's trade.*

Condition (27) 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

$$\left.\frac{\mathrm{d}p_z}{\mathrm{d}p_y}\right|_{\mathrm{VT}} = -\frac{\eta_y^t}{\eta_z^t}, \tag{28}$$

which is positively sloped if and only if $\eta_y^t < 0$. Furthermore, note that by (22a) and (22b),

$$\frac{\mathrm{d}p_y/\mathrm{d}t}{\mathrm{d}p_z/\mathrm{d}t} = -\frac{\Theta_z}{\Theta_y},$$

which is the slope of schedule YY in Figure 2. Thus, if $\mathrm{d}p_y/\mathrm{d}t > 0$ so that schedule YY is positively sloped (when the Thailand consumption goods are weak substitutes), the necessary and sufficient condition (27) for an improvement of Thailand welfare as a result of China trade liberalization reduces to

$$-\frac{\eta_y^t}{\eta_z^t} > -\frac{\Theta_z}{\Theta_y}. \tag{29}$$

If, however, $\mathrm{d}p_y/\mathrm{d}t < 0$, schedule YY is negatively sloped and condition (27) reduces to

$$-\frac{\eta_y^t}{\eta_z^t} < -\frac{\Theta_z}{\Theta_y}. \tag{30}$$

The following proposition is obtained by combining conditions (29) and (30):

Proposition 3. *A small trade liberalization by China is beneficial to Thailand if the Thailand consumption goods are weak substitutes and if condition (29) holds (or if the Thailand consumption goods are strong substitutes and if condition (30) 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.*

Two cases in which schedule YY is positively sloped (corresponding to condition (29)) are shown in panels (a) and (b) of Figure 3 (schedule ZZ being omitted for simplicity), depending on whether the schedule is less steep (panel a) or steeper (panel b) than the iso-welfare contour passing through the initial equilibrium point. In both cases, point E is the initial equilibrium point and point E′ the final equilibrium point after trade liberalization by China. 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: $V_2^t > V_1^t$. Panel (b) shows the case with a detrimental China trade liberalization.

The necessary and sufficient condition (27) can be expressed in terms of Thailand's import of Chinese goods. If, for example, $dp_y/dt > 0$, then condition (27) reduces to

$$M_y^t > -(E_y^t - M_w^t \mu_z)\frac{\Theta_y}{\Theta_z} - M_w^t \mu_y. \tag{31}$$

Alternatively, if $dp_y/dt < 0$, condition (27) reduces to

$$M_y^t < -(E_y^t - M_w^t \mu_z)\frac{\Theta_y}{\Theta_z} - M_w^t \mu_y. \tag{32}$$

Conditions (31) and (32) give the following proposition:

Proposition 4. *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 (31). In this case, if Thailand has a small import from China, condition (31) is violated and China's trade 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 (32).*

4.2.2 Finite Trade Liberalization

The previous subsection examines the impacts of a marginal change in China's tariff on the welfare of Thailand. However, to become a new member of the WTO, China has agreed to substantially lower its trade restrictions. We now want to find out whether the previous results are applicable for finite changes in China's tariff.

Basically, what we want is to compare $\tilde{V}^t(t) \equiv V^t(p_w^*(t), p_y(t), p_z(t))$ with $\tilde{V}^t(0) \equiv V^t(p_w^*(0), p_y(0), p_z(0))$. Thailand is said to be hurt by China's accession to the WTO if and only if the following condition holds:

$$\tilde{V}^t(0) < \tilde{V}^t(t). \tag{33}$$

In general, to find out whether condition (33) holds requires the determination of two equilibria of this three-country model: one before China's trade liberalization and another one after trade liberalization. To determine the equilibrium of the present model at any China tariff rate, one needs information about the technology, preferences, and factor endowments of these countries, an enormous amount of information. Since the present paper is not an empirical one, we make no attempt to make such an estimation.

Instead, we try to see what light the previous analysis may shed on the case of finite trade liberalization. First, we note that if the utility of Thailand is monotone in China's tariff rate, then the results of marginal changes do imply the same results for finite changes. Thus we have

Proposition 5. *Finite trade liberalization by China is beneficial to Thailand if the Thailand consumption goods are weak substitutes and if condition (29) always holds (or if the Thailand consumption goods are strong substitutes and if condition (30) always holds).*

Note that the result in Proposition 5 requires that condition (29) or (30) always holds. This may be a strong condition. If the condition holds only for some values of China tariff, then whether condition (33) holds is not certain. This means that marginal changes and finite changes may give different results.

To see the last point, let us consider Figure 4, which shows two iso-welfare contours and a possible 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 extend 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 are usually easier to carry out. However, to analyze finite changes in general requires much more information.

5   Concluding Remarks

In this paper, we developed a three-country, four-good model to analyze the trade relations among three countries: China, Thailand, and the United States. We used the model to examine some possible effects of a reduction in trade restrictions of China on the prices of the traded goods of these countries, trade among them, and welfare of Thailand.

This paper tries to address some of the concerns about China's accession to the WTO on the welfare of the Southeast Asian (SEA) economies. We showed that China's trade liberalization, which it agrees to implement when it was approved to be a new member of the organization, may benefit or hurt the SEA economies. Conditions for a beneficial trade liberalization were derived.

This paper attempts to go beyond the present concerns about China's trade liberalization, which focus mainly on the rivalry of the products of China and SEA economies in other markets. By using a simple theoretical framework, the present paper analyzes the trade relations among China, SEA economies, and the rest of the world. We are able to bring out some of the effects not well aware of in the literature. We showed that China's trade liberalization could affect the prices of traded goods, and thus the trade volumes of various countries, and these changes could in turn affect the welfare of the SEA economies. In particular, we showed that the resulting changes in prices could lead Thailand to export less to China but more to the United States, while China may export more to Thailand but less to the United States. Such trade relations should not be ignored in future studies of the impacts of China's accession to the WTO, especially when these SEA economies are concerned.

In addition to the trade relations between China and SEA economies that a more complete analysis of the impacts of China's WTO accession or its trade liberalization on SEA economies should consider, the following two features also need to be included.

1. Intra-industry trade between China and SEA economies. A recent study shows that China and the SEA economies have substantial intra-industry with each other.[10] China's trade liberalization will certainly affect its intra-industry trade with the SEA economies. It has been shown in the literature that intra-industry trade could bring welfare improvement to trading partners as countries expand their production level and enjoy economies of scale.[11] Hopefully future studies could provide more analysis of this type of trade between China and the SEA economies that has not received much attention in economic studies.

2. Direct Investment from Other Countries to China. As China becomes a new member of the World Trade Organization, it promised to reduce not only the restrictions on import of foreign goods, but also the restrictions on inflow of foreign capital. This will encourage more foreign direct investment from other countries to China. There have been concerns that some of these capital flows may be at the expense of the SEA economies. What may have been neglected is that China's WTO accession also provides the SEA economies investment opportunities, as their capital will be facing less restrictions when investing in China.

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[10]See Wong (2003).

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

Appendix

We now derive the stability conditions based on the price adjustment equations (20a) and (20b). Linearize the two price adjustment functions in the region close to the equilibrium point to give

$$
\begin{bmatrix} \mathrm{d}\dot{p}_y \\ \mathrm{d}\dot{p}_z^* \end{bmatrix} = \begin{bmatrix} -A\Theta_y & -A\Theta_z \\ -B\Phi_y & -B\Phi_z \end{bmatrix} \begin{bmatrix} \mathrm{d}p_y \\ \mathrm{d}p_z^* \end{bmatrix}.
\tag{34}
$$

For a stable equilibrium, the matrix in (34) has to be negative definite, i.e.,

$$
\Theta_y \Phi_z - \Theta_z \Phi_y \;>\; 0
\tag{35a}
$$

$$
\Theta_y, \; \Phi_z \;>\; 0.
\tag{35b}
$$

Condition (35a) implies that if $\Theta_z > 0$ so that schedule YY is negatively sloped, then

$$
-\frac{\Theta_y}{\Theta_z} < -\frac{\Phi_y}{\Phi_z},
\tag{36}
$$

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

$$
-\frac{\Theta_y}{\Theta_z} > -\frac{\Phi_y}{\Phi_z}.
\tag{37}
$$

Conditions (36) and (37) 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.
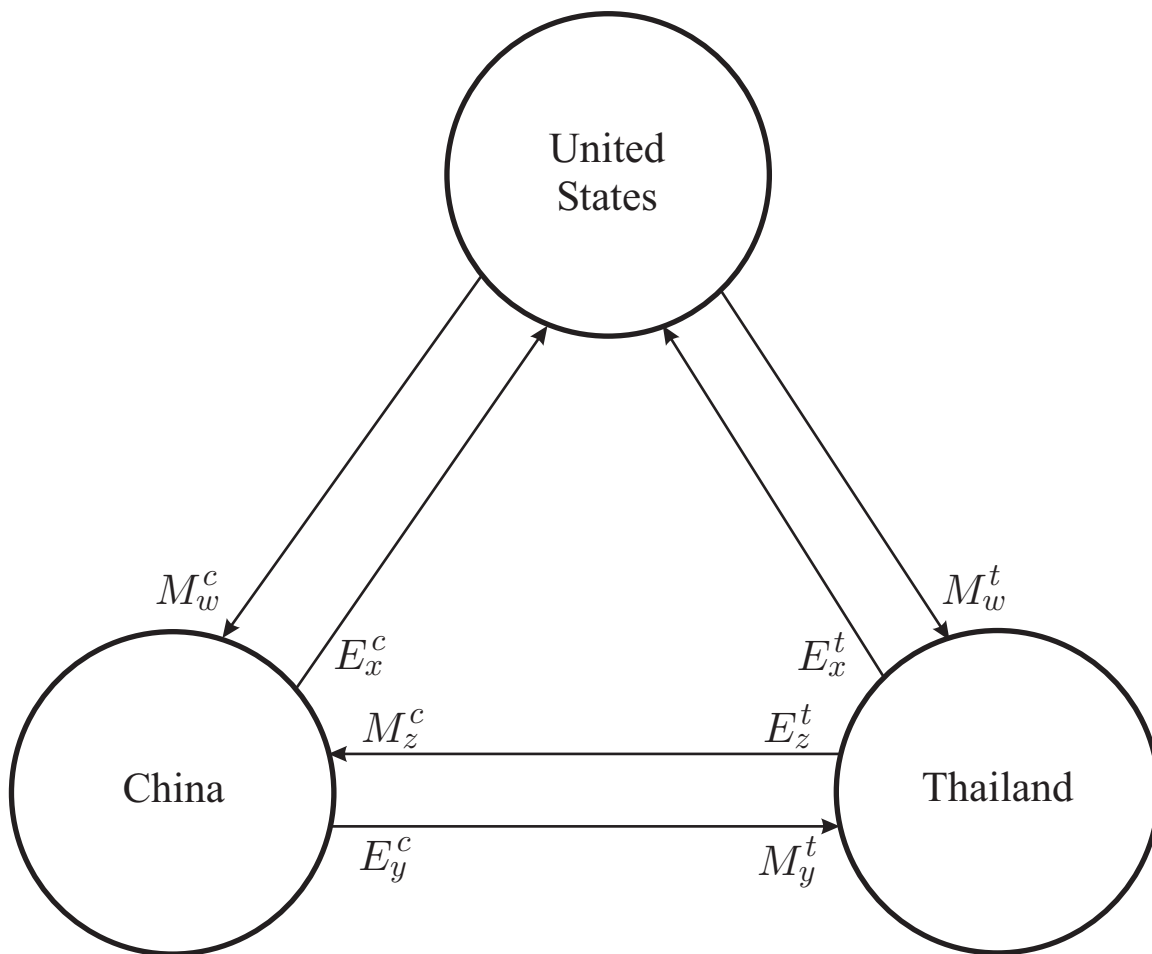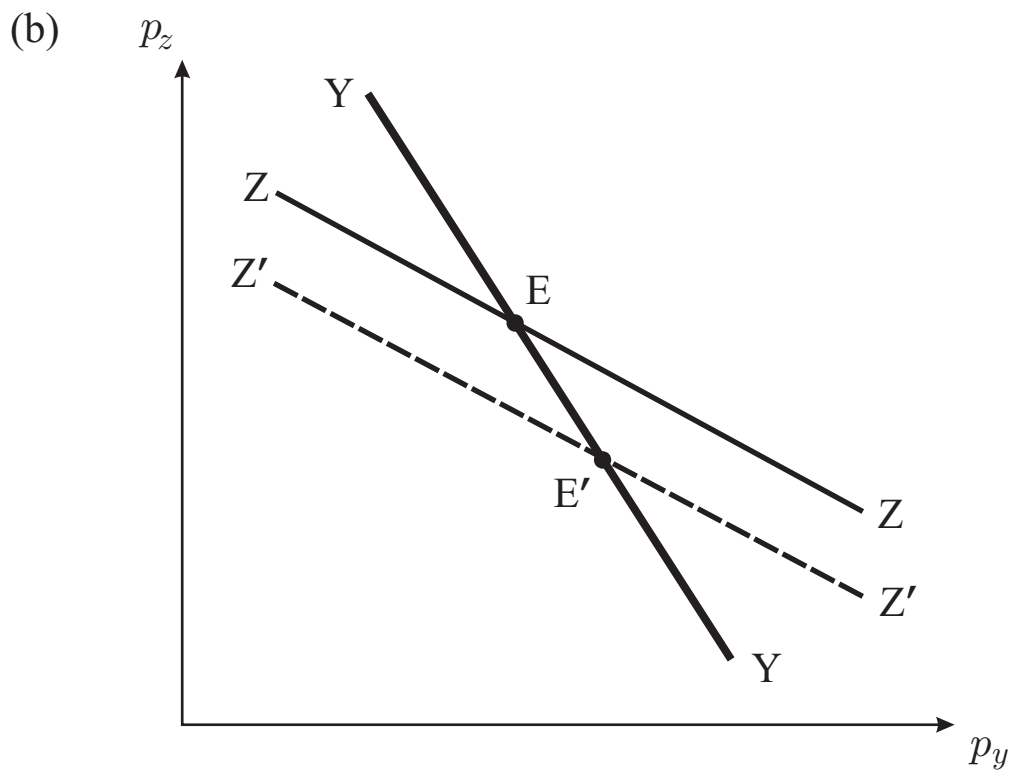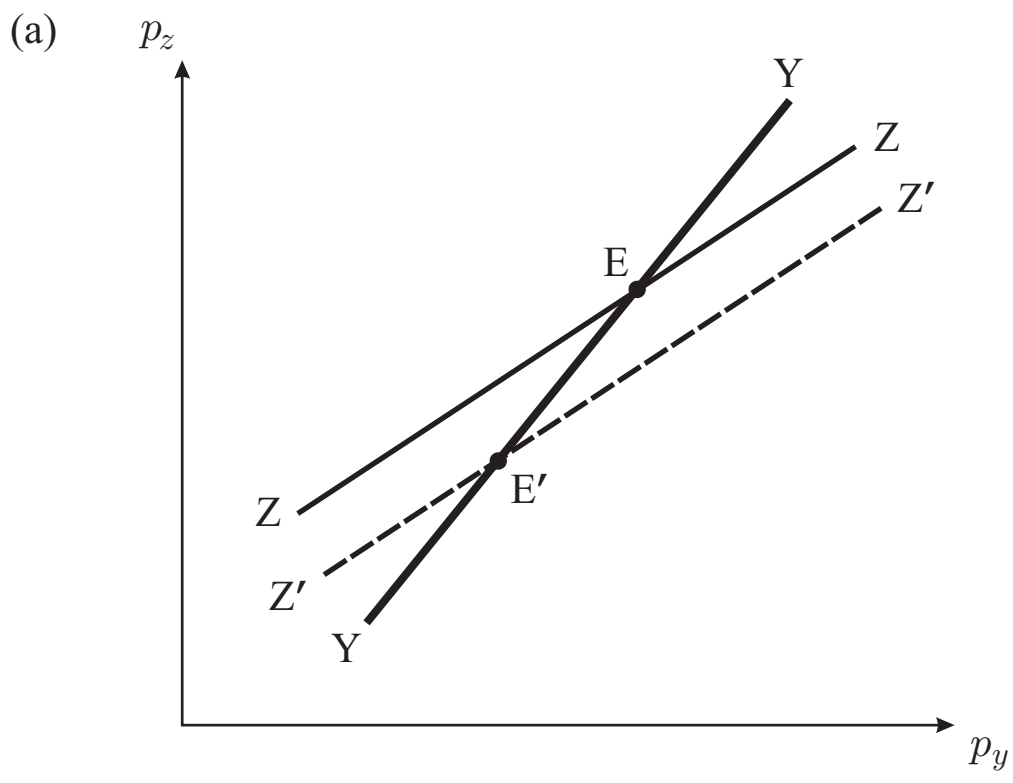
Figure 1

The Three-Country, Four-Good Framework

(a)

p_z

Y

Z

Z'

E

Z

E'

Z'

Y

p_y

(b)

p_z

Y

Z

Z'

E

Z

E'

Z'

Y

p_y

Figure 2

Price Effects of China's Trade Liberalization

(a) p_z axis; V_2^t, V_1^t, Y curves; points E' and E; p_y axis.
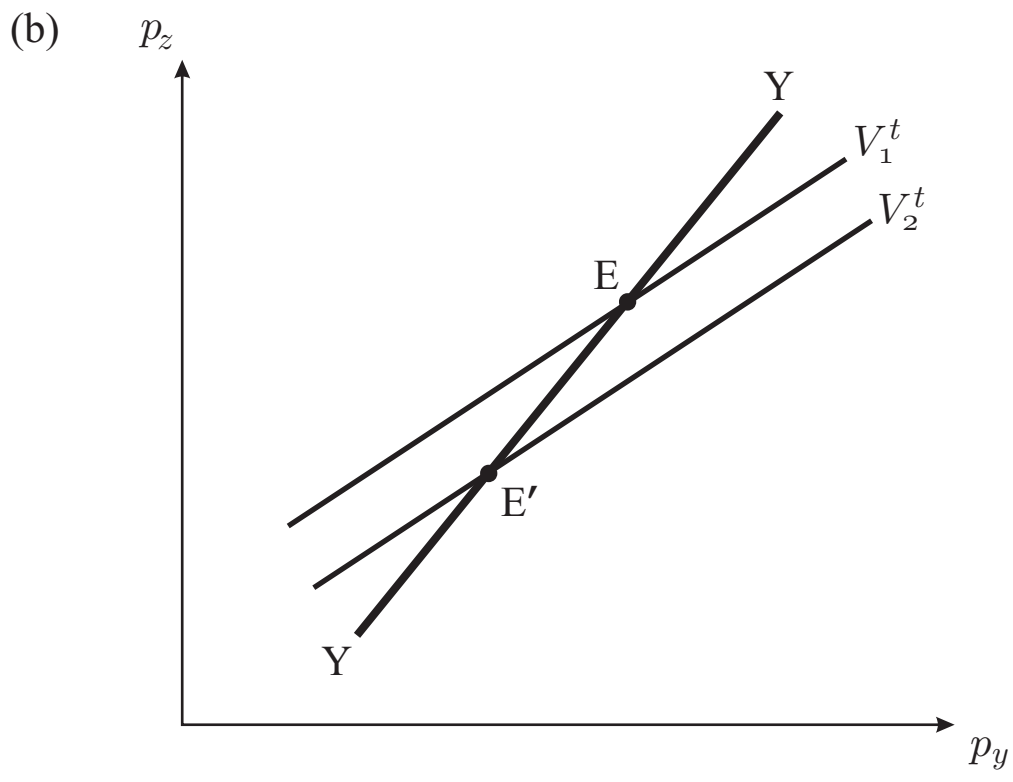
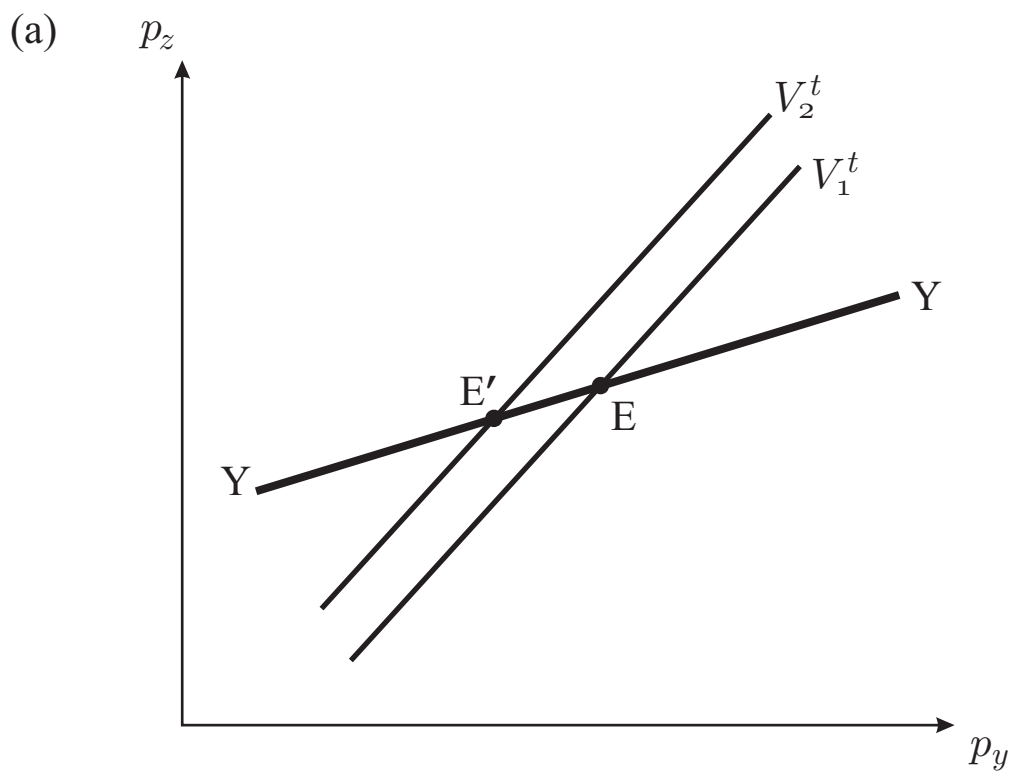(b) p_z axis; Y, V_1^t, V_2^t curves; points E and E'; p_y axis.

Figure 3

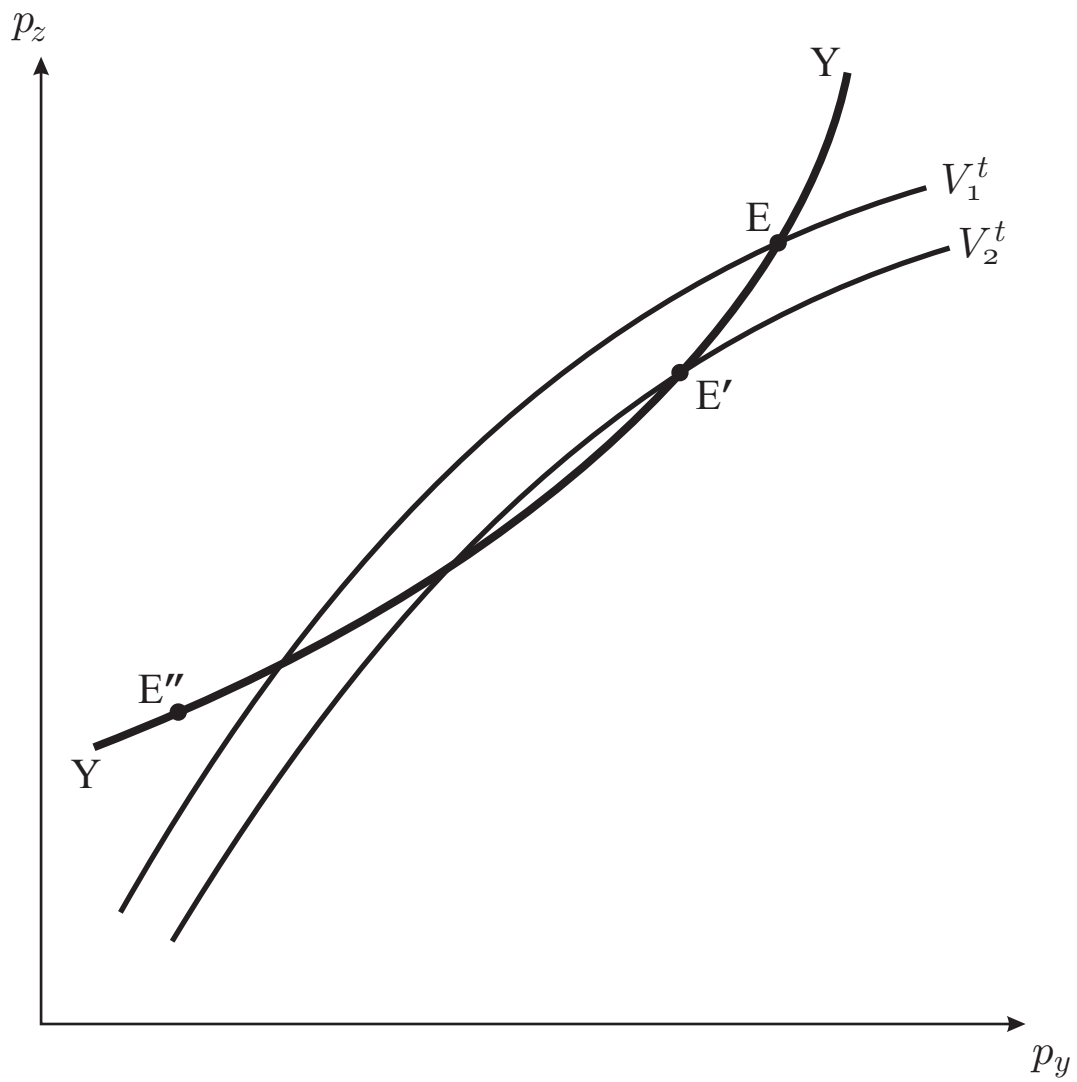China's Trade Liberalization and Thailand's Welfare

Figure 4

Welfare Impacts of China's Marginal and Finite Trade Liberalization

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