China's WTO Accession and Income Inequality

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Abstract

This paper investigates the effects of China's accession to the WTO on the international income inequality. China's WTO entry is expected to liberalize trade between the South (China) and the North (the Americas and EU). While empirical studies suggest that trade liberalization generates income convergence and reduces the per capita income gap between the poor and rich countries, China's WTO entry is shown to have an ambiguous effect on the income gap between the two regions. Similarly, trade liberalization by either region increases welfare of both regions, and does not necessarily reduce the gap in "real income" or utility.

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I. Introduction

After a ministerial meeting in Doha, Qatar, China became an official member of the World Trade Organization (WTO) a month later on December 11, 2001. China's WTO accession is expected to boost both the US-China and EU-China bilateral trade volumes. Both China and its trading partners are expected to benefit from China's expanding role in world trade. For instance, Ianchovichina, Martin and Fukase (2000) report that China's share of world exports will rise from 3.7 percent in 1995 to over 6.3 percent in 2005. If population is a guide, in the long run China's share of world exports may converge to its population share. However, little attention has been paid to the impact of trade expansion on the income gaps between high income countries and low income LDCs. Will such unprecedented trade liberalization shrink the income gap between industrial countries of Europe and the Americas and China?

There are two schools of thought regarding the effect of trade liberalization on international income inequality. Some have asserted that trade will tend to cause greater international inequalities between countries (Prebisch,1950; Singer, 1950, Myrdal, 1956). In contrast, Adam Smith envisioned the possibility in which trade between a rich country and a poor country leads to income convergence (Elmslie, 1994). Recent empirical studies also suggest that trade promotes income convergence. Rassekh and Thompson (1998) argue that since trade tends to equalize factor prices, per capita income can differ between countries primarily because of differences in capital-to-labor ratios.[1] Choi (2001) investigated the impact of neighbor-immiserizing growth in a model of three trading blocs. Chao and Yu (1997) also investigate the long run impacts of trade liberalization through relaxation of

quantity restrictions. Chao, Chou, and Yu (2001) analyzed the effect of trade liberalization through export duty rebates.

The purpose of this paper is to investigate whether China's entry into the WTO will deepen or reduce international inequality between the rich countries and China. This paper develops a two-country, two-good, two-factor, general equilibrium model within the North-South framework, and analyzes the impacts of trade liberalization on the income gap between the two regions. China (the South) is assumed to be abundant in labor and the North in capital. Two competing measures of national income are used to examine the effects of trade liberalization: national income and real income.

Section 2 develops the basic model. Section 3 investigates how trade liberalization affects the terms of trade and trade volumes, while Section 4 deals with the effects of trade liberalization on national incomes and welfare. Section 5 contains concluding remarks.

2. The Basic Model

We investigate the impacts of China's WTO accession within the North-South framework. The world consists of two trading blocs, the North (EU and the Americas) and the South (China).[2] China and the South are used interchangeably. We employ the following assumptions:

(1)　The South (China) consists of N identical workers who are also consumers.

(2)　Two factors, capital K and labor N, are used to produce two goods, the exportable Z and the importable Y.

(3)　The exportable Z is the numéraire, and the domestic price and the foreign price of the exportable are equal to unity.

(4)   The South is abundant in labor, whereas the North is abundant in capital. Both

regions have identical production technologies, and no factor intensity reversal occurs.

(5)   Factors are fully employed and are mobile between sectors.

(6)   Perfect competition prevails in product and factor markets.

It is important to note that factor price equalization is not assumed in this paper.

However, since no factor intensity reversal occurs, each region exports the product that

intensively uses its abundant factor.

Let Z and Y denote the domestic production of the exportable and the importable,

respectively. Variables of the North are denoted by lowercase letters. As in the standard

Heckscher-Ohlin model, the relationships between input and output are written as:

$$a_{KZ}Z + a_{KY}Y = K,$$

$$a_{NZ}Z + a_{NY}Y = N,$$

where a_{ij} is the input-output coefficient representing the amount of input i used to produce

one unit of product j, $i = K, N,$ and $j = Z, Y$. Production possibilities of the two regions are

given by

$$Z = F(Y),$$

$$z = f(y).$$

There is no uncertainty in the product prices, and producers are assumed to observe the world

price P^* and the domestic prices P and p.

In the South, consumer preferences are represented by a monotone increasing and

quasiconcave utility function, $U = U(C, X),$ where C and X denote domestic consumption of

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the exportable and the importable, respectively. Similarly, consumer preferences of the

North are denoted by $u = u(c, x)$. Budget constraints of consumers are:

$$PC + X = I,$$

$$pc + x = i,$$

where P and p are the domestic prices of the Y good, and I and i denote— in terms of the

numéraire—consumer income of the South and the North, respectively. The first order

conditions for optimal consumption are $U_C / U_X = P$ and $u_c / u_c = p$. Let $C = C(P, I)$ and

$X = X(P, I)$ denote the demand for the importable and the exportable. We assume that both

goods are normal in all countries. That is, in the South, $\partial C / \partial I > 0$ and $\partial X / \partial I > 0$. Demands

for the two goods, $c = c(p, i)$ and $x = x(p, i)$ of the North are similarly defined. The indirect

utility function can be written as

$$V = U[C(P, I), X(P, I)],$$

$$v = u[c(p, i), x(p, i)].$$

Assume that the home government restricts trade by imposing a tariff $T = P - P^*$ on

imports. In practice, export taxes are rarely used. Since the exportable good is used as a

numéraire in our analysis, we invoke Lerner's symmetry theorem that the export tax and

import tariff are equivalent in that they have identical effects on trade. Thus, we use the

export tax t on exports q for the North. Since the North imposes an export tax, the world

price, $P^* = p + t$, and the export price of Y in the North can deviate from its domestic price p.

The import demand function of China is

$$Q(P, I) = X(P, I) - Y(P), \tag{1}$$

which implies $Q_I = X_I$, where subscripts denote partial derivatives. Similarly, the North's export supply function is:

$$q(p,i) = y(p) - x(p,i). \qquad (2)$$

In the South, the government revenue from trade taxes is

$$G = TQ,$$

where T is a specific tariff. Following the convention, we assume that the tariff revenue is rebated to the consumer. Consumer income in China is written as

$$I = Z + PY + TQ.$$

Total revenue $Z + PY$ is distributed to factors, and is equal to factor income,

$$Z + PY + TQ = WL + RK.$$

Including the tariff revenue, the indirect utility functions can be written as

$$V(P,I) = V[P, Z + PY + TQ(P,I)],$$

$$(3)$$

$$v(p,i) = v[p, z + py + tq(p,i)].$$

Let the domestic price of the importable in China be

$$P = P* + T,$$

where T is the specific tariff. Note that in (1) an increase in T changes consumer income, $I = Z + PY + TQ$, which in turn affects China's import demand. Substituting consumer income into (1) gives

$$Q = X[P*+T, Z + (P*+T)Y + TQ(P,I)] - Y(P*+T) \equiv Q(P^*,T), \qquad (4)$$

where $Q(P^*,T)$ is now the reduced-form import demand function in terms of P^* and T, and it reduces to the usual import demand function $Q(P)$ in the absence of a tariff. Specific tariff rates, T and t, are assumed fixed.

Export taxes are rarely used in the real world. However, they are equivalent to export quotas, which have been used more often. Export quotas were used by OPEC during the 1970s, and again recently, raising the price of oil dramatically. To facilitate our analysis, we invoke Lerner's Symmetry Theorem that export taxes and import tariffs are equivalent in that they have identical effects on trade. We assume that the North imposes an export tax $t = P^* - p.$[3] Domestic price of Y in the North is $p = P^* - t$. From $q(p,i) = y(p) - x[(p,z+py+tq)]$, we get

$$q = y(P^*-t) - x[P^*-t, z+(P^*-t)y+tq(p,i)] \equiv q(P^*,t). \qquad (5)$$

The market clearing condition for China's importable good is:

$$Q(P^*,T) = q(P^*,t), \qquad (6)$$

where $q(P^*, t)$ is the North's export supply of Y.

3. China's Entry into the WTO and the Terms of Trade

In this section we investigate the effects of China's entry into the WTO on the terms of trade. We first examine how various parameters affect China's reduced import demand function in (4). Differentiating (4) with respect to T, we get

$$\frac{\partial Q}{\partial T} = X_P - Y' + X_I\left(Y+Q+T\frac{\partial Q}{\partial T}\right),$$

where X_P is the slope of the Marshallian demand curve, and Y' is the slope of the supply curve.

Let $X_P^u \equiv X_P + XX_I$ (< 0) be the slope of the compensated demand curve. Then

$$\frac{\partial Q}{\partial T} = \frac{X_P^U - Y'}{1 - TX_I} < 0. \tag{7}$$

Intuitively, this implies that an import tariff shifts the import demand curve to the left.

Differentiating (4) with respect to P^* gives

$$\frac{\partial Q}{\partial P^*} = X_P - Y' + X_I\left(Y + T\frac{\partial Q}{\partial P^*}\right) = \left(X_P^U - QX_I - Y'\right) + TX_I\frac{\partial Q}{\partial P^*}.$$

Rearranging terms, we get

$$\frac{\partial Q}{\partial P^*} = \frac{X_P^U - QX_I - Y'}{1 - TX_I} < 0, \tag{8}$$

since the importable is a normal good, the compensated demand curve X^U is negatively

sloped, and the supply curve of Y is positively sloped.

Differentiating the North's reduced form import demand function (5) with respect to t

gives

$$\frac{\partial q}{\partial t} = \left[x_p - x_i\left(-y + q + t\frac{\partial q}{\partial t}\right)\right] - y',$$

where $y'(p)$ is the slope of the North's supply curve of Y. Using the North's compensated

demand curve, we get

$$\frac{\partial q}{\partial t} = \frac{x_p^u - y'}{1 + tx_i} < 0, \tag{9}$$

That is, an export tax shifts the North's export supply schedule to the left. Differentiating (5)

with respect to P^* gives

$$\frac{\partial q}{\partial P^*} = y' - x_P - x_i \left(y + t \frac{\partial q}{\partial P^*} \right) = \left(y' - x_P^u + qx_I \right) - tx_I \frac{\partial q}{\partial P^*}.$$

Rearranging terms, we get

$$\frac{\partial q}{\partial P^*} = \frac{y' - x_p^u + qx_i}{1 + tx_i} > 0. \tag{10}$$

In terms of the parameters, China's entry into the WTO is represented by lowering tariffs by both the North and the South. How does China's unilateral trade liberalization affect the terms of trade? China's trade liberalization means a reduction in the tariff from the prohibitive rate T^o, at which China will not import any product from the North.[4] If the tariff rate is above the prohibitive rate T^o, China will be in autarky. Differentiating (6) with respect to T, holding all other tariffs constant, we get

$$\left(\frac{\partial Q}{\partial P^*} - \frac{\partial q}{\partial P^*} \right) \frac{\partial P^*}{\partial T} + \frac{\partial Q}{\partial T} = 0.$$

Rearranging terms, we get

$$\frac{\partial P^*}{\partial T} = -\frac{\dfrac{\partial Q}{\partial T}}{\dfrac{\partial Q}{\partial P^*} - \dfrac{\partial q}{\partial P^*}} < 0. \tag{11}$$

Note that $Q(P^*,T) - q(p^*,t)$ measures the world's excess import demand for Y. While individual countries may impose tariffs, the world's excess import demand must be inversely related to its price P^*. Since $\partial Q / \partial T < 0$ by (7), it follows that $\partial P^* / \partial T < 0$.

Similarly, differentiating (6) with respect to t gives

$$\left(\frac{\partial Q}{\partial P*} - \frac{\partial q}{\partial P*} \right) \frac{\partial P*}{\partial t} - \frac{\partial q}{\partial t} = 0.$$

Rearranging terms, we get

$$\frac{\partial P*}{\partial t} = \frac{\dfrac{\partial q}{\partial t}}{\dfrac{\partial Q}{\partial P*} - \dfrac{\partial q}{\partial P*}} > 0. \tag{12}$$

It follows that China's terms of trade improve as its own tariff increases, but worsen as the North's tariff increases.

4. China's WTO Accession and National Income

There are considerable empirical evidences showing that trade tends to reduce the income gaps between the rich and poor countries. Two measures may be used to determine whether the gaps between these countries are shrinking as a result of China's entry into the WTO: (1) national income and (2) consumer welfare. In a world of two factors, national income can be written as

$$\Phi = WN + RK, \tag{13}$$

where W and R are wage and capital rental, and N and K denote fixed supplies of labor and capital, respectively. Rassekh and Thompson (1998) and Slaughter (1997) focus their attention on per capita income,

$$\frac{\Phi}{N} = W + R\frac{K}{N}. \tag{14}$$

Countries may differ in capital endowment and population, as well as in factor prices. If trade equalizes factor prices, then differences in per capita income reflect the differences in capital abundance (K/N). By the Stolper-Samuelson Theorem, a change in tariff or trade

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liberalization affects the output prices and factor prices in (13). For instance, an increase in T

increases P, which in turn raises R, or the return to the factor intensively used in Y industry,

and decreases China's wage rate, W. Since factors receive income from production activities,

it is more convenient to work with an equivalent definition of national income. Specifically,

China's national income is:

$$\Theta = Z + PY = Z + (P*+T)Y. \tag{15}$$

Similarly, when z is used as the numeraíre, national income of the North is:

$$\theta' = z + py = z + (P*-t)y.$$

However, if its exportable is used as the numeraíre, the North's income is

$$\theta = z/p + y = z/(P*-t) + y. \tag{16}$$

One possible drawback of these concepts is that outputs are evaluated at domestic prices,

which can be distorted by tariffs.

The Effects of China's WTO Accession on China

We now examine the effects of China's WTO accession on China's income.

Differentiating (15) with respect to T, and noting $dZ + PdY = 0$ for maximization of

producer revenue, we obtain

$$\frac{\partial \Theta}{\partial T} = Y\left(1 + \frac{\partial P*}{\partial T}\right) > 0. \tag{17}$$

From (11), $\partial P*/\partial T < 0$. Note that in the absence of the Metzler paradox, $\partial P/\partial T > 0$.

The assumption that both traded goods are normal precludes this paradox. Thus, China's

trade liberalization reduces its national income.

How does the North's trade liberalization affect China's national income? Note that t does not affect China's income directly, but rather, indirectly through the terms of trade. Also, we assume that there is no strategic behavior, i.e., $\partial T/\partial t = \partial t/\partial T = 0$. Differentiating (15) with respect to t, and noting (12), we get

$$\frac{\partial \Theta}{\partial t} = Y \frac{\partial P^*}{\partial t} > 0. \tag{18}$$

Thus, unilateral trade liberalization by the Americas and EU *lowers* China's income.

The Effects of China's WTO Accession on the North

Next, consider the effects of China's entry into the WTO on the North. Similar to the expression for China's income, the North's national income is written as

$$\theta = z/p + y = z/(P^*-t) + y. \tag{19}$$

Differentiating (19) with respect to t and noting that $dz/(P^*-t) + dy = 0$ for maximization of national income, we obtain

$$\frac{\partial \theta}{\partial t} = -\frac{z}{p^2}\left(\frac{\partial P^*}{\partial t} - 1\right) > 0. \tag{20}$$

Note that $\partial P^*/\partial t > 0$ by (12). However, by Lerner's symmetry theorem, an export tax is equivalent to an import tariff. A rise in tariff creates a wedge between the increased domestic price and the decreased foreign price, and the absence of the Metzler paradox ensures that this tariff wedge works normally. In a case similar to the Metzler paradox, an increase in export tax may raise the foreign price P^* so much that domestic price $p = P^*-t$ may actually rise as well. However, since both goods are normal, this paradox does not

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occur, i.e., $dp/dt < 0$.[5] Barring a Metzler-like paradox for the export tax, we see that unilateral

trade liberalization by the North *decreases* its national income.

Note that China's tariff rate T does not affect the North's national income in (19)

directly, but through a change in the terms of trade. Differentiating (19) with respect to T

yields

$$\frac{\partial \theta}{\partial T} = -\frac{z}{p^2}\frac{\partial P^*}{\partial T} > 0. \tag{21}$$

That is, a unilateral reduction in China's tariff *lowers* the North's national income.

Comparing (17) and (21), we see that China's unilateral trade liberalization not only

reduces its own income but also the North's income. Thus, income divergence between the

two regions may widen or shrink by China's unilateral trade liberalization. From (18) and

(20), the North's unilateral trade liberalization also reduces its own national income as well

as China's national income. Again, the effect of unilateral trade liberalization on the income

gap between the two regions is ambiguous.

Proposition 1: Assume that national income is measured by factor income in (13). Then

unilateral trade liberalization by either region lowers the nominal incomes of both regions.

It follows that unilateral trade liberalization may widen or shrink the gap in nominal

incomes between the two regions. Nominal incomes do not adequately reflect the changes in

welfare. National income statistics are readily available and hence provide a basis for

international comparison of living standards. A drawback of using national income for this

purpose is that it varies with the terms of trade. For instance, when the tariff is lowered from

the prohibitive level, the South reaps gains from trade. However, (17) show that in the absence of the Metzler paradox, the South's national income continually declines as the tariff is reduced.

Real Income Convergence

We now consider another measure, consumer utility, to investigate whether China's entry into the WTO increases or decreases welfare gaps. How does a tariff reduction affect the South's consumer income and welfare? Differentiating $I = Z + PY + TQ$ with respect to T gives

$$\frac{\partial I}{\partial T} = Y\frac{\partial P}{\partial T} + Q + T\frac{\partial Q}{\partial T} > 0, \tag{22}$$

which is generally indeterminate. When evaluated at $T = 0$, this reduces to $\partial I / \partial T = Y(\partial P / \partial T) + Q > 0$. Note that tariff revenue is TQ, which is zero when $T = 0$, and as T increases, TQ increases at first, reaches a maximum, and declines thereafter. Except when autarky is chosen for noneconomic reasons, the tariff rate should be below the point that maximizes tariff revenue, at which rate $Q + T(\partial Q / \partial T) = 0$, and $\partial I / \partial T > 0$. When evaluated at the prohibitive tariff T^o, $\partial I / \partial T = Y(\partial P / \partial T) + T(\partial Q / \partial T)$. Since there is no tariff revenue at T^o initially, if Metzler paradox does not occur, a decrease in tariff will reduce the domestic price of the importable ($\partial P / \partial T > 0$), and yield positive tariff revenue ($T(\partial Q / \partial T) < 0$). Thus, beyond the tariff that maximizes tariff revenue, $\partial I/\partial T$ is indeterminate.

Next, differentiating I with respect to t gives

$$\frac{\partial I}{\partial t} = \frac{\partial I}{\partial P*}\frac{\partial P*}{\partial t} \tag{23}$$

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where

$$\frac{\partial I}{\partial P*} = Y + T \frac{\partial Q}{\partial P*},$$

which reduces to *Y* when the tariff is zero. Thus, an increase in the price of the importable raises consumer income. However, for a positive tariff, a rise in the price of the importable may not necessarily increase income.

Differentiating *V* in (3) with respect to *T* and using Roy's identity, we get

$$\frac{\partial V}{\partial T} = V_I \left(-X \frac{\partial P}{\partial T} + Y \frac{\partial P}{\partial T} + Q + T \frac{\partial Q}{\partial T} \right).$$

Recall that since both goods are normal, the Metzler paradox does not occur, and hence $\partial P / \partial T = \partial P * / \partial T + 1 > 0.$ Thus, we obtain

$$\frac{\partial V}{\partial T} = V_I \left(-Q \frac{\partial P}{\partial T} + Q + T \frac{\partial Q}{\partial T} \right) = V_I \left(-Q \frac{\partial P*}{\partial T} + T \frac{\partial Q}{\partial T} \right). \tag{24}$$

When evaluated at the prohibitive tariff T^o, $Q = 0$ and $\partial Q/\partial T < 0$, and hence $\partial V/\partial T < 0$ in (24). That is, China benefits from unilateral trade liberalization, i.e., from lowering its tariff from the prohibitive level. Starting from the free trade point ($T = 0$), an increase in T raises utility at first, reaches a maximum at the so-called optimal tariff ($\partial V/\partial T = 0$), and declines thereafter ($\partial V/\partial T < 0$). Comparing (22) and (24), we see that in the absence of the price effect on consumption $\left(-X \left(\partial P / \partial T \right) \right)$, the two equations will have the same sign. The utility criterion, rather than the national income criterion, more accurately captures the change in welfare when bilateral trade liberalization affects the terms of trade.

No strategic behavior is assumed in tariff settings between governments. As the foreign export tax rate varies, the South's import tariff remains constant, i.e., $\partial P / \partial t = \partial P * / \partial t$. Differentiating V in (3) with respect to t yields

$$\frac{\partial V}{\partial t} = V_I \left(-Q + T \frac{\partial Q}{\partial P*} \right) \frac{\partial P*}{\partial t} < 0, \tag{25}$$

where $\partial Q * / \partial P* < 0$ by (8) and $\partial P * / \partial t > 0$ by (12). Thus, unilateral trade liberalization by the North raises China's welfare. Comparing (18) and (25), we see that trade liberalization by the North raises China's welfare, but reduces its income. Thus, the two criteria yield conflicting signals.

Proposition 2: From the autarky situation, China's unilateral trade liberalization reduces its nominal income but improves its welfare. However, beyond a certain point, China may not benefit from further unilateral trade liberalization.

How does the North's trade liberalization affect China? The North's tariff affects the South's welfare only through the terms of trade changes. Differentiating (3) with respect to t gives

$$\frac{\partial V}{\partial t} = \frac{\partial V}{\partial P*} \frac{\partial P*}{\partial t} < 0, \tag{26}$$

since

$$\frac{\partial V}{\partial P*} = V_I \left(-Q + T \frac{\partial Q}{\partial P*} \right) < 0,$$

and by (12) $\partial P * / \partial t > 0.$ That is, the North's trade liberalization benefits China.

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Next, consider the effects of unilateral trade liberalization by the North. Differentiating $i = z + (P* - t)y + tq$ with respect to T, and noting that in (11) $\partial P*/\partial T < 0$, gives

$$\frac{\partial i}{\partial T} = \left(y + t\frac{\partial q}{\partial P*} \right)\frac{\partial P*}{\partial T} < 0. \tag{27}$$

That is, per capita income of the North shrinks as China reduces its tariff unilaterally.

Note that the North's own export tax affects the exports directly and also indirectly via a change in the terms of trade. That is, $dq/dt = \partial q/\partial t + (\partial q/\partial P*)(\partial P*/\partial t)$. Since the intent of an export tax is to reduce exports, we assume that dq/dt is negative. Differentiating $i = z + py + tq$ with respect to t gives

$$\frac{\partial i}{\partial t} = y\frac{\partial p}{\partial t} + q + t\frac{dq}{dt} > 0. \tag{28}$$

When evaluated at the prohibitive tariff rate t^o, $\partial i/\partial t = y(\partial p/\partial t) + t(dq/dt)$. Since there is no export tax revenue at t^o initially, if a paradox does not occur, a decrease in tax will raise the domestic price of the exportable ($\partial p/\partial t < 0$), and yield positive tariff revenue ($t(\partial q/\partial t) < 0$), but it will be negligible initially because the change in export volume will be small. Thus, the North's per capita income increases initially in the neighborhood of autarky, i.e., $\partial i/\partial t > 0$.

Differentiating the North's indirect utility in (3) with respect to t gives

$$\frac{\partial v}{\partial t} = v_i\left(q\frac{\partial P*}{\partial t} + t\frac{dq}{dt} \right). \tag{29}$$

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At the prohibitive export tax t^o, $q = 0$, and hence $\partial v/\partial t < 0$. That is, the North also benefits initially from its unilateral trade liberalization. Differentiating v in (3) with respect to T gives

$$\frac{\partial v}{\partial T} = v_i \left((-x + y) \frac{\partial P^*}{\partial T} + t \frac{\partial q}{\partial P^*} \frac{\partial P^*}{\partial T} \right)$$

$$= v_i \left(q + t \frac{\partial q}{\partial P^*} \right) \frac{\partial P^*}{\partial T} < 0,$$

(30)

since the foreign export supply curve is positively sloped ($\partial q/\partial P^* > 0$), where $q = y - x$ is the foreign export supply of the Y good. Thus, the South's trade liberalization benefits the North.

Comparing (24) and (30), China's trade liberalization benefits both China and the North. From (26) and (29), the North's trade liberalization clearly benefits both regions. In either case, trade liberalization raises the welfare of both regions, rather than reducing the income gap between the two regions.

Proposition 3. Unilateral trade liberalization by either the North or the South not only improves its own welfare but also raises the welfare of the other region, and does not reduce the real income (welfare) gap between the two regions.

4. Concluding Remarks

This paper investigated the impacts of China's WTO accession within the North-South framework. Comparative static results are summarized in Table 1. National income, measured by factor income $\Theta = WN + RK$, is often used for international comparison of living standards because it is readily available. However, this measure is easily manipulated by protectionist policies, because the terms of trade can be adjusted by tariffs or export taxes.

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At any rate, it is shown that unilateral trade liberalization by either trading bloc widens the income gap between the rich (the Americas and EU) and the poor regions (China).

Utility is a better measure in some sense for international comparison of "real" income gaps between countries. Unilateral trade liberalization by either the South or the North benefits both regions, and hence does not necessarily narrow the "real income" gap between the two regions. However, it is often argued that trade expansion between the two regions will tend to equalize factor prices. If trade causes factor prices to move toward equalization, then from (14), the income gap between the two regions entirely depends on the capital-labor ratios (K/N). If increased trade induces LDCs to accumulate more capital per person, then trade will generate income convergence. If not, expanding trade may perpetuate international income inequality as Krueger (1968) had argued earlier. The key to success or rising productivity of China and other newly industrializing countries may be found in capital accumulation afforded by their export-oriented policies. For instance, Owen (1999) found that countries with low human capital stocks tend to increase their accumulation of human capital with increased trade.

	North	South
Trade	$\dfrac{\partial Q}{\partial T} < 0$ $\dfrac{\partial Q}{\partial P*} < 0$ $\dfrac{\partial P*}{\partial T} < 0$	$\dfrac{\partial q}{\partial t} < 0$ $\dfrac{\partial q}{\partial P*} > 0$ $\dfrac{\partial P*}{\partial t} > 0$

National Income	$\dfrac{\partial \Theta}{\partial T} > 0$ $\dfrac{\partial \Theta}{\partial t} > 0$	$\dfrac{\partial \theta}{\partial T} > 0$ $\dfrac{\partial \theta}{\partial t} > 0$
Utility	$\dfrac{\partial V}{\partial T} < 0$ $\dfrac{\partial V}{\partial t} < 0$	$\dfrac{\partial v}{\partial T} < 0$ $\dfrac{\partial v}{\partial t} < 0$

Table 1. The Effects of China's WTO Accession on Income and Welfare

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Endnotes

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[1] Krueger (1968) suggests that when factor endowments are dissimilar between countries,

trade will equalize factor prices and can perpetuate divergence of per capita incomes.

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[2] See Choi (2001) for an analysis of with three trading blocs. In his model, China competes with other Asian countries.

[3] Suppose that the North imposes a tariff on its imports $(c-z)$. Recall that the price of the numéraire is unity. Balance of trade requires

$$(c-z) = p*(y-x).$$

Let α be the *ad valorem* tariff that the North imposes on its imports of the numéraire. Then the North's tariff revenue from restricting imports is

$$\alpha(c-z) = \alpha P*(y-x).$$

This shows that imposing an *ad valorem* tariff α on imports $(c-z)$ amounts to imposing an ad valorem tax α—or specific export tax $t = \alpha P*$ per unit—on the North's export $(y-z)$, which yields tax revenue $\alpha P*(y-x) = t(y-x)$.

[4] The South's prohibitive tariff rate T^o is not fixed, but depends on the export tax of the North. Conversely, the North's prohibitive export tax t^o also depends on the tariff the South imposes.

[5] Recall that the export tax t is equivalent to an import tariff t imposed on the North's import of Z, whose relative price is $1/p$. Note that $d(1/p)/dt = -(dp/dt)/p^2 > 0$ in the absence of Metzler paradox, which is precluded because both goods are normal.