# COUNTRY-BASHING TARIFFS: DO BILATERAL TRADE DEFICITS MATTER?

W. Michael Cox

and

Roy J. Ruffin

June 1995

**RESEARCH DEPARTMENT**

**WORKING PAPER**

**95-03**

**Federal Reserve Bank of Dallas**

Country-Bashing Tariffs: Do Bilateral Trade Deficits Matter?

W. Michael Cox
Federal Reserve Bank of Dallas
and Southern Methodist University

and

Roy J. Ruffin
University of Houston
and Federal Reserve Bank of Dallas

June 1995

Abstract

This paper investigates the impact of restricting bilateral trade imbalances in a very simple three country, three good model. The pattern of bilateral trade balances matters because in the Nash equilibrium, each country will impose tariffs on countries with whom they have bilateral deficits or promote trade with countries with whom they have bilateral surpluses. Nevertheless, all countries lose from a Nash country-bashing war. It is shown that while each country loses from the unilateral elimination of its bilateral imbalances, a country can gain from a bilateral agreement with its deficit partner provided that country has a surplus with a country devoted to free trade. The incentive of individual countries to bash other countries in a multilateral world gives an argument for a world trade agreement.

Country-Bashing Tariffs: Do Bilateral Trade Deficits Matter?

W. Michael Cox and Roy J. Ruffin[1]

Over the past decade, America's exports to Japan have averaged only three-fourths of imports from that nation. America's long-time bilateral trade deficit with Japan has led to repeated Japan-bashing —actual or threatened tariffs or quotas on Japanese goods (Bayard and Elliot, 1994). In the Spring of 1995, for example, the U. S. threatened 100 percent duties on Japanese luxury cars on the grounds that Japan's automobile market is closed to American products.[2]

It is well known to international trade theorists that the maximum gains from trade come from multilateral, not bilateral exchange. The folk wisdom among trade theorists is that bilateral trade deficits with specific countries do not matter because they are generally offset by bilateral surpluses with other nations. As put by Corden (1993, p. 74), for example, focusing on bilateral balances is "grossly misguided." Perhaps as a consequence of this understanding, trade

[1] Federal Reserve Bank of Dallas and Southern Methodist University; University of Houston and Research Associate, Federal Reserve Bank of Dallas. We wish to thank David Gould for his insightful comments and Levent Akdeniz for his assistance. The views expressed here are the authors and are not necessarily those of the Federal Reserve System.

[2] The evidence that the U.S. bilateral deficit with Japan is due to Japanese policies is mostly anecdotal. For example, stories abound that Japan's complex distribution system, exclusionary business practices, and lax antitrust enforcement are responsible for the deficit. Regression analysis tells a different story. Saxonhouse (1983, 1986) presents cross-country regressions in which Japan is shown to be no more protectionist than other advanced countries. Zwiebel (1993) applies the Saxonhouse methodology to a smaller set of countries (the Group of Seven) and finds that Japan imports *more* than the predicted amounts for most manufacturing industries while the United States imports *less*. Although Lawrence (1987) reached different conclusions, it is reasonable to conclude, along with Bhagwati (1989), that Japan is not "asymmetrically denying access to its markets in manufactures" (Bhagwati, 1989, p. 70).

theorists have paid little attention to the study of bilateral imbalances.[3] Indeed, we are not aware of a single paper that explores the welfare consequences of controlling bilateral trade imbalances.[4]

This paper extends the theory of optimal tariffs to consider country-bashing tariffs, that is, tariffs or subsidies on the goods from particular countries. We explore bilateral trade issues by developing a very simple, three country, three good model that highlights the welfare aspects of bilateral trade. In our model, a country can lower its bilateral trade deficit with one of its trading partners by either taxing that country's goods or by subsidizing imports from the other country. Uniform import or export tariffs have no impact. Thus, the only tariffs that have any impact in our model are differential tariffs or subsidies. Specific country-bashing tariffs hurt one trading partner and help the other. For example, when the U.S. imposes tariffs on Japanese luxury cars, the effect is equivalent to a subsidy on German or Swedish luxury cars.

To focus squarely on the issue of bilateral trade imbalances, we abstract from the usual optimal tariff argument. The standard theory of optimal tariffs applies to the imposition of tariffs by one country on goods from the rest of the world. From this literature, economists know that a large country can gain by cutting its exports to the rest of the world, even if other countries retaliate (Johnson, 1953). But just as it was useful for trade theorists to abstract from comparative advantage to study intra-industry trade (Krugman, 1979), so it may prove useful to abstract from the common optimum tariff argument in order to more clearly understand the economics of bilateral trade.

[3] The emphasis has been on explaining bilateral trade flows by using the gravity equation. See Anderson (1979), Helpman and Krugman (1985), Bergstrom (1987), and Thursby and Thursby (1987).

[4] It should be noted that the public finance literature examines the issue of the harmonization of domestic taxes within a customs union when member countries may have a bilateral imbalance with non-member countries. See Berglas (1981) and Georgakopoulos (1992) for an analysis of the Pareto-inefficiencies of such unions.

We show that eliminating bilateral trade deficits *unilaterally* is always harmful. An incipient, unanswered, country-bashing tariff on the deficit partner (or subsidy on the surplus partner), however, is always beneficial.[5] But if *all* countries play this game, all lose. Thus, it is no more irrational for countries to focus on the pattern of bilateral trade deficits and surpluses than for prisoners to confess in the prisoners' dilemma game. Indeed, we find that for our model the Nash equilibrium for country-bashing tariffs involves the partial elimination of a bilateral imbalances. This may in part explain why countries are so concerned with bilateral imbalances. The result is also reflective of the concerns of trade theorists: if all countries lose from a Nash country-bashing war, focusing on bilateral deficits turns out to be a self-defeating policy.

In our model, if in free trade there are no bilateral imbalances, then the Nash equilibrium is also free trade. If one country nevertheless imposes a tariff, the country on whom the tariff has been imposed will now have a bilateral deficit with that country and will have an incentive to retaliate.

In general, when we move away from Nash games, we find that if one country insists on free trade, the partner with whom it has a bilateral deficit can actually gain from forcing the remaining country into a bilateral agreement that eliminates or reduces their bilateral trade deficit. This is accomplished by threatening even more damaging unilateral action.

Section I illustrates the setup with a simple example and diagram that can be used to show how bilateral trade works. Section II formally presents the formal model, derives the equilibrium for any vector of tariffs, and shows that a common country-bashing tariff harms all countries. Section III computes the Nash equilibrium and shows how the pattern of bilateral

[5] This is much stronger than the usual result that a subsidy *may* be optimal when several terms of trade are involved. See Corden (1976) and Jones (1967).

balances determines the costs and benefits of country-bashing. Section IV examines the welfare consequences of eliminating bilateral trade deficits and presents a simple measurement of the bilateral trade deficit. Section V presents an argument for a world trade agreement that is truly multilateral (three or more countries). Section VI states the conclusions.

**I. Introduction and Preview**

Bilateral trade imbalances arise because in a multilateral world reciprocal demands between any pair of countries need not be the same. Endowment or preference asymmetries give rise to divergent incipient relative prices across trading partners, and thus to welfare gains from bilateral trade imbalances with those partners.

Suppose there are three countries: A, B, and C. Country A is endowed with apples, B is endowed with bananas, and C is endowed with cherries. Each country likes and consumes only the goods from the other two countries. Assume country A spends more on bananas than cherries; B spends more on cherries than apples; and C spends more on apples than bananas. With free trade, this means that country A must have a bilateral trade deficit with country B, while it has a bilateral trade surplus with country C. The other countries are in a similar situation.

Assume, for example, that each country always spends 75 percent of its income on its favored good and the other 25 percent on the other good. Then each country's welfare or real income can be measured by the utility function: $U = X^{.75}Y^{.25}$, where X is the favored good and Y is the other good. Now, suppose further that each country is endowed with 100 pounds of its fruit. The free trade consumption and utility pattern of each country is thus easy to describe. Because of the symmetry of the assumptions, in a free trade equilibrium all prices will be exactly the same. Thus, we may let the free trade price of each fruit be $1 a pound. Each country's income will be exactly $100; and each will spend $75 on its favored good. Figure 1 shows the free trade solution for, say, country A. It consumes at point F and its utility level is U = 56.99.

In the free trade equilibrium country A exports $25 worth of apples to country B and $75 to country C. In turn, country A imports $75 worth of bananas from country B and $25 worth of cherries from country C. Thus, as with the other countries, country A has a $50 deficit with country B and a $50 trade surplus with country C. The total trade account is balanced.

Suppose now all of the countries become concerned with their trade imbalances. If a multilateral policy were followed in which each country imposed the same country-bashing tariff on its favored import until bilateral imbalance were eliminated, then every country would consume 50 pounds of each imported fruit. This must be the case because with the same tariffs, the world prices of each fruit must be identical (say, again, $1). For every country now to consume 50 pounds of each imported fruit, it is necessary that each country impose a tariff rate of 200 percent in order to spend three times as much on its favored good. For example, in country A the domestic price of bananas would have to be $3 instead of $1. The utility level of each country would now be U = 50, as shown in Figure 1.

It is clear that if country A proceeded unilaterally to eliminate its bilateral trade deficit, it would have to impose a much larger country-bashing tariff on B. Country A's consumption of bananas, its favored good, would have to drop below 50 pounds. We shall see below that if country A goes alone, it will move all the way to point L, where its consumption pattern is completely reversed from the free trade level! Point N will be shown to be the Nash equilibrium.

**II. The basic model**

In this section we set out the model, derive the general tariff-distorted equilibrium, and discuss the benchmark case in which all countries follow identical policies.

There are three countries and three goods, as in our numerical example. For notational convenience we call the countries and goods 1, 2, and 3. We let good 3 be the numeraire. Country i has a fixed endowment of good i and consumes the other two goods. Preferences are described by identically symmetrical Cobb-Douglas utility functions. Country 1 favors good 2, 2 favors 3, and 3 favors 1. We designate (usually) good j as i's favored good. Country i consumes goods j and k, and its utility function is:

(1) $u_i = (c_{ij})^{b/(1+b)}(c_{ik})^{1/(1+b)}$.

Thus, each country spends b times as much on its favored good (good j) as on the other good, so that $b > 1$. If $b = 1$, there would be no bilateral deficits under free trade.

Each country faces the budget constraint

(2) $p_i x_i = p_j c_{ij} + p_k c_{ik}$

where $c_{ij}$ is the consumption of good j by country i, $x_i$ is country i's fixed endowment of good i, and $p_i$ is the world price of good i. Note that any tax/subsidy structure by country i on both import goods can be replicated as an equivalent tariff on the favored good, called $t_i$, which is defined $t_i = t_{ij}/t_{ik}$, where $t_{im}$ is unity plus the ad valorem tariff country i imposes on good m. Clearly, $t_i > 1$ is consistent with $t_{ij} > 1$ (a tax on i's favored good) or $t_{ik} < 1$ (a subsidy on i's other import). Thus, the domestic relative price of i's favored good in terms of its other import is $p_j t_i/p_k$. Since consumers adjust their marginal rates of substitution to domestic prices, the consumption pattern of each country must satisfy:

(3) $bc_{ik}/c_{ij} = p_j t_i/p_k$.

Clearly, uniform import taxes (or an export tax) wash out in this model.

Assuming that tariff revenues or subsidies are redistributed as lump-sum transfers to or from consumers, equations (2) and (3) imply that the solutions for country i's consumption pattern are:

(4) $c_{ij} = bp_i x_i/p_j(b+t_i)$

(5) $c_{ik} = p_i x_i t_i / p_k(b+t_i)$.

The market clearing equations can be written:

(6) $c_{12} + c_{32} = x_2$

(7) $c_{13} + c_{23} = x_3$.

Equations (4) and (5) can be substituted into equations (6)-(7) to solve for $p_1$ and $p_2$ (noting $p_3 = 1$):

(8) $p_1 = (x_3/x_1)[(t_1+b)/(t_3+b)](B_{23}/B_{12})$

(9) $p_2 = (x_3/x_2)[(t_2+b)/(t_3+b)](B_{31}/B_{12})$

where

(10) $B_{ij} = b^2 + bt_i + t_i t_j$.

It is clear from (8) and (9) that when all tariff rates are the same the prices of goods 1 and 2 in terms of good 3 simply reflect their relative supplies. That is, $p_i = x_3/x_i$ when $t_i = t$, for all i because all the terms involving b cancel. Of course, this solution is intuitively obvious because when country demands are symmetric and tariffs are equal, only relative supplies matter. Since world prices are not affected in this case, it must follow that each country is made worse off by matching country-bashing tariffs (just as for the small country in standard trade theory).

In the general case where tariff rates are unequal, the consumption pattern for country i is [Using (4), (5), (8), and (9)]:

(11) $c_{ij} = bx_j B_{jk}/(t_j+b)B_{ki}$; $c_{ik} = t_i x_k B_{jk}/(t_k+b)B_{ij}$.

If all countries impose the same country-bashing tariff (t), the $B_{ij}$'s cancel and the consumption pattern is:

(12) $c_{ij} = bx_j/(t+b)$; and $c_{ik} = tx_k/(t+b)$.

It clearly follows that the utility level is:

(13) $u_i = [tb^b x_j{}^b x_k]^{1/(1+b)}/(b+t)$.

Summarizing from equation (12):

**Proposition 1: When all countries impose the same country-bashing tariff each country consumes b/(t+b) of the world supply of its favored good and t/(t+b) of the other import.**

It is easy to show from equation (13) that $du_i/dt < 0$. As we remarked earlier, this result is not surprising. Everyone loses from a country-bashing war in which countries impose the same tariff on their favored good. This result stands in sharp contrast to that from the conventional theory of optimum tariffs in which, as is well known, large countries can gain from a matching tariff war. Indeed, we have completely abstracted from the usual optimum tariff argument, which relies on the ability of a country to control its exports. In our model, exports are fixed.

A trivial corollary to Proposition 1 is useful:

**Corollary 1: Under free trade, each country consumes the share b/(1+b) of the world supply of its favored good and the share 1/(1+b) of the world supply of the other import.**

**III. The Nash Equilibrium**

We now examine the Nash equilibrium in which each country sets its tariff rate so as to maximize domestic welfare on the assumption that the other countries will not retaliate.[6] There is an incentive for each country to impose a country-bashing tariff. The reason is simple: countries spend more on their favored good. An incipient tariff on the favored good, therefore, improves the country's terms of trade on its most important good and worsens its terms of trade on the relatively unimportant good. Welfare thus improves. As the country-bashing tariff is increased on the favored good, the volume of trade falls for that good and rises for the other good. Eventually, the welfare gain from reducing bilateral deficits ceases.

[6] The study of tariff games as Nash equilibria in the general two-country, two-good trade model has a long history, beginning with Johnson (1953). See McMillan (1986) and Riezman (1982). For extensions to conjectural variations and quotas, see Thursby and Jensen (1983) and Tower (1975).

Solving for the Nash equilibrium is straightforward. Using (1) and (11), the utility for country i is simply,

(14) $u_i = a[1/B_{ki}]^{b/(1+b)}[t_i/B_{ij}]^{1/(1+b)}$,

where a is a constant reflecting the endowments and the $B_{ij}$'s are defined as in (10). Equating $\partial u_i / \partial t_i$ to zero implies

(15) $B_{ij}t_it_k = bB_{ki}$.

Thus, due to symmetry in the Nash equilibrium, all $t_i$'s are the same (t).[7] That is,

(16) $t = b^{1/2}$.

Substituting (15) into (12) shows the consumption pattern in the Nash equilibrium. From (16) and Proposition 1, we get :

**Proposition 2. In the Nash equilibrium, $t_i = b^{1/2}$ for each i, and each country consumes the share $b^{1/2}/(1+b^{1/2})$ of the world supply of its favored good and the share $1/(1+b^{1/2})$ of the world supply of the other import good.**

Note that if b exceeds 1, then t exceeds 1. The implication is that, starting from free trade, each country generally ($b > 1$) has an incentive to either impose a tariff on goods from its deficit partner or subsidize imports from its surplus partner. It follows that the bilateral trade deficit in the Nash equilibrium is smaller than that under free trade. In the next section we show that when $t = b$, bilateral deficits are eliminated. In the Nash case, however, $t < b$ and bilateral deficits remain.

It is important to note that a country's incentive to impose a tariff depends on the state of its bilateral imbalances, whatever may be their cause. To illustrate this, consider the case where under free trade there are no bilateral imbalances ($b = 1$), so that the Nash equilibrium

[7] It is trivial to show that the symmetric solution is unique.

is the free trade equilibrium. If one country then imposes a tariff, the country on whom the tariff has been imposed will have a bilateral deficit with that country, and an incentive to retaliate. From equation (15), if $t_3=1$ and $b = 1$, country 1's optimal tariff is determined by $t_1^2(1+t_2) = 2$. Therefore, if $t_2 < 1$ (country 2 imposes a tariff on country 1 or gives a subsidy to country 3), it pays country 1 to impose a tariff on country 2's export. In short, the incentive to retaliate depends on trade patterns alone, and not on whether those patterns stem from innate preferences or inane policies.

## IV. Measuring and Eliminating Bilateral Deficits

The Nash equilibrium is compelling because it represents the rational expectations solution to trade wars and is self-reinforcing. However, since politicians and pundits almost universally condemn bilateral deficits, it is interesting to examine the consequences of their elimination.

Bilateral trade deficits, of course, should be expressed proportionately — that is, i's deficit with j relative to i's total trade with j,

(17) $D_{ij} = (p_j c_{ij} - p_i c_{ji})/(p_j c_{ij} + p_i c_{ji})$.

Substituting (8), (9), and (11) into (17) gives

(18) $D_{ij} = [bB_{jk} - t_j B_{ki}]/[bB_{jk} + t_j B_{ki}]$.

Notice that the endowments, the $x_i$'s, do not influence in any way the measure of the bilateral trade deficits. Notice also that $D_{12}$ is not generally the same as $D_{23}$ or $D_{31}$, except in the case of common country-bashing tariffs.

The extent of worldwide bilateral imbalances can be measured by a weighted average of the $D_{ij}$'s, specifically

(19) $D = D_{12}w_{12} + D_{23}w_{23} + D_{31}w_{31}$,

where $w_{ij} = (p_j c_{ij} + p_i c_{ji})/(p_1 x_1 + p_2 x_2 + p_3 x_3)$.

It is interesting to note that if a country begins to unilaterally bash another country, its (proportionate) bilateral trade deficit with that country falls by less than the bilateral trade deficits of the other countries. This happens because, while the absolute trade deficits of all countries must be the same (see footnote 8), country 1's total bilateral trade with country 2 falls by more than country 2's total bilateral trade with country 3. For example, if $b = 3$ then under free trade $D_{ij} = 0.5$. But if country 1 then imposes a tariff of $t_1 = 2$, $D_{12}$ falls to 0.472 while $D_{23}$ falls by more, to 0.423.

In the special case in which all the tariffs are equal the $D_{ij}$s will be the same. That is, with $t_i = t$ in (18) all of the terms involving $B_{ij}$ or $b+t_j$ cancel, yielding

(20) $D_{ij} = (b-t)/(b+t)$.

In this case, it makes no difference whether we use $D_{ij}$ or the weighted average (D) referred to above.

**Proposition 3: When all countries impose the same country-bashing tariff t, the bilateral trade deficit of each is (b-t)/(b+t).**

It is obvious from Proposition 3 that bilateral trade deficits will disappear if all countries impose the common tariff $t_i = b$. What about the nonuniform tariff case? With three countries and overall trade balance, eliminating one bilateral trade deficit eliminates them all.[8] Thus, in the general case where the tariffs are unequal, the bilateral imbalances will be eliminated when $D_{12} = 0$ or, from the numerator of (18),

(21) $(b^2 + bt_2 + t_2t_3)/(b^2 + bt_3 + t_3t_1) = t_2/b$.

Two additional propositions follow from (21):

**Proposition 4 (the unilateral case): For country i to unilaterally eliminate its bilateral trade**

[8] Let $S_{ij}$ represent country i's surplus with country j. Since $S_{12} + S_{13} = S_{21} + S_{23} = S_{31} + S_{32} = 0$, it follows that $S_{12} = 0$ implies all the $S_{ij}$ are zero.

**deficit when free trade prevails elsewhere, its country-bashing tariff must be $t_i = b^3$.**

**Proposition 5 (the bilateral case): For countries 1 and 2 to jointly eliminate their bilateral deficits, while country 3 is a free trader, each country-bashing tariff must be $t_1 = t_2 = b^{3/2}$.**

Let us now study the welfare consequences of eliminating bilateral imbalances. For reference, recall that under free trade each country consumes the share b/(1+b) of the world supply of its favored good, the share 1/(1+b) of world supply of its other import, and utility is

(22) $u_i = [b^b x_j{}^b x_k]^{1/(1+b)}/(1+b)$.

**The unilateral case.** Suppose now country 1 faces free trade elsewhere in the world but decides to unilaterally eliminate its bilateral trade deficit with country 2. Proposition 4 tells us that in this case its tariff should be $t_1 = b^3$. To find the effects of this policy we substitute $t_1 = b^3$ and $t_2 = t_3 = 1$ into equation (11). The effects on utility and consumption patterns are dramatic. Table 1 shows the consumption pattern for the general case as well as for our numerical example. The consumption pattern for country 1 is literally turned upside down! In free trade, it consumed b/(1+b) of the world supply of its favored good and 1/(1+b) of the world supply of its other import. Now, country 1 consumes 1/(1+b) of the world supply of its favored good and b/(1+b) of the world supply of its other import good. Under our numerical example, country 1 now consumes only 25 units of its favored good and 75 of its least favored good — exactly the opposite of the free trade pattern (point L in Figure 1 instead of point F). Country 1's utility level is now:

(23) $u_1 = (x_2)^{b/(1+b)}(x_3)^{1/(1+b)}b^{1/(1+b)}$.

The ratio of free-trade utility to utility in the unilateral case is $b^{(b-1)/(1+b)}$. Under our example (b = 3) this ratio equals 1.73, so that real income is 73 percent higher in free trade. Unilaterally eliminating the trade deficit is indeed "grossly misguided."

Country 2, the object of country 1's displeasure, is even more severely damaged (see

Table 1). Country 2 now consumes only $1/(1+b)$ of the world supply of its favored good and $1/(1+ b^2)$ of the world supply of its other import. Compared to free trade, it consumes much less of each good. In our numerical example, 2's consumption of the favored good falls from 75 to 25 and consumption of the other good falls from 25 to only 10. Thus, 2's utility falls to 19.88 — 35 percent of its free trade utility.

Country 3 is substantially benefited by country 1 bashing country 2 because that action increases 1's demand for 3's export. In the unilateral case, country 3's consumption of its favored good rises from $b/(1+b)$ to $b^2/(1+b^2)$ of the world supply; and its consumption of its least favored good rises from $1/(1+b)$ to $b/(1+b)$ of the world supply. In terms of our numerical example, 3's consumption of its favored good rises from 75 to 90 and its consumption of the other good rises from 25 to 75! Utility skyrockets to 85.99 — a 50 percent increase over its free trade utility.

**The Bilateral Case.** Is the policy of eliminating bilateral trade deficits always misguided? The answer is: No. Consider the case where country 3 — the country with whom 1 has a surplus — insists on free trade. This liberates country 1, because it knows that its export will always be exempted from tariffs. Accordingly, country 1 can become very aggressive. If country 1 proceeds unilaterally, as we have just seen ($b = 3$), it can destroy about 65 percent of country 2's real income. Remember that country 2's bashing of country 3 is equivalent to 2's subsidizing imports from 1. In return for country 1 reducing its tariffs on good 2 from $t_1 = b^3$ to $t_1 = b^{3/2}$, therefore, country 1 can easily convince country 2 to engage in bashing country 3 or subsidizing imports from country 1. Both countries 1 and 2 would benefit from this action, as compared to the unilateral case. As shown in Table 2, in this case, country 1 turns out to be better off than in free trade and country 2 is better off than it would be if country 1 proceeded unilaterally.[9] Surprisingly, country 3 is driven to its Nash equilibrium consumption pattern and is, thus, even better off than if all countries imposed the tariff $t = b$ (see below).

Country 1 is better off when both countries impose country-bashing tariffs since it is the only country that then faces free trade for its export and since the price of its export good rises relative to both of its import goods. Thus, in general, a country benefits from two types of action: its restrained but unanswered bashing of the trading partner who supplies its favored good; or that country engaging in a similar act. Each policy ultimately has the effect of improving the home country's terms of trade.

Nothing is worse for nation than to have a bilateral trade deficit with a strict free-trading nation, because such a country will not bash your arch-enemies. A country's arch-enemy is the country with whom it has a bilateral trade surplus, because it will be the potential target of country-bashing tariffs. Having a deficit with a free-trading nation puts a country in the position of always being the potential target, and never the potential beneficiary, of other countries' wars.

**The multilateral case.** We already studied multilateral agreements in Propositions 1 and 3 above. In the multilateral case, $t_i = b$ eliminates bilateral imbalances, in which case each country consumes exactly one-half of the world supply of both imports. The ratio of free trade utility to utility under the multilateral agreement is $2b^{b/(1+b)}/(1+b)$. In Figure 1, where $b = 3$, this ratio is 1.14. This multilateral case is illustrated by point M in Figure 1, where each country imposes an ad valorem tariff rate of 200 percent ($t = 3$).

**Summary.** Using our numerical example, Table 3 gives the utility levels for all three

---

[9] Note that the solutions shown in table 2 are not Nash equilibria. In the game involving countries 1 and 2 when country 3 insists on free trade ($t_3 = 1$), the Nash equilibrium is asymmetric and involves country 1 (the country that has a surplus with country 3) imposing a higher Nash tariff on 2 than 2's Nash tariff on 3. For example, if $b = 3$, the Nash tariffs are $t_1 = 2.21$ and $t_2 = 1.67$.

countries, as well as the prices of goods 1 and 2 for the five distinct cases of interest: Free trade (column 1); the Nash equilibrium (column 2); the multilateral case (column 3); the bilateral case (column 4); and the unilateral case (column 5).

## V. An Argument for a World Trade Agreement

We believe this paper gives a genuine argument for a world trade agreement, such as the World Trade Organization (WTO) — the new incarnation of GATT (General Agreement on Tariffs and Trade. The usual argument for a WTO is but a mere extension of the old bilateral one that a reciprocal reduction of tariffs helps two trading partners.[10] This argument is weak in two ways. First, it is not really a *multi*lateral argument (two countries suffice). And, moreover, in a two-country model the big country can win a tariff war.

Using the insights of this paper we believe that there are three arguments for a world trade agreement. First, a multilateral free trade agreement avoids country-bashing trade (Nash) wars that make all parties worse off. Second, the existence of a staunchly liberal trading country can create opportunities for aggressive bilateral policies on the part of countries that have surpluses with that nation. Third, though not a direct implication of our specific model, even a large country may want to join a multilateral agreement in order to minimize being the target of country-bashing tariffs from other countries.

Unfortunately, the new WTO does not specifically prohibit country-bashing. Though each country can take its case to the WTO, it remains to be seen how the WTO will respond to the country-bashing efforts of its members —particularly larger ones. Our paper suggests that there ought to be a provision in WTO that outlaws the type of behavior the United States has been engaging in relative to Japan. The danger, however, is that such a provision could lead to America's withdrawal from the WTO.

[10] See McMillan (1986, pp. 31-32) for a discussion of GATT games.

## VII. Conclusion

The pattern of bilateral balances matters. In the Nash equilibrium, each country will bash countries with whom they have bilateral deficits or promote trade with countries with whom they have bilateral surpluses. Nevertheless, all countries lose from a Nash country-bashing war. If a single country eliminates its bilateral deficit, it still loses even if the rest of the world does not retaliate. But if a country has a trade surplus with a free trading nation, it can gain from a bilateral agreement with its deficit partner to eliminate the bilateral deficit. On the other hand, a country whose trade deficit is with a free-trading nation is in a disadvantageous position because the free-trading nation will not bash its enemies and will always be the target of country-bashing by other countries.

A great deal of work remains to be done on the empirical and theoretical aspects of bilateral trade deficits. Many questions can be asked. For example: What (preferences, factor endowments, etc.) is really behind nations' bilateral trade deficits ? Have bilateral imbalances increased as the world has moved to freer trade? In the Great Depression, did bilateral imbalances grow or shrink (relative to trade)? What determines the pattern of bilateral balances? How do bilateral imbalances influence trade policy compared to, say, political economy issues? We look forward to the answers.

## REFERENCES

Anderson, James. E. 1979. "A Theoretical Foundation for the Gravity Equation." **American Economic Review** 69 (March): 106-116.

Bayard, Thomas O. and Kimberly Ann Elliot. 1994. **Reciprocity and Retaliation in U.S. Trade Policy**. Washington, D.C.: Institute for International Economics.

Berglas, E. 1981. "Harmonization of Commodity Taxes." **Journal of Public Economics** 16: 377-387.

Bergstrand, Jeffrey H. 1985. "The Generalized Gravity Equation, Monopolistic Competition and the Factor-Proportions Theory in International Trade. **The Review of Economics and Statistics** 71: 143-153.

Bhagwati, Jagdish. 1989. **Protectionism**. Cambridge: MIT Press.

Corden, W. Max. 1993. "The Revival of Protectionism in Developed Countries," in Dominic Salvatore, ed., **Protectionism and World Welfare**, Cambridge: Cambridge University Press.

_____________. 1976. "Customs Union Theory and the Nonuniformity of Tariffs." **Journal of International Economics** 6 (February): 99-106.

Georgakopoulos, T. 1992. "Trade Deflection, Trade Distortions, and Pareto Inefficiencies Under the Restricted Origin Principle." **Journal of Public Economics** 47: 381-90.

Helpman, Elhanan and Paul R. Krugman. 1985. **Market Structure and Foreign Trade**. Cambridge: MIT Press.

Johnson, Harry G. 1953. "Optimum Tariffs and Retaliation." **Review of Economic Studies** 21: 142-153.

Jones, Ronald. 1961. "Comparative Advantage and the Theory of Tariffs: A Multi-Country, Multi-Commodity Model." **Review of Economic Studies** 28 (June): 161-75.

____________. 1967. "International Capital Movements and the Theory of Tariffs." **Quarterly Journal of Economics**. 81: 1-38.

Krugman, Paul, R. 1979. "Increasing Returns, Monopolistic Competition, and International Trade." **Journal of International Economics** 9: 469-479.

Lawrence, Robert Z. 1987. "Imports in Japan: Closed Markets or Minds?" **Brookings Papers on Economic Activity** 2: 517-554.

McMillan, John. 1986. **Game Theory in International Economics.** Postrasse, Switzerland: Harwood Academic Publishers.

Riezman, Ray. 1982. "Tariff Retaliation from a Strategic Viewpoint." **Southern Economic Journal** 48: 583-593.

Saxonhouse, Gary R. 1983 "The Micro- and Macroeconomics of Foreign Sales to Japan." **Trade Policy for the 1980s.** Ed. W. R. Cline. Cambridge: MIT Press.

____________. 1989. "Differentiated Products, Economies of Scale, and access to the Japanese Market." **Trade Policies for International Competitiveness**. Ed. Robert Feenstra. Chicago: University of Chicago Press.

Thursby, Jerry G. and Marie C. Thursby. 1987. "Bilateral Trade Flows, the Linder Hypothesis, and Exchange Risk." **Review of Economics and Statistics** 69 (August): 488-95.

Thursby, Marie and Richard Jensen. 1983. "A Conjectural Variation Approach to Strategic Tariff Equilibria." **Journal of International Economics** 14: 145-162.

Tower, Edward. 1975. "The Optimal Quota and Retaliation." **Review of Economic Studies** 42: 623-630.

Zwiebel, Sherry. 1993. **Market Access for Manufacturing Imports to Japan**. Ph. D. Dissertation, University of Houston.

**Table 1: Consumption When Country 1 Unilaterally Eliminates Bilateral Imbalances**

| | General Case | | | Example: $b = 3$; $x_i=100$ | | |
|---|---|---|---|---|---|---|
| | Goods | | | Goods | | |
| **Countries** | 1 | 2 | 3 | 1 | 2 | 3 |
| 1 | 0 | $x_2/(1+b)$ | $bx_3/(1+b)$ | 0 | 25 | 75 |
| 2 | $x_1/(1+b^2)$ | 0 | $x_3/(1+b)$ | 10 | 0 | 25 |
| 3 | $b^2x_1/(1+b^2)$ | $bx_2/(1+b)$ | 0 | 90 | 75 | 0 |

**Table 2: Consumption When Countries 1 and 2 Eliminate Bilateral Imbalances**

| | General Case | | | Example: $b = 3$; $x_i = 100$ | | |
|---|---|---|---|---|---|---|
| | Goods | | | Goods | | |
| **Countries** | 1 | 2 | 3 | 1 | 2 | 3 |
| 1 | 0 | $x_2 b^{1/2}/(1+b^{1/2})$ | $bx_3/(1+b)$ | 0 | 63.4 | 75 |
| 2 | $x_1/(1+b^{1/2})$ | 0 | $x_3/(1+b)$ | 36.6 | 0 | 25 |
| 3 | $b^{1/2}x_1/(1+b^{1/2})$ | $x_2/(1+b^{1/2})$ | 0 | 63.4 | 36.6 | 0 |

**Table 3: Policy Outcomes**

**$b = 3$; $x_i = 100$ ($i = 1,2,3$)**

| | | | **Eliminating Bilateral Imbalances** | | |
|---|---|---|---|---|---|
| $t_1=b^3, t_j=1$ | $t_i = 1$ | $t_i = b^{.5}$ | $t_i = b$ | $t_1=t_2=b^{1.5}, t_3=1$ | |
| **Variable** | **Free Trade** | **Nash Equilibrium** | **Multilateral** | **Bilateral** | **Unilateral** |
| $u_1$ | 56.99 | 55.26 | 50 | 66.12 | 32.90 |
| $u_2$ | 56.99 | 55.26 | 50 | 27.50 | 19.88 |
| $u_3$ | 56.99 | 55.26 | 50 | 55.26 | 85.99 |
| $p_1$ | 1 | 1 | 1 | 1.183 | 0.833 |
| $p_2$ | 1 | 1 | 1 | 0.683 | 0.333 |

RESEARCH PAPERS OF THE RESEARCH DEPARTMENT
FEDERAL RESERVE BANK OF DALLAS

Available, at no charge, from the Research Department
Federal Reserve Bank of Dallas, P. O. Box 655906
Dallas, Texas 75265-5906

Please check the titles of the Research Papers you would like to receive:

___ 9201 Are Deep Recessions Followed by Strong Recoveries? (Mark A. Wynne and Nathan S. Balke)
___ 9202 The Case of the "Missing M2" (John V. Duca)
___ 9203 Immigrant Links to the Home Country: Implications for Trade, Welfare and Factor Rewards (David M. Gould)
___ 9204 Does Aggregate Output Have a Unit Root? (Mark A. Wynne)
___ 9205 Inflation and Its Variability: A Note (Kenneth M. Emery)
___ 9206 Budget Constrained Frontier Measures of Fiscal Equality and Efficiency in Schooling (Shawna Grosskopf, Kathy Hayes, Lori L. Taylor, William Weber)
___ 9207 The Effects of Credit Availability, Nonbank Competition, and Tax Reform on Bank Consumer Lending (John V. Duca and Bonnie Garrett)
___ 9208 On the Future Erosion of the North American Free Trade Agreement (William C. Gruben)
___ 9209 Threshold Cointegration (Nathan S. Balke and Thomas B. Fomby)
___ 9210 Cointegration and Tests of a Classical Model of Inflation in Argentina, Bolivia, Brazil, Mexico, and Peru (Raul Anibal Feliz and John H. Welch)
___ 9212 The Analysis of Fiscal Policy in Neoclassical Models[1] (Mark Wynne)
___ 9213 Measuring the Value of School Quality (Lori Taylor)
___ 9214 Forecasting Turning Points: Is a Two-State Characterization of the Business Cycle Appropriate? (Kenneth M. Emery & Evan F. Koenig)
___ 9215 Energy Security: A Comparison of Protectionist Policies (Mine K. Yücel and Carol Dahl)
___ 9216 An Analysis of the Impact of Two Fiscal Policies on the Behavior of a Dynamic Asset Market (Gregory W. Huffman)
___ 9301 Human Capital Externalities, Trade, and Economic Growth (David Gould and Roy J. Ruffin)
___ 9302 The New Face of Latin America: Financial Flows, Markets, and Institutions in the 1990s (John Welch)
___ 9303 A General Two Sector Model of Endogenous Growth with Human and Physical Capital (Eric Bond, Ping Wang, and Chong K. Yip)
___ 9304 The Political Economy of School Reform (S. Grosskopf, K. Hayes, L. Taylor, and W. Weber)
___ 9305 Money, Output, and Income Velocity (Theodore Palivos and Ping Wang)
___ 9306 Constructing an Alternative Measure of Changes in Reserve Requirement Ratios (Joseph H. Haslag and Scott E. Hein)
___ 9307 Money Demand and Relative Prices During Episodes of Hyperinflation (Ellis W. Tallman and Ping Wang)
___ 9308 On Quantity Theory Restrictions and the Signalling Value of the Money Multiplier (Joseph Haslag)
___ 9309 The Algebra of Price Stability (Nathan S. Balke and Kenneth M. Emery)
___ 9310 Does It Matter How Monetary Policy is Implemented? (Joseph H. Haslag and Scott Hein)
___ 9311 Real Effects of Money and Welfare Costs of Inflation in an Endogenously Growing Economy with Transactions Costs (Ping Wang and Chong K. Yip)
___ 9312 Borrowing Constraints, Household Debt, and Racial Discrimination in Loan Markets (John V. Duca and Stuart Rosenthal)

___ 9313 Default Risk, Dollarization, and Currency Substitution in Mexico (William Gruben and John Welch)
___ 9314 Technological Unemployment (W. Michael Cox)
___ 9315 Output, Inflation, and Stabilization in a Small Open Economy: Evidence from Mexico (John H. Rogers and Ping Wang)

___ 9316 Price Stabilization, Output Stabilization and Coordinated Monetary Policy Actions (Joseph H. Haslag)
___ 9317 An Alternative Neo-Classical Growth Model with Closed-Form Decision Rules (Gregory W. Huffman)
___ 9318 Why the Composite Index of Leading Indicators Doesn't Lead (Evan F. Koenig and Kenneth M. Emery)
___ 9319 Allocative Inefficiency and Local Government: Evidence Rejecting the Tiebout Hypothesis (Lori L. Taylor)
___ 9320 The Output Effects of Government Consumption: A Note (Mark A. Wynne)
___ 9321 Should Bond Funds be Included in M2? (John V. Duca)
___ 9322 Recessions and Recoveries in Real Business Cycle Models: Do Real Business Cycle Models Generate Cyclical Behavior? (Mark A. Wynne)
___ 9323* Retaliation, Liberalization, and Trade Wars: The Political Economy of Nonstrategic Trade Policy (David M. Gould and Graeme L. Woodbridge)
___ 9324 A General Two-Sector Model of Endogenous Growth with Human and Physical Capital: Balanced Growth and Transitional Dynamics (Eric W. Bond, Ping Wang,and Chong K. Yip)
___ 9325 Growth and Equity with Endogenous Human Capital: Taiwan's Economic Miracle Revisited (Maw-Lin Lee, Ben-Chieh Liu, and Ping Wang)
___ 9326 Clearinghouse Banks and Banknote Over-issue (Scott Freeman)
___ 9327 Coal, Natural Gas and Oil Markets after World War II: What's Old, What's New? (Mine K. Yücel and Shengyi Guo)
___ 9328 On the Optimality of Interest-Bearing Reserves in Economies of Overlapping Generations (Scott Freeman and Joseph Haslag)
___ 9329* Retaliation, Liberalization, and Trade Wars: The Political Economy of Nonstrategic Trade Policy (David M. Gould and Graeme L. Woodbridge) (Reprint of 9323 in error)
___ 9330 On the Existence of Nonoptimal Equilibria in Dynamic Stochastic Economies (Jeremy Greenwood and Gregory W. Huffman)
___ 9331 The Credibility and Performance of Unilateral Target Zones: A Comparison of the Mexican and Chilean Cases (Raul A. Feliz and John H. Welch)
___ 9332 Endogenous Growth and International Trade (Roy J. Ruffin)
___ 9333 Wealth Effects, Heterogeneity and Dynamic Fiscal Policy (Zsolt Becsi)
___ 9334 The Inefficiency of Seigniorage from Required Reserves (Scott Freeman)
___ 9335 Problems of Testing Fiscal Solvency in High Inflation Economies: Evidence from Argentina, Brazil, and Mexico (John H. Welch)
___ 9336 Income Taxes as Reciprocal Tariffs (W. Michael Cox, David M. Gould, and Roy J. Ruffin)
___ 9337 Assessing the Economic Cost of Unilateral Oil Conservation (Stephen P.A. Brown and Hillard G. Huntington)
___ 9338 Exchange Rate Uncertainty and Economic Growth in Latin America (Darryl McLeod and John H. Welch)
___ 9339 Searching for a Stable M2-Demand Equation (Evan F. Koenig)
___ 9340 A Survey of Measurement Biases in Price Indexes (Mark A. Wynne and Fiona Sigalla)
___ 9341 Are Net Discount Rates Stationary?: Some Further Evidence (Joseph H. Haslag, Michael Nieswiadomy, and D. J. Slottje)
___ 9342 On the Fluctuations Induced by Majority Voting (Gregory W. Huffman)
___ 9401 Adding Bond Funds to M2 in the P-Star Model of Inflation (Zsolt Becsi and John Duca)
___ 9402 Capacity Utilization and the Evolution of Manufacturing Output: A Closer Look at the "Bounce-Back Effect" (Evan F. Koenig)
___ 9403 The Disappearing January Blip and Other State Employment Mysteries (Frank Berger and Keith R. Phillips)
___ 9404 Energy Policy: Does it Achieve its Intended Goals? (Mine Yücel and Shengyi Guo)
___ 9405 Protecting Social Interest in Free Invention (Stephen P.A. Brown and William C. Gruben)
___ 9406 The Dynamics of Recoveries (Nathan S. Balke and Mark A. Wynne)
___ 9407 Fiscal Policy in More General Equilibriium (Jim Dolman and Mark Wynne)
___ 9408 On the Political Economy of School Deregulation (Shawna Grosskopf, Kathy Hayes, Lori Taylor, and William Weber)
___ 9409 The Role of Intellectual Property Rights in Economic Growth (David M. Gould and William C. Gruben)
___ 9410 U.S. Banks, Competition, and the Mexican Banking System: How Much Will NAFTA Matter? (William C. Gruben, John H. Welch and Jeffery W. Gunther)
___ 9411 Monetary Base Rules: The Currency Caveat (R. W. Hafer, Joseph H. Haslag, andScott E. Hein)
___ 9412 The Information Content of the Paper-Bill Spread (Kenneth M. Emery)

| | | |
|---|---|---|
| ___ | 9413 | The Role of Tax Policy in the Boom/Bust Cycle of the Texas Construction Sector (D'Ann Petersen, Keith Phillips and Mine Yücel) |
| ___ | 9414 | The P* Model of Inflation, Revisited (Evan F. Koenig) |
| ___ | 9415 | The Effects of Monetary Policy in a Model with Reserve Requirements (Joseph H. Haslag) |
| ___ | 9501 | An Equilibrium Analysis of Central Bank Independence and Inflation (Gregory W. Huffman) |
| ___ | 9502 | Inflation and Intermediation in a Model with Endogenous Growth (Joseph H. Haslag) |
| ___ | 9503 | Country-Bashing Tariffs: Do Bilateral Trade Deficits Matter? (W. Michael Cox and Roy J. Ruffin) |

| **Name:** | **Organization:** |
|---|---|
| **Address:** | **City, State and Zip Code:** |
| **Please add me to your mailing list to receive future Research Papers:** _____ **Yes** _____ **No** | |

Research Papers Presented at the
1994 Texas Conference on Monetary Economics
April 23-24, 1994
held at the Federal Reserve Bank of Dallas, Dallas, Texas

Available, at no charge, from the Research Department
Federal Reserve Bank of Dallas, P. O. Box 655906
Dallas, Texas 75265-5906

Please check the titles of the Research Papers you would like to receive:

____ 1 A Sticky-Price Manifesto (Laurence Ball and N. Gregory Mankiw)

____ 2 Sequential Markets and the Suboptimality of the Friedman Rule (Stephen D. Williamson)

____ 3 Sources of Real Exchange Rate Fluctuations: How Important Are Nominal Shocks? (Richard Clarida and Jordi Gali)

____ 4 On Leading Indicators: Getting It Straight (Mark A. Thoma and Jo Anna Gray)

____ 5 The Effects of Monetary Policy Shocks: Evidence From the Flow of Funds (Lawrence J. Christiano, Martin Eichenbaum and Charles Evans)

| | |
|---|---|
| Name: | Organization: |
| Address: | City, State and Zip Code: |
| Please add me to your mailing list to receive future Research Papers: | ______Yes ______ No |