Unbalancing Act: Strategies for Trade in Manufactures and Agricultural Trade Impacts

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Abstract: Global trade tensions have risen due to bilateral trade imbalances, principally in manufactures. For example, recent US policy debate has emphasized methods to reduce US bilateral trade deficits with Japan and the EC. Changes in the level of bilateral protection of trade in manufactures can affect agricultural trade through exchange-rate, price, and income effects. This analysis focuses on how different policies on trade in manufactures would affect US agricultural exports. The analysis uses a static equilibrium world model, which includes endogenous exchange rates, income, sectoral prices, and traded quantities. The model contains disaggregated agriculture, aggregated Armington-type manufactures, and aggregated nontraded goods. Two different trade policies are analyzed: foreign liberalization of trade in manufactures and increased US protection of trade in manufactures. The results indicate that these strategies to reduce bilateral trade deficits have negative effects on US agriculture, with significantly worse effects occurring when US protection of trade in manufactures is raised. When foreign countries liberalize trade in manufactures, the dollar appreciates, but some of its negative effects on US agricultural trade are mitigated by a rise in foreign income. By contrast, when US protection of trade in manufactures is increased, the dollar appreciates and foreign income falls, exacerbating the negative effects on US agricultural trade.

Introduction

During the 1980s, bilateral trade conflicts have proliferated. Much of the global tension has been focused on bilateral trade surpluses in manufactures. During this time, the US trade deficit reached record levels, rising from a deficit of $35,000 million in 1982 to around $160,000 million in 1986. This increase has led to a major debate over the appropriateness and effectiveness of current US trade policies. Some argue that if foreign markets were more open or if foreign exports were less subsidized, US exports would expand and US imports would shrink. Supporters of this argument contend that the USA should adopt policies to put pressure on other countries to reduce their unfair trade practices.

Two trading areas are the most likely targets for aggressive US reactions towards perceived unfair practices: Japan and the EC. These areas have incurred the fastest growth in their bilateral trade surpluses with the USA (over $50,000 million and $25,000 million, respectively, in 1986). In addition, US exports to these areas have largely stagnated over the past five years, while their exports to the USA have risen sharply. The harbinger of future policies is sanctions against Japanese construction firms in new US budget legislation passed in December 1987.

The adoption of a tougher stance against foreign practices in the manufacturing sectors will not only affect manufactures but will also indirectly affect agriculture. If the USA takes such a posture on trade in manufactures, what are the likely effects on US agricultural trade? How are trade in agricultural and nonagricultural products related? This paper provides a framework in which to look at these questions and to provide some preliminary results. This study analyzes how US trade, and US agricultural trade in particular, would be affected under two different types of policy responses. Under the first type, Japan and the EC liberalize their trading practices on manufactures to avoid US retaliatory behaviour. Under the second type, the USA imposes retaliatory import restrictions on manufactures because these countries do not liberalize their trading practices. A key result is that agricultural exports are likely to be adversely affected by either type of policy, even in the absence of foreign retaliation specifically against agriculture.

Model and Methodology

A static world policy simulation framework (Roningen, 1986) is used to develop a multicountry, multicommodity model. It includes eight countries/regions: USA, EC, Japan, Canada, Argentina, Brazil, Mexico, and the rest of the world. Commodities for each country are disaggregated into individual agricultural goods (wheat, maize, soyabeans, rice, sugar, dairy, beef, and poultry), a composite "other" agricultural good, a composite nonagricultural

manufactured traded good, and a composite nontraded good. A base level (1984) is established for consumption and production, consumer prices, producer prices, and world prices. For each country, producer and consumer prices (or the implicit per unit values) deviate from world price by the *ad valorem* rate of protection. For nonagricultural goods, *ad valorem* tariff and nontariff barrier tariff-equivalent rates are used for protection measures based on estimates by Deardorff and Stern (1986), Whalley (1985 and 1986), and Anjaria, Kirmani, and Petersen (1985). The model extends the analysis in Schwartz and Krissoff (1987) by introducing endogenous income effects in addition to trade, price, and exchange-rate effects. A brief description of the model is as follows.

For the *i*th country/region in the model, demand (D) and supply (S) functions depend on all prices (P) and income (Y):

$$(1)\ DA_i = DA_i(PA_i, PT_i, PH_i, Y_i),$$

$$(2)\ DT_i = DT_i(PA_i, PT_i, PH_i, Y_i),$$

$$(3)\ DH_i = DH_i(PA_i, PT_i, PH_i, Y_i),$$

$$(4)\ SA_i = SA_i(PA_i, PT_i, PH_i),$$

$$(5)\ ST_i = ST_i(PA_i, PT_i, PH_i), \text{ and}$$

$$(6)\ SH_i = SH_i(PA_i, PT_i, PH_i),$$

where A denotes agricultural goods, T represents the nonagricultural manufactured traded products (exported or imported), and H represents the nontraded (home) good. The model excludes wages and factor rental rates.

Income is defined as expenditures on all traded agricultural and manufactured goods ($j=1, \ldots, n$) and on the nontraded good:

$$(7)\ Y_i = \sum_{j=1}^{n} PT_{ij}DT_{ij} + PH_iDH_i.$$

Alternatively, income equals the value of production plus "net capital flows" (net foreign borrowing).

The domestic economy reaches an equilibrium when home goods have an excess supply (ES) equal to zero and when net traded goods (including agricultural goods) equal "net capital flows" (F). F is defined as including capital and service accounts and accommodating changes in international reserves. For country i,

$$(8)\ ESH_i = SH_i - DH_i = 0, \text{ and}$$

$$(9)\ \sum_{j=1}^{n} P_{ij}ES_{ij} = \sum_{j=1}^{n} P_{ij}S_{ij} - \sum_{j=1}^{n} P_{ij}D_{ij} = F_i,$$

for traded goods j. World markets clear when excess supply of a good across all countries is equal to zero. For agricultural commodities, this occurs when:

$$(10)\ \sum_{i=1}^{m} ESA_{ij} = \sum_{i=1}^{m} SA_{ij} - \sum_{i=1}^{m} DA_{ij} = 0,$$

for each j, $j = 1, ..., n - 1$. For the nonagricultural good that is traded, n, equilibrium occurs when:

$$(11)\ \sum_{i=1}^{m} EST_{in} = \sum_{i=1}^{m} ST_{in} - \sum_{i=1}^{m} DT_{in} = 0.$$

The traded price in each country's home currency is:

$$(12)\ P_{ij} = E_i\ PW_j\ (1+t_{ij}),$$

where E_i equals home currency per US dollar, PW_j is the world dollar price of the jth traded good and t_{ij} can be interpreted as an export subsidy or import tariff ($t_{ij}>0$), or export tax or import subsidy ($t_{ij}<0$), and is assumed to be exogenous.

A shock to the system—in terms of a change in protection of either sector of the economy in any country or commodity market—leads to changes in base values in quantities produced, consumed, and traded and world and domestic prices. The system also determines either (1) changes in each country's balance of trade under the assumption of fixed exchange rates and the availability of external financing or (2) changes in each country's exchange rate under the assumption of floating rates, which return all countries' trade balances to their initial equilibria:[2]

$$(13)\ (\Pi_1+\Pi_2)E^* + \Pi_1[PWA^*+(1+tA)^*] + \Pi_2[PWT^*+(1+tT)^*] = F^*,$$

where * indicates percentage changes in variables and Π is a parameter consisting of supply and demand elasticities and the shares of agricultural and nonagricultural goods in trade.[3]

Under fixed exchange rates, in the small country case, agricultural markets are affected by (1) changes in domestic prices of nonagricultural and nontraded goods resulting from changes in the country's nonagricultural protection and (2) changes in national incomes arising from changes in nonagricultural protection. In the large country case, the additional effects of changes in world prices feed back to domestic prices and affect domestic production and consumption, and, consequently, trade.

Under a floating exchange rate system, the country's currency would depreciate or appreciate following liberalization until the changes in the external trade imbalance are eliminated; i.e., until $F^* = 0$. Hence the exchange rate change causes a further feedback from world prices to domestic prices and subsequent adjustments to quantities. In the analysis reported here, exchange rates are assumed to be endogenous.

If the parameters of equation *(13)*, Π_1 and Π_2, are positive, then a reduction in protection leads to a depreciation of the exchange rate which offsets, to some extent, the negative effects on domestic prices of a reduction in protection levels. If the agricultural protection levels are initially negative and nonagricultural protection is initially positive, then a reduction of protection can lead to a depreciation, which would reinforce the positive effects of liberalization on domestic agricultural prices.

In order to permit the analysis of targeted trade policies, the model is modified so that the nonagricultural manufacture is treated as an Armington-type good. By treating the nonagricultural domestic and imported products as imperfect substitutes (Armington-type structure), the model can be specified in terms of bilateral trade flows (e.g., see Dixit and Roningen, 1986). This specification is particularly appropriate for a composite good where each country is not buying and selling a homogeneous commodity. Consumers distinguish, within the nonagricultural traded goods, between products which are produced domestically and those which are imported. Consumers, in the decision-making process, are assumed to determine their expenditures for the agricultural goods, for each nonagricultural traded product depending on country/region of origin (one product from each country), and the nontraded good.

Simulation Results

The essence of the current trade policy debate is that the USA should single out countries with unfair trading practices and put pressure on them to reduce their trade barriers. If they refuse, the USA should raise its trade barriers against those individual countries. This paper reports the simulation results of three basic scenarios, assuming that Japan and the EC would be major targets of such a trade policy. In the first scenario, Japan liberalizes protection of its trade in manufactures so that its level of external protection is identical to the US level of protection. In the second scenario, both Japan and the EC lower their rates of protection of trade in manufactures to the US level. The third scenario raises US protection against both Japanese and EC manufactures to their respective existing rates of protection. The simulations yield medium-term effects of policy changes. These results are reported in Tables 1 and 2.

Overall Trade-Balance and Exchange-Rate Effects

Although the change in the overall trade balance in each country is forced to zero in the simulations, changes in bilateral trade balances are not. Therefore, one can analyze how much of the bilateral trade deficits in manufactures with the EC and Japan would be eliminated under the three policy scenarios. Liberalization by Japan alone (scenario 1) has the smallest effect, improving the US bilateral trade deficit with Japan and the EC by about 3.0 percent each over the base level (Table 1). The effects of liberalization are offset slightly by small depreciations of the yen and ECU.

Table 1—Changes in US Exports, Bilateral Trade, and Exchange Rates

	Scenario* 1	2	3
	Percent change from base period		
US manufacturing exports†	0.5	1.5	-6.0
US manufacturing trade deficit:†			
With Japan	-3.2	-2.5	-14.2
With EC-10	1.7	-13.2	-18.3
Yen/US dollar exchange rate‡	0.5	0.7	3.2
ECU/US dollar exchange rate‡	0.1	0.7	2.0

*See text for description of scenarios.
†A negative entry indicates a fall in value from the base period (i.e., lower exports or lower trade deficit); a positive number indicates an increase in value.
‡A negative entry indicates a fall in the yen/dollar exchange rate or a depreciation of the dollar; a positive number indicates a rise in the yen/dollar exchange rate or an appreciation of the dollar. The same relationship holds for the ECU/dollar exchange rate.

When both the EC and Japan liberalize (scenario 2), the US-EC trade balance improves substantially, by 13.2 percent. But, the US-Japan deficit improves by only 2.5 percent, due mainly to a larger depreciation of the yen, which induces higher US imports and a lower increase in exports than in scenario 1. When the USA imposes retaliatory tariffs on Japan and the EC (scenario 3), the US bilateral trade deficits shrink by over 14 percent with Japan and by over 18 percent with the EC. However, unlike the first two scenarios in which total US exports of manufactures show small increases, US exports fall by nearly 6 percent. Whereas liberalizing trade causes both US imports and exports to increase, imposing tariffs causes both US imports and exports of manufactures to fall.

In each of the three cases, the improvements in the US bilateral trade deficits come about differently. When the EC and Japan liberalize their trade, the improvement occurs due to an increase in US exports over and above the increase in US imports from these countries. The rise in exports is stimulated largely by greater access to these foreign markets. The rise causes the dollar to appreciate, which, in turn, causes US imports from these countries to grow (by less than exports). By contrast, when the USA imposes retaliatory tariffs on foreign manufactures, both US imports and exports fall. Imports fall due to higher tariff/nontariff protection. The fall in imports causes the dollar to appreciate, which, in turn, causes US exports to fall.[4]

US Agricultural Trade-Balance Effects

Only protection of trade in manufactures changes in the simulations. Protection of trade in agricultural products remains fixed at its base-period levels in all countries. Changes in agricultural prices that occur due to changes in protection of trade in manufactures are transmitted across countries. Agricultural protection is assumed to be exogenous and does not respond to changes in agricultural prices. In addition, perfect price transmission is assumed to hold. Because cross-price effects, complementarity, substitution, and input effects tend to be small between agricultural and nonagricultural manufactured goods, the major effects on agriculture tend to come through exchange rate changes.

US agricultural exports fall when foreign countries liberalize their trade in manufactures due to a small appreciation of the dollar (Table 2). When only Japanese protection of trade in manufactures is reduced (scenario 1), the effect on agriculture is very small, about a 1-percent drop in the value of agricultural net trade. The drop is due mainly to changes in trade volumes; prices sustain small declines. Small reductions in exports of dairy and small increases in net imports of livestock and "other" agriculture account for the overall decline. Changes in grains/oilseed and sugar trade are insignificant.

Table 2—Changes in the Value of US Agricultural Trade

	Scenario* 1	2	3	Base period
	Percent change from base period†			*$1,000,000,000*
US total agricultural trade balance (net exports)‡	-1.2	-2.9	-11.2	15.5
Grain/oilseed net exports	-0.4	-0.9	-4.2	17.4
Sugar net imports	-0.2	-0.4	4.0	0.3
Dairy net exports	-1.6	-5.9	-7.5	0.2
Livestock net imports	4.3	11.7	40.5	1.3

*See text for description of scenarios.

†A negative entry indicates a fall in value from the base period (i.e., lower net imports or lower net exports); a positive number indicates an increase in value.

‡Total agricultural net exports equal the sum of net exports of grain and oilseeds, sugar, dairy, livestock, and "other" agriculture.

When the EC liberalizes trade of manufactures in addition to Japan (scenario 2), the effects are more pronounced. The US agricultural trade balance falls by almost 3 percent. Grain/oilseed trade drops by nearly 1 percent. As in scenario 1, reduced volumes of dairy exports and increased livestock imports account for most of the decline in total trade. Sugar imports are virtually unchanged.

When the USA raises protection of trade in Japanese and EC manufactures (scenario 3), the deterioration in the US agricultural trade balance is more than triple that under liberalization, falling by over 11 percent. The decline in grain/oilseed trade is also over three times scenario 2. Dairy and livestock balances are also significantly worse than under liberalization. Sugar import expenditures increase slightly (or sugar exporter quota rents increase slightly) for the same reason as in scenario 2. The principal cause for the general decline in agricultural exports and increase in imports is the increased appreciation of the dollar induced by higher protection (Table 1). The large difference in the results between scenario 2 and 3 is also due to divergent income effects. Foreign liberalization of trade in manufactures increases foreign income and foreign imports of agricultural products, thereby mitigating some of the appreciation of the dollar. By contrast, when the USA increases its protection of trade in manufactures, foreign income falls and the exchange-rate effect is compounded rather than offset.

Conclusions

US strategies to reduce bilateral trade deficits on manufactures through targeted trade policies are likely to have a negative effect on US agriculture. This tends to be the case whether foreign governments open up their markets to allow more imports of US manufactures or whether the USA imposes retaliatory restrictions on targeted manufactures coming into the USA. In either case, US bilateral trade deficits improve, but at the expense of agricultural trade. Either an increase in protection of trade in manufactures by the USA or foreign liberalization of trade in manufactures will tend to raise the value of the dollar and reduce the competitiveness of US agricultural products.

Foreign liberalization of trade in manufactures tends to produce small negative effects on US agriculture. By contrast, a retaliatory increase in US protection of trade in manufactures appears to create significantly worse effects on agriculture. The analysis does not consider the possibility that foreign governments may, in turn, also retaliate by increasing tariffs and restrictions on US exports, including agriculture. In that case, the effect on agriculture is likely to be more severe than the results found in this analysis.

The results suggest that a balanced approach towards reducing (or raising) protection of both agricultural and nonagricultural goods is necessary in order to avoid penalizing agriculture. Under a balanced approach, for example, foreign liberalization of trade in agricultural goods along with manufactures would tend to offset the bias against US agricultural exports introduced by foreign liberalization of trade in manufactures. An analogous argument can be made in the case where US protection is increased against imported manufactures.

Notes

[1]Economic Research Service, US Department of Agriculture.

[2]In the second case, changes in trade protection are assumed to affect currency values indirectly through the elasticities of demand and supply for traded and nontraded goods. Since the elasticities approach does not consider a world with capital flows, the shock is implicitly assumed to affect only the trade balance and does not induce changes in capital flows. Corden (1987) argues that since the capital account depends on savings and investment decisions, changes in protection have an ambiguous effect on capital flows. While one could have arbitrarily selected to limit the change in the trade balance so that it did not always equal zero, no rigorous criterion requires one to do so. Therefore, the standard convention was adopted.

[3]The entire system of equations, derivation of the reduced-form equations (for prices, income, and exchange rates) in terms of the exogenous variables, and details on protection of the agricultural and nonagricultural sectors are reported in Krissoff and Ballenger (1987b). Sources for the data and base values used in the model are reported in Krissoff and Ballenger (1987a).

[4]To see why an increase in protection causes the dollar to appreciate, consider the following. As protection increases, imports fall. As a result, fewer dollars enter the world currency markets to obtain foreign exchange needed to purchase foreign goods. As the supply of dollars in world currency markets falls, the price of dollars rises; i.e., the dollar appreciates.

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DISCUSSION OPENING—*Eduardo Segarra* (Department of Agricultural Economics, Texas Tech University)

Given the conference theme of "Agriculture and Governments in an Interdependent World," this conference could not have been a better forum for discussing the topic addressed by Schwartz and Krissoff. International trade studies based on traditional comparative advantage concepts alone have become part of the history of economic thought rather than of contemporary analytical economic literature on methods that should be used in the analysis and evaluation of international trade issues. International trade economists have come to recognize the existence of the notion of competitive advantage, which refers to comparative advantage concepts once government intervention and interdependencies among economic sectors are taken into consideration. That is, by acknowledging the existence of competitive advantages among trading countries, economic as well as political interdependencies among governments are internalized in analyzing and evaluating international trade issues.

Current concerns over the increased intensity of protectionist policies have provided the impetus to move towards the elimination of some or all barriers to trade. The elimination of these distortive policies are viewed as a necessary condition for promoting free trade or trade liberalization. For this reason, I commend Schwartz and Krissoff's efforts in analyzing and evaluating the impacts on agriculture of liberalization of trade in manufactures among the USA, Japan, and the EC. Their analysis is important because tariffs and other measures that protect the manufacturing sector reduce the competitiveness of agriculture since they are equivalent to import taxes.

In evaluating the impacts on agriculture of liberalization of trade in manufactures, however, in addition to internalizing interdependencies between the manufacturing and agricultural sectors, one must recognize that if domestic production externalities exist in agriculture and are not internalized in production costs, then trade remains distorted. That is, trade and resource economists rarely analyze the implications of the linkages between natural resources and trade even though their analyses are generally centred on objectives of maximizing social welfare. This is important because if significant trade liberalization stems from the Uruguay Round, changes in the resource mix used in agricultural production could be quite significant. This implies that if externalities stemming from agricultural production are not considered in evaluating welfare losses due to trade losses, welfare losses due to decreases in exports could

be overestimated. This is due to the fact that reduced exports would imply lower optimal production levels for the exporting country, which in turn would imply lower levels of natural resource use and/or lower rates of natural resource deterioration. In looking at the simulation results obtained by Schwartz and Krissoff and depending on the particular trade liberalization scenarios that they analyzed, one can find that the change in the total value of US agricultural exports could decrease anywhere from $200 million to $1,740 million. However, what they fail to recognize is the presence of production externalities in terms of natural resource degradation in agriculture in the USA. If agricultural exports were to be reduced as a result of trade liberalization, as they found, and if, in response to that, domestic production was to be reduced, then a decreased burden on natural resource use would arise that would tend to increase welfare due to the reduced levels of production externalities domestically, thus implying a lower loss than that pointed out above. Therefore, Schwartz and Krissoff's losses could be regarded as upper bounds on losses, which would have to be revised downwards to account for domestic production externalities abatement. Their analysis is in the right direction and I commend them for that, but some room exists for improvements.

GENERAL DISCUSSION—*Ming-Ming Wu, Rapporteur* (Department of Agricultural Marketing, National Chung-Hsing University)

The authors were asked how liberalization of policies on trade in manufactures abroad affects US farm income. In reply, they said that farm revenues had two components: those earned from domestic sales and those earned from export sales. Foreign liberalization of policies on trade in manufactures increases demand for US manufactures. This raises the value of the dollar, which in turn puts downward pressure on US tradeable prices (of both manufactures and agricultural products) relative to the rest of the world and to US nontraded goods. But the rise in foreign demand for US exports of manufactures means that prices of manufactures rise relative to agricultural prices. Therefore, in relative terms, domestic farm revenues fall. In addition, the rise in the dollar depresses export sales and export revenues. The combined effect is a decline in US farm income due to a change in foreign policies on trade in manufactures.

Participants in the discussion included F. Thoumi.