Trade and Development Review
Vol. 2, Issue 2, 2009, 70-78
http://www.tdrju.net

The Greater the Differences, the Greater the Gains?♣

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This paper addresses the fundamental question of whether, in a comparative-advantage context, the gains from trade will be greater when the differences between trading countries are greater. Such a presumption is established. The paper then discusses circumstances that could cause the presumption to fail.

JEL Classification: D60, F13, H20

Keywords: Trade gains, International differences

1. Introduction

In the late 1970s and early 1980s trade theorists devoted much effort to developing non-comparative-advantage models featuring economies of scale and imperfect competition. This development was explicitly motivated by accumulating empirical evidence emphasizing that the larger part of world trade consisted of the exchange of (relatively similar) manufactures between (relatively similar) industrial countries. One often heard statements like, "Comparative-advantage trade is trade to exploit differences, so this can't be comparative-advantage trade." Such statements were nonsense. It is true that, in a comparative-advantage world, if autarky relative prices do not differ much across countries, trade can produce only modest relative-price changes in each country. But such modest changes can induce large trade volumes if import price-elasticities are high enough, and it is exactly with trade between similar countries in similar goods that we would expect elasticities of substitution (and so import elasticities) to be the highest. This is illustrated in Figure 1, where highly elastic home import-demand (M) and foreign export-supply (X^*) relations produce a large volume of trade despite only modest differences in autarky relative prices.

♣ This paper was presented at the international seminar on "Gobalization, Agglomeration, and Inclusive Growth," May 21-22, 2009 at Jadavpur University, Kolkata, India. This paper exists because of the stimulation provided by Kemp and Tran-Nam (2007). Roy Ruffin contributed valuable comments.

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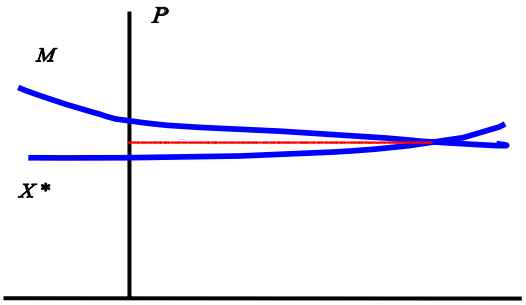

Figure 1: Volume of Trade

Figure 2 makes a similar point in the context of a Ricardian model, where the high elasticities come from substitution in production. Here, *A* and *A** denote autarky equilibrium in a situation where the two countries are pretty similar, and *B* and *B** autarky equilibrium in an alternative situation of very dissimilar countries. If tastes are the same in both cases, the free-trade equilibria, denoted *T* and *T** will be identical. Clearly, the volume of trade is the same when international differences are small as when they are huge, but the two situations differ dramatically regarding the *gains* from trade.

So, to our students we may say something like: "But it still matters whether this trade is due to comparative advantage rather than to something else. While comparative advantage need not imply 'the greater the differences, the greater the **trade**,' it does suggest '*the greater the differences, the greater the* ***gains***.' This suggests that the more important consequences of trade policies are those impacting trade between dissimilar countries, even though that may be a smaller part of world trade. But if this trade is due to something other than comparative advantage, all bets are off."

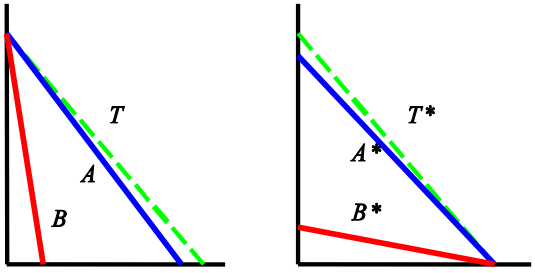

Figure 2: Volume of Trade in a Ricardian Model

But we can point our students to no formal proposition addressing the statement in italics! Instead we may present a few (well-chosen, we hope) examples. Such a proposition should be a fundamental part of comparative-advantage trade theory, comparable in importance to the comparative-advantage theorem itself. This paper investigates whether, in a comparative-advantage world, greater differences do imply greater gains. When greater differences imply greater trade, or when greater trade can be expected to be correlated with greater gains, is **not** addressed here.

2. The Framework

I wish to address the issue of *the greater the differences, the greater the gains* (**GD–GG**) in a framework of general differences, confined of course to a comparative-advantage context. Suppose a two-country, two-good, comparative-advantage world (perfect competition, no externalities) with a free-trade equilibrium described by:

$$M(P, \alpha) = X^*(P, \alpha), \qquad \textbf{(1)}$$

where M is home excess demand for good B, X^* foreign excess supply, and P the free-trade relative price of B in terms of A. Designate the country with the comparative advantage in A as the home country (so that M and X^* are positive). The vector α encompasses all parameters determining the degree of comparative advantage of the two countries: endowments, technology parameters, taste parameters, relevant government policies.

With so many parameters, it's desirable to restrict parameter changes in some way to ensure that comparisons are meaningful. A natural point of reference is a given free-trade equilibrium **(1)**. Consider the set of all possible changes $d\alpha$ that satisfy:

$$M_\alpha \bullet d\alpha = X^*_\alpha \bullet d\alpha \qquad \textbf{(r1)}$$

$$de + de^* = 0 \qquad \textbf{(r2)}$$

and,

$$P(\partial b_0/\partial\alpha + \partial b_0^*/\partial\alpha) + (\partial a_0/\partial\alpha + \partial a_0^*/\partial\alpha) \leq 0. \qquad \textbf{(r3)}$$

Here e and e^* denote home and foreign expenditure in the free-trade equilibrium, and (b_0, a_0) and (b_0^*, a_0^*) respectively denote home and foreign autarky production (= consumption) of the two goods. So **r1** and **r2** restrict attention to parameter changes that leave the world relative price and the

world income (but not the international distribution of that income) unchanged in the free-trade equilibrium. The reason for **(r2)** is that a change in the size of the world economy would itself change the gains from trade, independently of whether the countries had become less alike or not, and the purpose of **(r3)** is to prevent the parameter change from eroding trade gains simply by enhancing the value of autarky. The roles of these constraints will be discussed later. The basic idea is to start with a given free-trade equilibrium and then ask whether the gains that that equilibrium generates are greater the greater the differences in the countries that are trading.

Consider **only** $d\alpha$ that satisfy **r1**, **r2** and **r3**. **(R)**

With the point of reference thus set, the next step is to specify what is meant by "greater differences" (**GD**). I think that, in a comparative-advantage setting, the compelling candidate is simply autarky price differences. Autarky prices are given by

$$M(P_0, \alpha) = 0 = X^*(P_0^*, \alpha). \qquad \textbf{(2)}$$

Since the home country has the comparative advantage in A, $P_0 > P_0^*$. So a parameter change can be said to produce greater differences between the two countries if:

$d\alpha$ implies that $dP_0 > dP_0^*$. **(GD)**

Finally I must specify what I mean by "greater gains" (**GG**). Measure the global gains from trade in the following conventional way.

$$G = e + e^* - (Pb_0 + a_0) - (Pb_0^* + a_0^*). \qquad \textbf{(3)}$$

If G is positive, world income with free trade is more than sufficient, at free trade prices, to purchase the world autarky consumption bundle. By "greater gains" I mean simply that G increases.

$d\alpha$ implies that $dG > 0$. **(GG)**

So, my criterion is that, globally, gainers gain more than losers lose. This is analogous to the basic gains-from-trade proposition of comparative advantage that, in each country, gainers gain more (strictly: not less) from trade than losers lose. Of course the literature has gone beyond that to investigate the existence of a lump-sum transfer scheme that would produce a Pareto improvement [see Kemp (1962), Samuelson (1962), Grandmont and McFadden (1972), and Kemp and Wan (1972)]. Also, Dixit and Norman (1980, pp 79, 80) have demonstrated the use of commodity and factor taxes and subsidies to generate a Pareto improvement. Analogously, I could now also ask

what further restrictions on **R** might guarantee that all individuals gain, not just the world as a whole (while ruling out *international* lump-sum transfers). But I instead investigate only the more basic issue.

3. Analysis

So, now the stage is set to pose the basic question: When must a $d\alpha$ consistent with **R** and implying **GD** necessarily also imply **GG**? An answer comes fairly easily.

From **(2)**,

$$dP_0 = -\frac{M_\alpha^0 \bullet d\alpha}{M_{P^0}^0}, \qquad dP_0^* = -\frac{X_\alpha^{*0} \bullet d\alpha}{X_{P^{*0}}^{*0}}$$

Now, $X_{P^0}^{*0} > 0 > M_{P^0}^0$, since these expressions are evaluated at autarky where income effects wash out. Impose the following.

> **Assumption 1** Given $d\alpha$, $M_\alpha \bullet d\alpha$ has the same sign over all P for which $M \geq 0$, and $X_\alpha^* \bullet d\alpha$ has the same sign over all P for which $X^* \geq 0$.

Now, **r1** requires $M_\alpha \bullet d\alpha$ to have the same sign as $X_\alpha^* \bullet d\alpha$, in the initial free-trade equilibrium, and Assumption 1 ensures that this will be the same sign as that of $M_\alpha{}^0 \bullet d\alpha$ and $X_\alpha^{*0} \bullet d\alpha$. Because of the assumed pattern of comparative advantage, $P_0 > P_0{}^*$. If the signs of $M_\alpha{}^0 \bullet d\alpha$ and $X_\alpha^{*0} \bullet d\alpha$ are both positive, $dP_0 > 0$ and $dP_0{}^* < 0$, by **(4)**, whereas both signs being negative gives the opposite result. Thus, a $d\alpha$, consistent with **R**, causes **GD** with $dP_0 > 0$ and $dP_0{}^* < 0$, given Assumption 1, if it causes both terms to be negative.

So, given **GD**, differentiate **(3)**:

$$dG = de + de^* - P\left[\frac{\partial b_0}{\partial \alpha} + \frac{\partial b_0^*}{\partial \alpha}\right] - \left[\frac{\partial a_0}{\partial \alpha} + \frac{\partial a_0^*}{\partial \alpha}\right] - \left[P\frac{\partial b_0}{\partial P_0} + \frac{\partial \alpha_0}{\partial P_0}\right]dP_0 - \left[P\frac{\partial b_0^*}{\partial P_0^*} + \frac{\partial \alpha_0^*}{\partial P_0^*}\right]dP_0^*$$

$$\geq -\left[P\frac{\partial b_0}{\partial P_0} + \frac{\partial \alpha_0}{\partial P_0}\right]dP_0 - \left[P\frac{\partial b_0^*}{\partial P_0^*} + \frac{\partial \alpha_0^*}{\partial P_0^*}\right]dP_0^*$$

$$= \left[(P_0 - P) \frac{\partial b_0}{\partial P_0} \right] dP_0 - \left[(P - P_0^*) \frac{\partial b_0^*}{\partial P_0^*} \right] dP_0^*$$

The inequality in **(5)** follows from **r2** and **r3** and the second equality from the production envelope theorem valid in comparative-advantage models.

The terms $(P_0 - P)$ and $(P - P_0^*)$ are both non-negative, with at least one strictly positive, since the home economy has a comparative advantage in A. Production substitution in a comparative-advantage world implies that db_0/dP_0 and db_0^*/dP_0^* are both positive (assuming we are not confined to an endowment model). Finally, **r1** and Assumption 1 give **GD** with $dP_0 > 0$ and $dP_0^* < 0$. Thus $dG > 0$.

Proposition 1 Given Assumption 1, any $d\alpha$ consistent with **R** that implies **GD** also implies **GG**.

Proposition 1 establishes a "presumption" that, indeed, the greater the differences, the greater the gains.

4. Discussion

Proposition 1 gives only a presumption because it depends upon Assumption 1 and, also, on how the problem is defined by **R**. In particular, the requirements **r2** and **r3** restrict the domain of relevance of Proposition 1. This section addresses circumstances that could cause the presumption to fail, that is, circumstances under which greater differences do *not* cause greater gains.

Inferiority

We have an opportunity for counterexamples to **GD–GG** if we dispense with Assumption 1. Assumption 1 says that the parameter change should shift the import-demand (export-supply) curve unambiguously in one direction or another. This is true in most of the standard exercises. But sufficient inferiority in consumption could produce violations. Suppose, for example, that imports are very inferior. Then a parameter change that caused an economy to want to import more near autarky, where income effects basically wash out, might cause it to want to consume less in free trade, with significant income effects.

Figure 3 illustrates how a failure of Assumption 1 might vitiate the presumption. The initial equilibrium is at E with free-trade relative price P'. The parameter change $d\alpha$ shifts the initial M and X^* schedules to M' and $X^{*\prime}$, respectively, with the equilibrium moving to E'. The free-trade price remains at P', as required by **(R)**. Both autarky prices rise, but P_0 rises more than P_0^*, so **(GD)** is satisfied. This is possible because X^* shifts to the left near autarky but to the right with a higher volume of trade, that is, X^* "twists" as a result of the parameter change. Foreign inferiority in the consumption of B could cause this: Near autarky the income gain from trading more could raise foreign consumption of B, leaving less for export, whereas at the higher income levels produced by larger trade gains foreign consumers purchase less of the inferior B, leaving more for export. The last two terms on the right-hand side of **(5)** now work to cross purposes, and the last term will dominate if $P - P_0^*$ is large enough relative to $P_0 - P$, that is, if trade is sufficiently more valuable to the foreign economy than to the home economy. (The figure shows $P - P_0^*$ larger than $P_0 - P$).[1]

Assumption 1 is only a sufficient condition, not a necessary one. So the suggestion is that while counterexamples are unlikely to be important, they do exist, and they would likely (but not necessarily) involve significant inferiority in consumption. This is consistent with the message delivered by Kemp and Tran-Nam (2009).

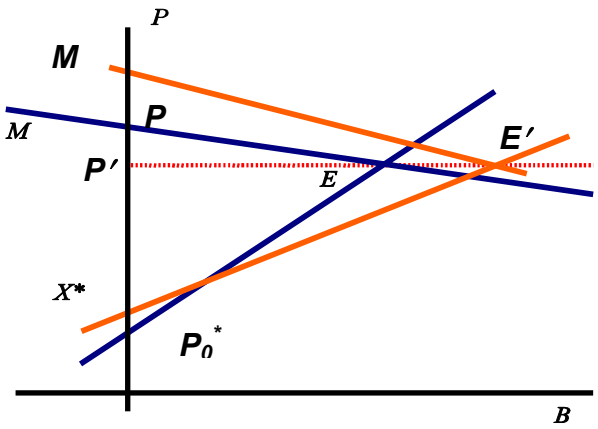

Figure 3: Consumption Inferiority

1. Note that, in Figure 3, the increase in differences between the two countries has indeed increased the volume of trade. But, as mentioned in Section I, this paper does not address this issue.

The Heckscher-Ohlin-Samuelson model

Perhaps more interesting, though, is the role played by **R**, especially by **r2**. Note that, if $de + de^* > 0$, the above logic is not affected (indeed, reinforced), so that Proposition 1 still holds. Thus **r2** can be generalized to $de + de^* \geq 0$.

So, suppose that a $d\alpha$, consistent with **r1** and implying **GD**, also implies that $de + de^* < 0$. In this case, the above logic still implies that, with **GD**, the world does gain relative to the *initial* free-trade world income, but that the actual free-trade world income falls, leaving the net gain from trade indeterminate.

For a concrete example, consider the textbook Heckscher-Ohlin-Samuelson world with two countries that, except for endowments, are identical, including identical homothetic tastes. Let Assumption 1 hold, and consider the role of **R**.

Suppose that with free trade both countries are in a common free-trade diversification cone. Then a transfer of capital from one country to the other, provided it leaves both in the diversification cone, clearly satisfies **r1** and **r2**. Consecutive transfers of capital from the labor-abundant country to the capital-abundant one make the two countries more dissimilar. Also, such transfers move capital from the country where, in autarky, its marginal productivity is higher to where it is lower, so that **r3** is also satisfied. Thus such transfers satisfy Proposition 1 and consecutively increase the gains from trade, as long as both countries remain in the diversification cone.[2]

But when at least one country leaves that cone, the free-trade equilibrium will feature specialization by at least one country. Then a further transfer of capital from the labor-abundant country to the capital-abundant one, which would increase even more the international disparity in relative factor endowments, would now also shift capital from where, with free trade, its marginal product is now relatively high to where it is now relatively low, thus lowering world income with free trade at the initial P. Thus **r2** fails while **r3** still holds. On balance, the net gain from trade could either rise or fall.

The moral seems to be that, if free trade features specialization, trade has not been sufficient to counteract completely the effect of national borders. Thus making countries even more dissimilar accentuates the negative effect of those borders in the trading equilibrium. This is a significant

2. Note that, in this case also, such transfers do increase the volume of trade.

qualification to the **GD-GG** presumption, perhaps more important than counter-examples involving departures from Assumption 1. And **r2** is very useful in exposing the argument.
In principle, a failure of **r3** could also vitiate the prediction of Proposition 1. But I have been unable to find any significant counter-examples. The HOS model discussed in this section satisfies **r3**, as does the Ricardian example illustrated in Figure 2.

Understanding the qualifications to the presumption facilitates a judgment about when it is most likely to be pertinent. For example, trade between rich countries tends to feature substitution effects that are strong relative to income effects and much diversification in national production. So the presumption established by Proposition 1 can be expected to be high in this context.

5. Concluding Remarks

I have addressed the fundamental question of whether, in a comparative-advantage context, the gains from trade will be greater when the differences between trading countries are greater. When the question is formalized in what I regard as the natural way, such a presumption does indeed hold, but it is not a certainty. Two sets of plausible circumstances could cause the presumption to fail: large income effects relative to substitution effects combined with significant inferiority in consumption, and specialization in production under free trade.

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