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SUGGESTIONS FOR A RESEARCH AGENDA IN MODELING TRADE POLICY

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Current work in modeling trade policy is reviewed to suggest profitable directions for new research. The premise is that the near future will look very much like the recent past. The gap between the current theory of international trade policy and actual policies is striking. This gap is a sufficient reason to pause and consider what type of research is most appropriate.

A true believer in the neoclassical model may feel more than a little exasperation at the failure of policymakers to follow the recommendations of that model. There are two types of explanations for the failure; these explanations are not mutually exclusive. The first is that, although the normative aspects of the basic model are correct, they are largely irrelevant because policymakers are not philosopher kings who maximize social welfare but, rather, are the creatures of special interest groups. If that is so, then to understand the world, economists should examine the data to determine how policymakers reach their decisions. In the last decade, the theory of revealed preference has been used to estimate objective functions that can account for policy choices. A less formal approach seeks the statistical relation between policies and diverse explanatory variables, for example, the correlation between the number of workers in an industry and the degree of protection the industry receives (2). 1/ This view of policymakers also encourages the construction of models based on elements of political science and game theory. For example, politicians adopt policies that maximize the probability of re-election, given the choices of rival parties. This view of the world seems plausible, and there is likely much to be learned from it.

The second explanation for the gap between theory and practice concentrates on the deficiencies of the textbook neoclassical model. Even if policymakers were philosopher kings, they would be poorly served by that model. This second explanation is more optimistic than the first. It leads to an active role for economists and a promising research agenda. If policies are adopted solely for reasons of political expediency, it is pointless to attempt to devise rational policies. However, if economic rationality is even one consideration among many in the policy process, it is worthwhile to understand what actually constitutes rationality.

This paper outlines some of the areas in which the standard neoclassical trade policy model has been improved and areas in which continued improvement can be expected. "Trade policy" is taken to mean international commercial policy. It includes, for example, tariffs, subsidies, and nontariff barriers; it excludes macroeconomic policies such as exchange rate adjustments and deficit reduction. Although policies of the latter type are clearly important in trade, it is useful to consider the more narrow aspects of commercial policy. The issues discussed below have important bearing on agricultural trade.

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1/ Underscored numbers in parentheses refer to sources cited in the References.

However, the theory has been developed for trade in general and not with regard to agricultural trade specifically. This paper adopts the more general concern.

The plan of the paper is as follows. The simple policy model is briefly reviewed, and some of its important insights are mentioned. Four directions in which the model has been extended are then discussed. The first of these concerns the generalization from two goods and two factors to many goods and factors. From a theoretical perspective, this is standard material; but a great deal of empirical work remains to be done. The paper then discusses the inclusion of uncertainty, dynamics, and strategic considerations. These four extensions to the basic model have one feature in common. By adding complexity, they have added ambiguity. In some cases, there seems little hope that this ambiguity can be resolved, by either further theoretical or empirical work. To the extent that ambiguity is a feature of the real world, it is welcomed in models. No attempt is made to present a complete survey of these extensions to the basic model. The discussion is intended to review some of the work that has been done in order to suggest profitable avenues for future research.

Repeated reference has been made above to the standard trade policy model. By that, I mean the two-factor, two-commodity, general equilibrium model of an open economy. Additional assumptions, such as constant returns to scale in production or homothetic preferences, are added as required. This model has been used to analyze how the levels of welfare, trade, and consumption are affected by various distortions. It also indicates how noneconomic objectives, such as a desired level of factor employment in a particular sector, can be achieved efficiently. Bhagwati (4) provides an excellent discussion of the model. The conclusions are strong and intuitively appealing: Noneconomic objectives should be achieved by interventions in the market most directly affected. The decrease in a distortion, such as a tariff, raises welfare. Although the model is simple, it is rich in insight and continues to be useful (for a recent application, see (24).

Many Commodities

If more than two goods are permitted, the simplicity vanishes. As an illustration, consider the case of the optimal tariff for a large country. With n goods, the optimal tariff (tax) on the ith good is

$$\tau_i = \sum_j \frac{\alpha_j}{\varepsilon_{ij}\,\alpha_i},$$

where α_j is the value of exports of the jth commodity and ε_{ij} is the cross-price elasticity of foreign demand for the ith good with respect to the jth price (20, p. 171). In the case with only two goods, this reduces to the formula giving the optimal tariff as the inverse of the elasticity of world excess supply. With n goods, it may be optimal to subsidize exports or imports of a commodity for which the country has market power.

Two other examples are used to indicate the importance of a multicommodity framework. Consider a small country that imposes tariffs on many imports. Will a reduction in the highest tariff increase welfare? As mentioned above,

in the case of two commodities, the answer is unambiguously, "yes"; but in a world of many commodities, the welfare effect may be positive or negative. The papers by Fukushima (13) and Hatta (15) consider the question. If (1) there are no inferior goods, (2) the good with the highest tariff is a net substitute for other goods, and (3) nontraded goods are net substitutes for other goods, a decrease in the highest tariff will improve welfare. These conditions provide a basis for the empirical determination of the effects of proposed tariff changes.

As a final example, take the problem of choosing the optimal distortion in a particular market, given that distortions in other markets cannot be altered. To motivate the issue, consider the following hypothetical argument: "In the United States the nonagricultural sector is heavily subsidized; in order to offset this distortion, agriculture should be subsidized; such a subsidy brings the relative price between nonagricultural and agricultural goods closer to the free trade equilibrium relative price." Such a position could be defended in a world with two goods; in a world of many goods, it asserts too much.

The optimal choice of a distortion in a particular market, given fixed distortions in other markets, is a problem in the theory of the second best. Dixit and Norman provide a modern treatment, and Dixit and Newbery discuss an application (10, 9). The optimal distortion is a weighted average of the (fixed) distortions in the other markets; the weights sum to one, but they need not all be positive. If some weight is negative, it is possible that all sectors with fixed distortions are subsidized; yet, it is optimal to tax the remaining sector. For example, suppose there is a small country with three sectors (9). Let sectors 2 and 3 be subsidized; if the net output of sector 2 increases as a result of an increase in the price of good 1, it may be optimal to tax good 1. The calculation of optimal distortions, holding other distortions fixed, provides the type of empirical evidence necessary to support or refute the hypothetical argument given above concerning U.S. agriculture.

The examples illustrate the importance of using a multicommodity model in determining either the qualitative or the quantitative effects of policy. Much of the intuition of the two-good model does not carry over, in a simple way at least, to the real world.

Uncertainty

The basic trade policy model has been extended in a different direction by the inclusion of uncertainty. At least two distinct issues have been raised in this regard. The first considers the optimal policy to achieve a particular noneconomic objective in the presence of uncertainty. This is a direct extension of the type of problem reviewed by Bhagwati (3). The second issue is more fundamental: Even in the absence of any noneconomic objective, free trade may not be optimal. This can occur when there is not a complete set of markets to insure against risk. It is possible that autarky is Pareto superior to free trade.

The papers by Young and Anderson illustrate the effect of uncertainty on the optimal choice of policies in the presence of a "noneconomic" constraint (30, 31). In a deterministic framework, Bhagwati and Srinivason showed that a tariff maximizes welfare, given constraints on the level of imports (5). In the absence of uncertainty, the same result is achieved by a quota where

import licenses are auctioned. With the introduction of uncertainty, for example, a stochastic world price, the equivalence between a fixed quota and a fixed tariff no longer holds. If the objective is to maximize expected domestic consumer surplus subject to a ceiling on expected imports, a fixed specific tariff is optimal. A tariff can be regarded as a state-contingent quota. The rent on an import license under such a quota, that is, the amount an individual would be willing to pay for such a license, is the difference between domestic and world price. With a fixed specific tariff, the rent on the state-contingent quota is constant in all states of the world. A tariff equates the marginal value of imports across different states of the world; that is, a tariff serves as a mechanism of arbitrage, and this explains its optimality.

These considerations hold when the criterion is consumer surplus. If the marginal utility of income is not constant, this measure of welfare is not appropriate. Using the indirect utility function over imports, Young and Anderson show that, when faced with a ceiling on expected imports, a quota may lead to a higher level of expected utility than does a tariff (30). This occurs where the representative consumer is very risk averse. The explanation is that a tariff leads to wider fluctuations in real income than does a quota. Under a tariff, an increase in world price of imports leads to an increase in domestic price. Imports become more expensive, and the level of imports drops; this leads to a fall in real income. Under a (binding) quota, the level of imports does not change, so the fall in real income attendant on a rise in world price is less. The advantage of a quota lies in the smaller fluctuations in real income that it induces; the advantage of a tariff, as discussed above, is that it serves as a mechanism of arbitrage across states of nature. For a very risk-averse country, a quota may be superior.

The problem of maximizing expected welfare subject to a ceiling on the expected level of imports illustrates the importance of considering uncertainty in trade policy models. It seems unlikely that empirical studies will be able to resolve many policy questions that involve uncertain environments because the same demand structure can be generated by indirect utility functions with different degrees of risk aversion. Results of the type that Young and Anderson obtain do not indicate the proper way of estimating welfare effects, but they do suggest that care must be taken in evaluating any such estimates.

The introduction of uncertainty alters some of the fundamental propositions regarding the welfare effects of trade. A number of papers have shown that, in the absence of a complete set of markets, free trade may not be optimal (11, 16). It is possible that autarky may be superior to free trade. Newbery and Stiglitz construct an example in which this is the case (23). In their model, the producer allocates resources between a risky crop and a safe crop. Demand for each good is unit elastic; so, in the absence of trade, the producer's income is nonstochastic. Suppose trade begins with a second country that is identical except for imperfect correlation between the random variables (weather) that determine the per acre yield of the risky crop in each country. This tends to stabilize the quantity of the risky crop available for sale and thereby to stabilize the price. However, it destabilizes producer income, and this induces a supply response. Consumers gain from the stabilized price but lose as a result of the supply response. If producers are very risk averse, the supply response will be large; if consumers are not very risk averse, they benefit little from the stabilized price. In this case, both consumers and producers can lose from the introduction of trade.

The Newbery and Stiglitz model is more important as a cautionary tale than as an indication of the likely effects of trade. The lesson is that the absence of a complete set of markets is a distortion much like any other, and it may call for compensating distortions. This observation suggests the need for more detailed analysis of the institutional structure in which private decisions are made. Which are the important missing markets? How should policy ameliorate their absence?

Dynamics

The inclusion of dynamics represents a third area in which the basic trade policy model has been extended and in which further work is needed. Three issues that involve dynamics suggest possible directions for future research. The first involves adjustment costs, the second emphasizes the effect of policy on stocks and flows, and the third distinguishes between shortrun and longrun considerations.

In the two-good, general equilibrium model, the reduction of a tariff alters production decisions. At the new equilibrium, the value (at world price) of output has increased; hence, welfare has increased. This analysis ignores what happens between the time the distortion is reduced and the new equilibrium is reached. If costs of adjustment are significant (due, for example, to fixed factors or factor prices), a comparison of welfare at the new and old equilibria may greatly exaggerate the benefits of trade liberalization.

The empirical question is particularly difficult. Presumably, it would be possible to construct a multiperiod, computable general equilibrium (CGE) model to simulate the effect of a policy change in the presence of adjustment costs. Baldwin and others adopt a simpler strategy to investigate this issue (3). They use a static CGE model to determine the equilibrium following a change in tariff structure and then assume a reasonable (but ad hoc) adjustment process toward that equilibrium. Another method of capturing the intertemporal effects of a policy change is to estimate a dynamic partial equilibrium model and perform simulations. A paper by Anderson and Tyers is an example of such an approach (1). Although this paper does not include adjustment costs, the model could be modified to do so.

A number of approaches based on dynamic optimization have been developed in the last several years to estimate adjustment costs. These methods are suitable for partial equilibrium analysis. They can be used to estimate the effect on the value of a firm (or industry) and on investment behavior of an exogenous change in a price. The extension to general equilibrium analysis is not obvious.

The second illustration of the importance of a dynamic model is based on a paper by Fried (12). He takes the standard dynamic model in which an agent (or country) divides its income between consumption and investment; the novelty is that the stock of assets enters directly as an argument in the instantaneous flow of utility. This specification is defended on the grounds that assets offer insurance against future disruptions in consumption. This modification alters some important welfare implications. The improvement in the terms of trade for a small country may reduce welfare. Suppose, for example, that the imports into the country are capital intensive. A fall in the relative price of imports reduces the return to capital and, thus, the value of assets. This causes a drop in the flow of utility due to assets.

The steady-state welfare effect of an improvement in the terms of trade is positive in this case. However, the total welfare effect may be negative due to the initial fall in the value of assets.

For similar reasons, a tariff may improve the welfare of a small country. In this case, it matters whether domestic residents hold their assets in domestic or foreign capital stock. This raises an issue that Fried does not consider: the effect of expectations of policies on the value of domestic assets and, hence, on domestic portfolios. To illustrate, suppose that a single policy being considered will raise the domestic price of the capital-intensive good. If the policy is imposed, it is irreversible. All agents share the same subjective probability that the policy will be imposed in any one period, given that it has not already been imposed. This uncertainty raises the dollar value of a unit of domestic capital and lowers the rate of return on a dollar invested in domestic capital. Domestic capital has become the "risky asset" of portfolio theory. Whether domestic agents hold more or less of their assets in domestic capital depends on their risk aversion, and this determines the effect the policy will have if it is instituted.

Although obvious, these points may be overlooked: Trade policies affect stocks (asset values) as well as flows (return to factors), and the mere anticipation of a policy may have significant and undesirable effects (for example, foreign ownership of domestic assets induced by changes in domestic portfolios).

The third example of the inclusion of dynamics in trade policy model is based on the optimal tariff problem. The world excess supply curve that a large country faces is assumed to be dynamic. Foreign producers and consumers do not adjust instantaneously to changes in prices. The monopsonistic importer can maximize the instantaneous flow of rent from trade by setting a tariff equal to the inverse of the shortrun elasticity of excess supply. This causes the excess supply curve to shift inward over time, and it reduces rents in the future. Alternatively, the monopsonist can maximize the flow of rents in the steady state by setting a tariff equal to the inverse of the longrun elasticity of excess supply. This is a very conservative policy and causes a loss in rents over the infinite period during adjustment to the steady state.

The difficulty lies not in determining an "optimal" dynamic policy but in knowing which to select. Karp discusses three possibilities, which depend on how much information exporters have about the future, and whether or not importers can make credible commitments about future policies (18). The results underscore the importance of a world trading system that permits credible commitments. In the absence of such a system, large nations may be forced by the logic of their position, rather than by any irrationality, to pursue policies that harm both themselves and their partners.

Optimality must be defined with respect to particular sets of information and feasible strategies. One should be cautious about comparing observed policies with "optimal" policies because the meaning of the latter is ambiguous. The institutional environment that determines the feasibility or credibility of policies may merit more attention than does the level of a policy variable. The economist as institutionalist may be more relevant to policymakers than is the economist as optimizer.

Strategic Considerations

The strategic aspect of trade policy has been studied using game theory since at least the fifties. The approach is attractive because it leads to models that capture the rivalry and retaliation that characterize international relations. Game theoretic methods still lie on the periphery of trade policy analysis, largely due to the ambiguity of the results. The tendency is to prefer the perfectly competitive paradigm; long familiarity with the assumptions of that model has bred a degree of acceptance, if not always respect. The wealth of possibilities inherent in game models makes the development of a unified theory of trade policy, based on game theory, very unlikely. Despite this, specific models may yield insight into particular situations. This section considers two applications of game theory to trade policy analysis. The first application is the game analogue of the optimal tariff problem; the second considers the use of commercial policy to form credible commitments.

Johnson's paper is the classic work on equilibrium tariffs (17). Two large countries choose their optimal tariff, taking as given the tariff of their trading partner. This yields the Nash equilibrium. Using constant elasticity offer curves, Johnson showed that it was possible that one country might prefer the Nash equilibrium to free trade. The model has been extended in three directions.

Hamilton and Whalley calculate equilibrium tariffs under more general production and demand specifications (14). These imply the constant elasticity offer curve as a special case. The authors use estimated parameter values for the underlying functions. Their calculations suggest that Nash equilibrium tariffs would be significantly above current tariff levels. This underscores the importance of maintaining cooperative agreements even in their present imperfect state.

Thursby and Jensen drop the Nash assumption of zero conjectural variation (28). Country A does not take country B's tariff as given; it recognizes that its own tariff affects B's choice. They show that the equilibrium is sensitive to the conjectural variation. The latter is given exogenously. Without additional restrictions, such as consistency and linearity, it cannot be determined endogenously.

Karp and McCalla use a partial equilibrium model with linear demand and (dynamic) supply equations and obtain equilibrium rules in a dynamic game (19). This permits policymakers to recognize that their policies affect the future as well as the present. The model has recently been generalized by the addition of uncertainty and risk aversion. Further elaborations of Johnson's 1954 model will probably appear (17). The main contribution of this line of research is to provide an indication of the likely effects of a general retreat into protectionism.

A 1981 paper by Mayer provides an interesting contrast to the noncooperative games discussed above (21). Mayer investigates the outcome of cooperative behavior, that is, negotiated reductions in tariffs. In the two-country model, Pareto optimality requires either free trade or one country using a tariff and the other a subsidy. If, however, one country has two interest groups that are not permitted to compensate each other by means of side payments, then free trade is, in general, no longer in the Pareto optimal set. If one country is significantly larger than the other, a cooperative

equilibrium requires that the large country use a tariff and the small country a subsidy. Mayer also treats tariff negotiations as a two-stage game. In the first stage, a particular rule for tariff cuts is chosen, for example, a proportional cut in all tariffs. In the second stage, the specifics of the rule are agreed upon, for example, the factor of proportionality. Economists may be useful in helping to elucidate the effects of various sets of rules.

The second example of the use of game theory in trade policy is closely related to the issue of determining the rules under which subsequent games are played. The central idea is that governments may be in a position to make credible commitments where private firms are not in that position. This ability enables the government to use commercial and industrial policy to improve domestic welfare.

The paper by Spencer and Brander illustrates this idea (27). Monopolistic firms in each of two countries produce for the export market; the goods are close substitutes. In the first stage of the game, each firm decides on its research and development (R&D) level; this affects its cost of production in the next stage. In the second stage, firms choose production levels given previous R&D; the Nash equilibrium is determined by production costs. In choosing R&D levels, firms behave strategically, and a Nash equilibrium at the R&D stage is assumed. The combined level of R&D investment is greater than the socially optimal account. Nevertheless, it would be in the interest of one government to subsidize domestic R&D. This subsidy moves the domestic firm to the position of the Stackelberg leader in the R&D game. The firm cannot unilaterally adopt this position since there is no way that it can credibly subsidize itself. The government does have the ability to make such a commitment. If the government is able to use both R&D and an export policy, it is optimal for it to tax R&D and subsidize exports. The first policy induces the domestic firm to invest in R&D to the point where average costs are minimized, and the second policy enables the domestic firm to act as the de facto leader in the production stage of the game.

This scenario assumes that the government in the second country does not adopt similar policies. If both governments attempt to use industrial and commercial policies, the result is a game between governments. It would then be in the interests of both to negotiate cooperative policies. For symmetric firms, this would require a tax on R&D to minimize costs and a tax on exports to achieve the level of output that maximizes joint profit.

Other papers in a similar vein include Dixit (7, 8), Brander and Spencer (6), and Ware (29). These papers emphasize the importance of making credible commitments. The paper by Ware, for example, shows how large stocks can act as a deterrent to potential entrants much as does investment in excess capacity (25, 26). This seems particularly relevant to agriculture. It has been suggested that, rather than being a burden, large U.S. wheat stocks through most of the sixties permitted the United States to exercise market power (22). When strategic considerations are accounted for, seemingly irrational policies, such as export subsidies and "excessive" stockholding, may appear rational.

Conclusion

Different areas of trade-policy research were discussed with a view to suggesting candidates for a research agenda. The point of departure was the gap between the theory and practice of trade policy. Economic irrationality

and self-interest may account for a large part of this gap. However, the most commonly used theoretical model is inadequate, and it may be more useful to attempt to improve that model. When economists have a better understanding of what constitutes rational behavior in a complex world, they will be in a better position to gauge the rationality of policymakers.

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