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# COST OF PRODUCTION AND PRODUCTIVITY IN ANALYZING TRADE AND COMPETITIVENESS

by

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1990

Productivity

Paper prepared for the

Invited Paper Session: International Competitiveness:

Usefulness of Cost of Production and Productivity Measures

AAEA Meetings, August 4-8, 1990

AAEA 1990

## Cost of Production and Productivity in Analyzing Trade and Competitiveness

Agricultural economists for many years have calculated costs of producing agricultural commodities and measures of productivity (output per unit of input). Early research focused on farm management extension needs, then came the data demands of linear programming models of representative farms. More recently, estimates of costs of production have been used for setting price supports. Similar stories of the growth in demand for cost data and productivity measures could be told for Canada, Western Europe, Japan, and other countries.

The growth of agricultural trade and the more recent increase in trade conflicts have generated interest in issues of competitiveness. One set of issues is concerned about basic comparative advantage. Would the home country's agriculture still be competitive if Government support were removed at home and abroad? A second set of issues is concerned about how changes at home or abroad in policy, technical efficiency, or input prices would affect international competitiveness.

On the surface, it seems quite appropriate to apply our accumulated research skills and data on costs of production and productivity to these questions of international competitiveness. What we have found from early attempts to do this in agriculture, however, is that the comparisons have not always been very helpful in understanding competitiveness. For evaluating global competitiveness, some revisions of old measurement methods may be required.1/

The purpose of this session is to improve our measures of agricultural costs and productivity so that they give us a better understanding of international competitiveness. My purpose is to present as background several basic concepts of trade and competitiveness that can be used as guides to refine these measures in order to make useful cross-country comparisons. I start with a simple model that illustrates basic links between measures of costs and competitiveness. I focus on costs, but some of the implications may be extended to measures of productivity.

### International Competitiveness: Basic Concepts

Assume Country A and Country B are two of many countries that produce and export wheat. To simplify, assume that the two exporting countries do not consume wheat, wheat is a very small part of their total economic activity, and there are no transportation charges between countries. Several important concepts relating to cost of production, productivity, trade, and competitiveness can be shown with this simple model.

Let the curves $F_A$ and $F_B$ in Figure 1 represent export supply curves, at farm gate prices, for Countries A and B, respectively. They represent the quantity that would leave the farm for export at alternative farm prices. Since there is no domestic use, curves $F_A$ and $F_B$ are also

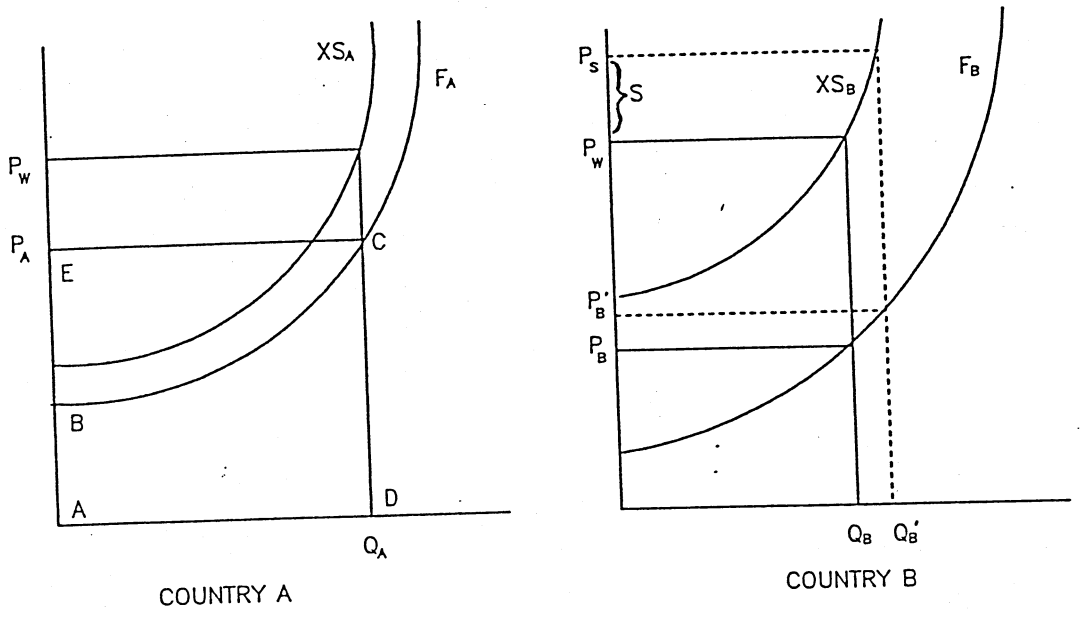


Figure 1. Wheat supply in two countries

domestic supply curves. Let the curves $XS_A$ and $XS_B$ represent excess supply curves at the port of exit from the country. The vertical difference between the XS and F curves represents variable domestic "marketing," costs (e.g., storage, transportation, handling, including any marketing and export taxes or subsidies). The world market in figure 1 clears at price $P_W$ with Country A producing and exporting quantity $Q_A$ and Country B producing and exporting $Q_B$.2/ The supply curves show that Country A has high variable production costs and low variable marketing costs relative to costs in Country B. Thus the farmgate price in Country A, $P_A$, is higher than the farmgate price in Country B, $P_B$.

Suppose these cost curves were unknown but economists had accurately measured the average cost of producing and marketing wheat in Countries A and B. After adjusting for year-to-year variability, they likely would find in Country A that the average total unit cost for producing $Q_A$ units was $P_A$.3/ The average variable production cost per unit would equal area ABCD in figure 1 divided by $Q_A$, and the per-unit residual returns to fixed production factors would equal area BEC divided by $Q_A$. Total marketing costs per unit would equal the difference between $P_W$ and $P_A$. Equivalent cost estimates could be obtained for Country B.

## Competitiveness

Concepts of competitiveness may be introduced with this simple model. "Competitiveness" does not have a definition in neoclassical economic

theory; it is a political concept. It is becoming conventional, however, for economists and others to perceive of competitiveness as the result of the combined effect of market distortions and comparative advantage. For examples, see Amstutz, Barkema, et.al., and Sharples. "Market distortions" usually implies distortions caused by policy, but it also could include distortions caused by imperfect competition.

Comparative advantage is theoretical, explaining trade and optimal welfare in an undistorted world. Competitiveness, on the other hand, relates to the observable. If firms and industries cannot survive by selling at the going price, they are not competitive. If they are able to survive and increase market share, they have become more competitive. Note, however, that an increase in competitiveness of an industry--possibly due to government support--does not necessarily imply an increase in national welfare.

In the context of figure 1, a country over time can become more internationally competitive in exporting wheat by doing things that shift its wheat export supply curve right (or down). Examples include: (1) increasing the stock of fixed resources in wheat production and marketing, (2) increasing efficiency (productivity), (3) reducing input prices, (4) reducing interest rates, (5) changing policies to lower taxes or raise subsidies on wheat production and marketing, and (6) depreciating the home currency, discussed below.

Analyses of the forces listed above help to explain changes in past competitiveness, and help to evaluate alternative futures. The rest of the paper addresses the issue of how international comparisons of production costs can help to better understand competitiveness.

## Cost Estimates and the Supply Curve

In order to address global wheat competitiveness questions, in the context of figure 1, we need to have (1) estimates of the intermediate run wheat supply and export supply curves, and (2) estimates of how the forces listed above would shift the supply curves. I contend that estimates of costs of production and marketing tell us little about the supply curves but cost estimates can help to estimate <u>shifts</u> in the supply curves. Cost estimates also provide a more detailed picture of how differing competitive forces uniquely shaped agriculture in different countries at the time the costs were estimated.

Economists generally agree that agriculture is an increasing-cost industry, as represented by the upward-sloping supply curves in figure 1. The supply curve shows the cost of producing the marginal unit over a range of output prices. A cost survey typically provides information on average variable and average fixed costs at one point in time (i.e., for one output price). Thus, an estimate of average unit cost tells us very little about the supply function.

Furthermore, knowing the distribution of costs across all firms in the industry may not tell us much about the supply curve because that distribution does not represent marginal costs. Suppose, based on a survey of costs of all firms, that production is arrayed from lowest variable cost to highest variable cost. This distribution shows how all firms at one point in time react to one set of expected market conditions. The industry supply curve, on the other hand, shows how all firms in the industry would react to a range of alternative expected output prices. Firms would be expected to change their production methods and input mix in response to expected changes in output price.

## Getting Cost Comparisons Right

Even though cost estimates do not help much in defining the supply curve, those data are still useful for answering questions about competitiveness. To do this, however, care must be taken to make the comparisons consistent with trade theory. The remainder of the paper focuses on issues associated with comparing costs across countries.

Suppose economists decide to compare wheat costs in countries A and B. They would face many conceptual and technical problems--problems that are discussed in the other papers in this session. I focus on three important issues specifically associated with making international cost comparisons; (1) to include marketing costs, (2) to include the impacts on costs of taxes and subsidies, and (3) to get the exchange rate right. These are discussed below.

### Include Marketing Costs

Figure 1 shows that in order to evaluate international competitiveness, marketing costs, as well as production costs, need to be examined. Comparisons of costs of <u>production</u> tell us little about competitiveness. As presented in figure 1, both wheat exporting countries successfully compete in the global wheat market. It would be misleading to conclude, based only on Country B's lower average variable production costs, that Country B has some basic competitive advantage in wheat exports relative to Country A. In international trade, it is the cost of production plus all the additional costs to get the commodity to the foreign buyer, that determine competitiveness.

### Account for the Effects of Public Policies

In order to understand competitiveness, one needs to account for policy measures that influence the price signals faced by producers and marketers. These include input and output taxes or subsidies; and border tariffs, taxes, and quotas. For example, suppose Country B provides a subsidy on exports of wheat (figure 1). Although the export price remains at $P_W$, an export subsidy of S is equivalent to raising the

border price to $P_S$ for exporting firms. As a result, producers would receive price $P_B'$ and Country B would produce and export quantity $Q_B'$. Because of the higher price and added production, marginal and average variable costs of production and marketing per ton of wheat would increase as shown in figure 1. Land rents and land values would increase because of their larger residual returns. An accurate accounting would show total costs equal to $P_S$ in Country B while in Country A they would equal $P_W$. The subsidy raised costs.4/ Likewise, removing the subsidy would be expected to lower costs.

## Pay Attention to Exchange Rates

Comparisons of production and marketing costs among countries inevitably involves using exchange rates to convert costs to a common currency. Recent history shows that exchange rates are among the most volatile parameters in the whole process of estimating and comparing costs.

For example, during the 9-month period between June 1989 and March 1990, the real value of the U.S. dollar dropped over 25 percent relative to the currencies of other countries who export corn and soybeans (U.S. Dept. Agr., p. 55). That depreciation of the dollar implies that in 9 months the U.S. costs of producing and marketing corn and soybeans dropped over 25 percent relative to costs of competitors. No change in domestic agriculture likely would ever have such a large impact on inter-country cost comparisons in such a short time. Movements of real exchange rates imply that forces outside of agriculture have a very large impact on short run and longer run cost comparisons.

The effect on cost estimates of the volatility of real exchange rates may be reduced by computing an average over several years. This procedure would be consistent with the intermediate-run assumptions generally used for evaluating competitiveness issues.

## Usefulness of Cost Comparisons

Assume that wheat costs in Countries A and B of our example have been estimated. Appropriate attention has been paid to marketing costs, to taxes and subsidies, and to the exchange rate. What do we learn about competitiveness from the comparisons? We likely find that when averaged over several years, total costs approximate incentive prices (observed prices plus taxes and subsidies) in each country. Thus the estimate of total cost, taken alone, is not very useful information since we already know price and, by extension, we already know total cost.

Further, inter-country comparisons of costs gives little insight into basic forces of comparative advantage. The cost structure of an export industry such as wheat is shaped by policy distortions as well as by the forces of comparative advantage. A different, unknown, cost structure would emerge in each country if distortions were somehow removed and the

market were only subject to forces of comparative advantage.

Knowledge of the components of cost, however, are useful for a better understanding of competitiveness. A comparison of cost components across countries show the net effect on input use and factor payments of the existing forces shaping competitiveness in each country.

Cost components may also be used to approximate shifts in supply curves. For example, suppose that we are interested in evaluating the impact of a 50 percent increase in pesticide costs (due to an environmental tax?) in Country A on Country A's competitiveness in the world wheat market. By knowing the ratio of pesticide cost to total variable and fixed cost of production and marketing, and assuming that there would be no significant change in the input mix, one has an approximation of how much Country A's supply curve and export supply curve would shift left (up). The change in costs could be used to shift a supply curve in a world trade model. Then, the impact on world trade and competitiveness could be estimated. We need to be careful, however, in using cost data to evaluate how production or exports might respond to major changes in input or output price ratios. Producers facing a major change in price ratios would be expected to reorganize production. By reorganizing, a new cost structure would emerge.

## Conclusions

I conclude that international comparisons of estimates of agricultural costs (1) need to be consistent with trade theory, (2) tell us little about comparative advantage, (3) are useful for showing how differing competitive market forces within countries have influenced input use and payments to fixed factors, and (4) are useful to a limited extent for estimating how future incremental changes in input prices, technical efficiency, and policy might shift agricultural supply curves. Thus, by incorporating basic concepts of trade theory, analysis of inter-country comparisons of costs and productivity should provide useful information about how domestic competitiveness forces have affected resource use and costs.

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## Footnotes

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1/ For a detailed example of an inter-country comparison of costs of producing cereals, see Stanton. Capalbo and Denny provide a rigorous example of comparisons of aggregate agricultural productivity measures for the U.S. and Canada.

2/ This model represents an intermediate run equilibrium where production and input use responds to price changes that persist for several years. For individual commodities, most inputs would be considered "variable." For example, land would be a variable input to production of one crop on a diversified farm. Its opportunity cost would be its return from alternative crops.

3/ These curves represent private costs. Additional social costs of private production and marketing, such as pollution or soil erosion, are not included unless reflected in taxes or other costs imposed on private firms by public policy.

4/ ERS estimates of production costs omit direct effects of Government programs because the estimates are used for policy purposes. A recent study by Salassi, et. al., shows that in 1988 the ERS estimate of residual returns to management for U.S. rice production was $-105 per acre if policy effects were excluded, and $49 per acre if included.