

UNDERSTANDING INTERNATIONAL TRADE IN AGRICULTURAL PRODUCTS: ONE HUNDRED YEARS OF CONTRIBUTIONS BY AGRICULTURAL ECONOMISTS

TIM JOSLING, KYM ANDERSON, ANDREW SCHMITZ, AND STEFAN TANGERMANN

The study of international trade in agricultural products has developed rapidly over the past fifty years. In the 1960s the disarray in world agriculture caused by domestic price support policies became the focus of analytical studies. There followed attempts to measure the distortions caused by policies also in developing countries and to model their impact on world agricultural markets. Tools were advanced to explain the trends and variations in world prices and the implications of market imperfections. Challenges for the future include analyzing trade based on consumer preferences for certain production methods and understanding the impact of climate change mitigation and adaptation on trade.

Key words: agricultural trade; commodity prices; trade policy; agricultural trade distortions; measurement of agricultural protection; modeling agricultural trade.

JEL Codes: F13, F55, Q17.

The study of the economics of international trade in agricultural and food products is a relatively new area of specialization in the agricultural economics profession. Certainly the three mainstream areas that dominated the first fifty years of the American Agricultural Economics Association (AAEA)—production economics, marketing, and policy—each acknowledged the existence of international trade, but they largely ignored the analytical challenge of understanding the behavior of international markets and their role in resource-use efficiency and income distribution. By contrast, most agricultural economists trained since the 1960s have been exposed to international trade theory and recognize the per-

vasive influence of international economic events on domestic markets and policies. Trade agreements have evolved to where they constrain domestic policy, and international commodity prices are usually transmitted at least to some extent back to the farm level. Even the “newer” areas of agricultural and applied economics, such as environmental and resource economics, development economics, and consumer economics, are influenced by the institutions of international trade.

This review aims to document the growth of the study of international agricultural markets and institutions by identifying some of the main contributions of the profession to our understanding of the key issues. It is a subjective assessment of the development of professional thinking on several of the main areas where contributions have been made to the understanding of the nature of international trade in agriculture and food commodities. Each of these advances illustrates the cumulative contributions made by economists working in universities and research agencies of national and international institutions. We apologize at the outset to the many whose work we have not been able to mention.

Tim Josling is Professor Emeritus, Food Research Institute, and Senior Fellow, Freeman Spogli Institute of International Studies, Stanford University. Kym Anderson is the George Gollin Professor of Economics and former executive director of the Centre for International Economic Studies at the University of Adelaide; Andrew Schmitz is the Ben Hill Griffin, Jr. Eminent Scholar and a professor of Food and Resource Economics, University of Florida, Gainesville; a research professor, University of California, Berkeley; and an adjunct professor, University of Saskatchewan, Saskatoon. Stefan Tangermann is Professor Emeritus, University of Göttingen and former Director for Trade and Agriculture at OECD. We would like to thank the many members of the International Agricultural Trade Research Consortium (IATRC) who responded to an informal poll on the most influential writings in agricultural trade in their experience.

Amer. J. Agr. Econ. 92(2): 424–446; doi: 10.1093/ajae/aaq011
Received December 2009; accepted January 2010

© The Author (2010). Published by Oxford University Press on behalf of the Agricultural and Applied Economics Association. All rights reserved. For permissions, please e-mail: journals.permissions@oxfordjournals.org

Changing Trade Issues over the Past Ten Decades

Agricultural economists, by the nature of their discipline, are attracted to the issues of the day. It follows that those who work on international trade issues in the main respond to emerging trade situations that demand analysis and explanation. Theoretical developments and improvements in analytical technique often accompany these attempts to understand and explain current problems. As a backdrop to the more detailed discussion of the contributions of economists to the study of international agricultural trade, we therefore begin by tracing the evolution of trade issues over the 100 years since the founding of the AAEA. This will illustrate the tumultuous nature of the changes that have called out to be addressed by economists, as well as the dramatic advances in theoretical and analytical tools that have been developed to understand these issues.

Agricultural trade historically has been a significant share of total commerce, and for many countries has played a dominant role in determining foreign policy. As late as 1890, agricultural exports accounted for 75% of the total exports from the United States (Johnson 1977, p. 298). By the time the AAEA came into existence in 1909, the export share was about 50%, and that share fell steadily until the 1940s before reviving in the immediate postwar era to about 20%. For the world as a whole, agricultural trade has steadily declined as a share of total trade in goods and services and is now less than 8%, even though it has been increasing faster than world agricultural production. Yet trade in agricultural products remains very important for both high-income and developing countries, and agricultural trade policies typically are among the most sensitive in any international trade negotiations.

The first two decades of the AAEA, from 1909 to 1929, was a period of steady decline in trade from the high point of the nineteenth-century globalization period to the growth of protectionist movements and the collapse of European empires in the devastation of World War I. Though the founding fathers of the AAEA were well aware of the geopolitics of the period and the impact on agricultural trade flows, few books or articles by agricultural economists stand out as dealing systematically with trade issues during that period. Government intervention in agricultural markets was not on the horizon, and agricultural tariffs were generally low relative

to barriers to trade in manufactured goods and services.

During the 1920s, the situation began to change. With domestic farm policy emerging as a way to boost rural incomes, pressure grew to use trade policy as part of the strategy. The McNary-Haughen Act was an early attempt to use trade policy to influence domestic markets, and the same trend toward protectionism was occurring in other countries.¹ The book by Edwin Nourse (1924) introduced a more holistic view of world markets as well as a cogent explanation of their significance for U.S. agriculture. At this time, trade theorists began to expand on the determinants of trade, and the significance of resource endowments emerged as a major factor in the explanation of trade flows.

By the third decade of the AAEA's existence, trade policy was a matter of high political interest and international contention. The Great Depression was widespread and protracted in part because of increased trade protection, and agricultural trade was not spared. The 1930 Smoot-Hawley tariff bill was originally designed as an agricultural tariff increase but ended up more generally applied to all goods. Did the profession sit idly by while the world trade system disintegrated and economic autarchy reigned? It is not easy to find seminal articles from this period on agricultural trade and the collapse of markets, with the notable exception of T. W. Schultz's, who wrote on world agricultural trade and the serious implications for U.S. markets (Schultz 1935).

The fourth decade was not one of major contributions to the agricultural economics literature in the area of trade. Wartime conditions were not conducive to academic pursuits, since many members of the profession were co-opted into government posts and presumably made contributions that may never be revealed.² However, the postwar trading system was being constructed in the 1940s, and agricultural issues were often at the heart of the discussion.³ The debates between such notable economists as James Meade and Keynes and

¹ Agricultural economists commented on these issues, in the contexts of both domestic policy and the trade system. A fine example is the study by Black (1928), who warned of the consequences of this policy.

² An exception was Henry C. Taylor's book on world agricultural trade, emphasizing the importance of the European market (Taylor and Taylor 1943).

³ The debate on managing commodity markets is an example; see the discussion below of the writings by Davis (1942) and Tsou and Black (1944).

their American counterparts explicitly dealt with the inclusion of agricultural trade in the postwar system but were notable for their assumption that these issues were of such a high political importance that the arguments for freer markets were unlikely to prevail. Meanwhile the theory of international trade took major steps forward: Samuelson's (1948) article on factor price equalization appeared, and the basis was laid for modern trade theory.

The decade of the 1950s saw the start of a serious professional interest in agricultural and commodity trade. D. Gale Johnson published a book on the inconsistency between U.S. trade and agricultural policies: the one advocating open markets, the other maintaining protective barriers (Johnson 1950). For twenty years Johnson refined this message and had a profound impact on the profession (if not on policy), as is detailed below. Condliffe (1951) included some insightful comments about agricultural trade in his book *The Commerce of Nations*, in addition to showing the complexities of trade regulations at that time (Condliffe 1951).⁴ The link between commodity trade and economic development and growth also began to be considered during this period. In fact this was the start of development economics as the colonial system disintegrated. Even the beginnings of the political economy of agricultural trade can be traced to this period. Kindleberger (1951) introduced interest-group analysis into the explanation of national tariff policies, setting the stage for later political economy work on agricultural trade.

By the start of the 1960s the issue of agricultural commodity trade became a significant international concern. The 1960s saw sharp increases in agricultural protection in industrial countries. The trade system staggered under the burden of the disposition of surpluses built up under high price supports. Developing countries saw a different side of this with their requests for market access (on concessional terms) rebuffed by strong domestic political forces and their export earnings depressed by low commodity prices in international markets. Much of the professional writing in the United States on agricultural trade in

this period focused on how to increase exports, either commercially or through food aid.

The 1960s saw another development that has had a profound impact on agricultural trade: the rebirth of regional economic integration and somewhat less ambitious free trade areas. European economists, as well as their North American counterparts, were intrigued by the bold experiment of the European Economic Community (EEC) but were concerned about the protectionist Common Agricultural Policy (CAP) that formed an integral part of the agreement. The tensions between the EEC (later the EU) and the United States over agricultural trade were a major theme for economists during this period and indeed until the mid-1990s, when the World Trade Organization (WTO) internalized some of these conflicts.

Both trade theory and the theory of economic integration were developing rapidly, as real-world events challenged accepted explanations. In the 1960s, trade theorists paid increasing attention to international capital movements within the context of standard trade theory: Capital movements could be a substitute for product trade.⁵ Agricultural economics as a whole stuck close to its microeconomic roots and to a "closed economy" view of the agricultural sector. There was still a disconnect between the teaching of agricultural marketing and domestic policy on the one hand and teaching about the functioning of the international trade and monetary system on the other. This meant that the profession was somewhat slow in responding to the emerging trade issues of the 1960s.⁶

By the 1970s a host of new issues had arisen which emphasized the importance of external economic events. A sharp rise in oil prices, together with droughts in India, Africa, and the USSR, caused agricultural commodity markets to spike upward. Two devaluations of the dollar

⁴ Condliffe influenced a generation of students at Berkeley, including Hillman, who began to ask systematic questions about the issues facing agricultural trade. Hillman (1996) shows some frustration over the lack of earlier studies on trade, declaring: "[A]bout the only works relating to agricultural trade were a 1920s book by Nourse and Gale Johnson's work on the trade policy dilemma of US agriculture."

⁵ Schmitz and Helmberger (1970) then developed a model in which they demonstrate that capital movements and product trade can be complements, in that increased capital movements bring about increased product trade. Their examples chosen were for agriculture and natural resource industries and presaged the growth of agricultural and food trade linked to foreign direct investment that has continued to this day.

⁶ In an editorial introduction to the otherwise impressive collection of articles on agricultural economics published by the American Economics Association (AEA) in 1969, the editors admit that the "decision to emphasize a limited number of topics resulted in the exclusion of a number of areas in which agricultural economists have specialized. Among the more important fields that have been excluded [is] . . . international trade" (AEA 1969, p. xvi). D. Gale Johnson was on the selection committee for this volume, so presumably he found inadequate material in this area to include.

and the virtual abandonment of the Bretton Woods monetary system added more shocks to markets. Increased macroeconomic instability and chaotic commodity market behavior showed up the dysfunctionality of domestic policies. D. Gale Johnson's seminal book *World Agriculture in Disarray* and his work on sugar markets encapsulated this situation (Johnson 1973, 1974). G. Edward Schuh (1974) reminded the profession of the importance of macroeconomics to agricultural markets and the significance of exchange rates to agricultural trade patterns. And, in an extensive survey of "traditional" fields of agricultural economics from the 1940s to the 1970s (Martin 1977), policies related to agricultural trade were deemed worthy of a full section, authored masterfully by D. Gale Johnson (Johnson 1977).

The 1980s ushered in a remarkable period of conflicts over agricultural trade and of policy reform that sowed the seeds for their reconciliation. The reform of multilateral trade rules for agriculture had to await the necessary changes in domestic policy, but this reform eventually emerged from a mix of budget pressures and paradigm shifts.⁷ The International Agricultural Trade Research Consortium (IATRC, discussed in a later section) became a focus for work on trade. It was also a period when economists were becoming increasingly sophisticated in the art of building models of markets and estimating behavioral parameters. The international trade literature in general was changing over this period, with an examination of imperfect competition models and of the importance of geography, the study of the political economy of protection, and the issue of regional integration. Agricultural economists became adept at translating and applying these new areas of exploration into the world of agricultural product trade and associated policies, as discussed below.

The decade of the 1990s saw a significant change in the international rules governing national trade policies for agriculture makes. That set of changes made this an active decade for agricultural trade professionals. Despite the signing of the General Agreement on Tariffs and Trade (GATT) in 1947 by the advanced industrial countries, and the progressive reduction of tariffs on imports of manufactures, there had been little progress on reducing agricultural trade barriers. The

changing paradigms of economic policy that started in the mid-1980s led eventually in 1995 to the full incorporation of agriculture into the successor to the GATT, the World Trade Organization.⁸ Multimarket and economy-wide models became still more sophisticated. This was an age of detailed empirical work on agricultural trade rather than one of conceptual improvements. But agricultural trade was becoming mainstream in agricultural economics curricula, and domestic policy courses in the United States and the EU began to include some "open economy" issues. Meanwhile, agricultural trade itself was changing with the globalization of the food industry, posing novel challenges for economists.

It is clearly too early to judge the lasting nature of contributions since the beginning of the new millennium, but the expansion of the range of trade issues connected with environmental, consumer, animal welfare, water, and climate change issues has greatly broadened the focus of agricultural trade analysts. Recent concerns over the impact of price spikes on food security and of the use of agricultural crops as biomass for fuel have kept agricultural trade issues high on the international agenda.

Rapid growth in processed and high-value agricultural and food products, and a revolutionary spread of retail supermarkets accompanied the "second wave" of globalization in the modern era, so that it is no longer fanciful to talk of a global market for farm products. Some economists focus on WTO issues, which have become a significant subfield of agricultural trade research and analysis. Others take a development view: Much empirical work on agricultural trade now is done by those examining developing-country issues, including questions such as the use of trade policy as an element in food security or antipoverty programs. Still others study regional or bilateral trade arrangements in all their glory, pondering the balance between the benefits of partial liberalization and the costs of giving preferred access to high-cost producers. Many contributions are now made by those working in (or with) multilateral institutions (such as the World Bank, the Organisation for Economic Co-operation and Development [OECD], and the United Nations Conference on Trade and Development [UNCTAD]),

⁷ Policy dialogue in international bodies such as the Organisation for Economic Co-operation and Development contributed significantly to the paradigm shift, and this dialogue was an extension of the academic discussions of the time.

⁸ However, trade negotiations have continued to pivot on the thorny issue of liberalization of farm product trade, as evidenced by the current problems in the WTO's Doha Round.

often in collaborative studies. This seems to reflect a shift in the way in which agricultural trade research has been organized, a topic to which we return at the end of the paper.

As a way of highlighting the ways in which the profession has responded to these changing events, we organize our subjective survey around six areas. Each area is an example of a cumulative advance in understanding, starting with one or two articles and books and developing into a body of more or less accepted wisdom.

Contribution #1: Understanding the behavior of international commodity prices

One of the most persistent questions in agricultural trade is whether there are consistent long-run trends in international market prices for agricultural commodities. On the one hand, supply constraints (limited land area) in the face of demand growth (population and per capita income) could push farm product prices ever higher. On the other hand, as consumers spend a high share of rising incomes on non-food items (the Engel effect), economic growth will cause a shift in demand away from basic foods. Relatively rapid agricultural productivity growth will lower the costs of farm production and hence tend to lower farm prices. The evidence for much of this century appeared to point to a declining price trend.⁹ However, the significance of this trend became a matter of considerable controversy in the 1960s.

The variability of prices has also been a major topic for investigation over the years. High prices in the early 1970s brought this issue to the fore, and a more recent price spike in 2007–8 has renewed concerns about the corrosive economic impact of market instability. Primary product prices in international markets are notoriously more volatile than prices for other products. How much of the price volatility is due to the characteristics of markets (e.g., supply shocks from weather or disease) and how much to government intervention became a subject for study in the 1970s and 1980s.

Commodity Prices and the Terms of Trade

The behavior of prices of agricultural commodities on world markets has been an understandable obsession with economists. Of specific interest to agricultural trade analysis is

the trend in the relative price of agricultural products compared with nonagricultural products. The terms of trade for agricultural (and other primary) products have featured prominently in debates about the possible bias of the trade system toward particular groups of countries. The debate on whether the economic system generated outcomes that were stacked against developing countries was highly visible in the 1960s. [Prebisch \(1950\)](#) and [Singer \(1950\)](#) had come independently to the conclusion that there was a structural reason for the observed decline in the price of agriculture relative to manufactured goods, reinforcing the tendency due to the different income elasticities. Imperfect markets in industrial goods allowed manufacturers to retain much of the benefits from productivity increases rather than passing them on to consumers, whereas agricultural productivity gains were passed directly to consumers (or at least processors) in the form of lower prices. As a consequence, the terms of trade turned progressively against the rural “periphery” in favor of the industrial “center.” The concept proved powerful in political terms and was a major motivation for the founding of UNCTAD in 1964 and the calls for a New International Economic Order by developing countries in the 1970s.

The Prebisch/Singer hypothesis has done better as a political call to arms than as a statistical conclusion. A major revision of the data that had originally been used was published by [Grilli and Yang \(1988\)](#), which broadly confirmed a downward trend.¹⁰ But other analysts disagreed with the interpretation of the data: Trends in prices over the past 100 years are by no means smooth. There have indeed been sharp declines in agricultural prices (particularly in 1920) but also periods where the trend is upward (over the first part of the twentieth century), when it disappears (from 1920 until the late 1970s), and when a strong downward trend begins (until 1990) ([Ocampo and Parra 2002](#)). [Cashin and Mc Dermott \(2002, 2006\)](#) confirm these results and reject both the existence of a long-run trend and the evidence of structural changes in the series used. The past decade has seen a recovery of prices, and many argue that the trend may be upward for at least a few more years to come. Moreover, the link between terms of trade and economic development has become

⁹ This is in contrast to recent evidence for the period from the late eighteenth to the early twentieth century ([Williamson 2008](#)).

¹⁰ Their data have since been updated to 2000 by [Pfaffenzeller, Newbolt, and Rayner \(2007\)](#).

more blurred. Identification of “primary product exporters” with “developing countries” looks increasingly dated: For many key farm commodities, high-income countries are the major exporters, and for many developing countries—especially in Asia—manufactured goods now dominate their exports.

The recent revival of the idea that agricultural prices may be on a long-term upward trend owes much to three phenomena: rapid growth in emerging countries, particularly in China, India, and Brazil, with its implication for dietary improvements; the extraordinary increase in oil prices in 2007, which raised energy costs in agriculture and led to governmental mandates and subsidies for biofuels; and the apparent stagnation in technical advance in agriculture as a result of declining research expenditures. Contributions to the understanding of these price movements have been somewhat contradictory. Some find a significant role for speculation (Gilbert 2008); others for biofuel policies (OECD and Food and Agriculture Organization [FAO] 2008). But what seems generally agreed is that agricultural commodity prices now have a direct link with the price of petroleum, once it exceeds a threshold level at which biofuels become a privately profitable substitute for fossil fuels.

International Price Shocks

The importance of commodity price fluctuations and of the domestic policy responses to them was made apparent in the 1970s. The quadrupling of petroleum prices in 1973–74 and their doubling again in 1979–80, when the Organization of Petroleum Exporting Countries (OPEC) coordinated major reductions in supply, triggered a renewed focus on analyzing the consequences of such nonfarm shocks for the agricultural sector. Initially the focus of this literature was on analyzing the impact on consumers and firms, as producers faced sharply higher energy costs. But the magnitude of the petroleum price stimulated massive and rapid exploration for and exploitation of new energy reserves. Such supply reactions were incorporated in the analysis of price impacts, leading to what became known as the “Dutch Disease” literature that sought initially to explain the effects on other sectors of the Dutch economy following the discovery and exploitation of natural gas fields off the coast of the Netherlands.

Gregory (1975) made an early contribution to this literature on the impact of nonfarm sector booms: He found that the direct effect is

a rise in the demand for labor in the booming nonfarm sector that will initially draw workers from other sectors to the booming sector but that this is followed by an indirect impact on agriculture and other sectors as the change in real income in the economy affects the demand for all products.

The same core theory has been used to analyze the inter- and intrasectoral and tax policy impacts of agricultural commodity price booms and busts. In the context of sub-Saharan Africa, it was common practice for governments to tax away windfalls from export price booms, either for depositing in a stabilization fund to be drawn on to support farmers during periods of price collapses or to boost treasury coffers so as to allow the boom to be shared with the rest of the society, including nonbooming farm industries. But recent analysis has cast doubt upon the ability of governments to effect such transfers.

Trade economists have also been concerned with the impact of storage policies on international market price stability and on the optimal storage policy for an open economy. The early theoretical work on stabilization was stimulated by Hueth and Schmitz (1972), who showed the distributional effects in both a closed and an open economy from price stabilization brought about through storage. Feder, Just, and Schmitz (1977) analyzed storage policies under trade uncertainty and showed cases where trade would be greatly reduced under a high degree of uncertainty. Just et al. (1978) analyzed the welfare implications of storage from an international perspective using nonlinear assumptions, and Newberry and Stiglitz (1981) expanded the framework for optimal policy intervention under instability for open economies. The persuasive nature of their arguments, that private and public storage are code-terminated and so the latter might just take the place of the former, together with the return to lower prices in world markets, has effectively dropped the topic of intergovernmental storage agreements from the policy agenda since the 1980s.¹¹

Domestic Policies and Market Instability

The argument that governments may exacerbate international market fluctuations by their own attempts to stabilize domestic prices

¹¹ The topic did not totally disappear: Williams and Wright (1991), for instance, added additional insights into the welfare impacts of commodity storage in both trade and no-trade situations.

emerged largely as a result of the impact of the policies of the EU in the early 1970s. The instruments of the CAP included variable levies and variable export subsidies (“restitutions”) to avoid the importation of instability from international markets. Economists in Europe pointed out that the implication of such policies was to kink the import demand curve and export supply curves at the chosen domestic stabilization price. This in effect reduced the extent to which the EU participated in the absorption of shocks from the rest of the world and increased the extent to which its own domestic shocks were transmitted abroad.

The point was made in a broader context by D. Gale Johnson when he argued that governments use a variety of instruments to add stability to domestic markets, resulting in a less stable international market, which leads to further unwillingness to trust that market for reliable supplies (Johnson 1975). Exporters are likely to compete in aggressive ways to offload surpluses from the domestic market, causing prices to fall below the level that should clear the market. This argument has been recognized in the adoption in the Uruguay Round of rules limiting governments to tariffs rather than quotas and variable levies, and to committing to never raise those tariffs above negotiated bound rates. But the issue is still of considerable interest to trade modelers, who must choose the degree of price transmission from world to domestic prices.

Contribution #2: Demonstrating the linkages between agricultural trade and exchange rate policies

In times of large global imbalances, fluctuating exchange rates, and other macroeconomic instability, it has become clear that such macro prices as exchange rates, interest rates, and inflation matter greatly in determining national economic welfare and the competitiveness and profitability of individual sectors. However, the importance of exchange rates to agricultural trade was for many years neglected in the literature and in policymaking, perhaps reflecting the fact that exchange rates were fixed for long periods of time in the pre-1969 era. The 1970s disabused economists of the notion that agricultural trade can be studied in isolation from the broader economic environment. Macroeconomic conditions clearly had an impact on foreign demand as well as on the domestic market. Agricultural sectors competed with each other on an unsteady

playing field with the goal posts and sidelines in constant motion.

The U.S. Dollar and Agricultural Trade

The large exchange rate realignments that occurred worldwide in the early 1970s, resulting in a significant devaluation of the U.S. dollar, drew the attention of agricultural economists to the influence that monetary developments could have on agricultural markets. The outstanding contribution was that of G. Edward Schuh (1974), who drew attention to the implications of the exchange rate for trade flows and domestic markets in agriculture. What motivated Schuh's analysis was his impression that the many explanations of the U.S. farm problem that had been provided had overlooked one crucial element, i.e., the dollar exchange rate. Schuh argued that the dollar exchange rate had indeed significantly influenced the economic fate of U.S. agriculture in the post-World War II period. More specifically, Schuh claimed that the U.S. dollar had been overvalued for a considerable part of the period and that this misalignment had contributed to depressing prices for traded agricultural products on the domestic U.S. market. This had reduced output of farm products below, and stimulated their consumption above, what otherwise would have been the case. In short, the overvalued dollar exchange rate had acted as a disincentive to U.S. agricultural exports.

Schuh did not limit his analysis to the direct influence of the exchange rate on prices and quantities in a static context. He noted that in spite of this price depression, U.S. agricultural output continued to expand, and so he extended the analysis to include dynamic features. Starting from de Janvry's exposition of induced technical change and the concept of an innovation possibility curve, Schuh showed how an overvalued exchange rate, through its influence on both product and factor prices in domestic agriculture, could affect the speed and nature of technological progress. He argued that the negative effect on farm profits resulting from the overvaluation of the dollar induced a more rapid adoption of productivity-enhancing technical progress. Coupled with higher land prices, brought about by acreage retirement policies, and the resulting shift in factor proportions, this in turn accelerated the outmigration of labor from agriculture. All of these developments changed

sign as the dollar began to depreciate under the currency realignments of the early 1970s.

The introduction of macroeconomic developments into the analysis of agricultural markets and trade, further developed in [Schuh \(1976\)](#) and [McCalla \(1983\)](#), firmly established a wider set of factors to be taken into account by the profession when considering the economic conditions of agriculture. This applied to developing countries too, especially after many of them began to liberalize their markets for foreign exchange in the 1980s ([Schiff and Valdés 2002](#)). [Chambers and Just \(1981\)](#) demonstrated the deficiencies in some of the models used and came up with their own version of a dynamic quarterly econometric model of the U.S. wheat, corn, and soybean markets. Their results show significant market and trade effects of dollar devaluations.

European Exchange Rates and the CAP

Meanwhile, Europe's agricultural economists were busy studying a very European exchange rate issue, that of "green" money. When a unified agricultural market was created across the member states of the newly established European Economic Community, support prices under the Common Agricultural Policy were set not in the currency of any member state, but in a virtual unit of account, equal in value (originally) to the U.S. dollar, and from there converted into national currencies through the prevailing exchange rates. However, soon after prices had been harmonized across member states in 1967, exchange rates began to change, with the deutschmark (DM) revaluation and the French franc devaluation in 1969. Keen to keep prices in national currencies unchanged, agricultural policymakers decided to maintain the old rates for converting support prices from the unit of account into national monies. Thus, in effect, they created new specific exchange rates for agricultural policy purposes, dubbed *green rates*. In order to prevent arbitrage trade from undermining the resulting price differences between member countries, policymakers also had to introduce border taxes and subsidies for both intra- and extra-Community trade in agricultural products (called monetary compensatory amounts). The system soon became technically complex, with disastrous implications for economic efficiency. The agricultural economics profession in Europe, though, benefited from it, as the regime provided many opportunities for analysis and critique. An early example

was [Josling \(1970\)](#), who analyzed the impact of the DM and franc realignments on farmers and calculated the compensation that would be needed to German farmers. This was indeed paid through a rebate of tax revenues. There followed a rich literature on the green money system: [Heidhues et al. \(1978\)](#) contributed one of the more comprehensive investigations into this specific European exchange rate issue in agriculture. This aberration to the EU's single internal market in agricultural goods survived until the establishment of the euro in 1999 in the context of EU monetary union.

Contribution #3: Introducing market power and industrial organization into agricultural trade analysis

The "pure" theory of international trade was typically premised on arms-length exchange between atomistic firms and consumers, each identified by their "country" of business or residence. Thus it became common to refer to countries as "importers" or "exporters" of a product, even though they were essentially statistical aggregations of the actors involved. Two developments in trade theory moved the analysis away from this view of countries as the traders in a competitive marketplace. One development was toward incorporating intermediate goods into trade models, a trend that accelerated as it became clear that much trade was among firms and between different parts of the same firm. A second development was to incorporate a degree of market power into the analysis, on either the exporter side or the importer side, such that monopoly and monopsony rents could be captured by the (private sector) actors. This complicated the basic results of trade theory but improved the credibility of the analysis based on such concepts.

A major advance consistent with these developments was made in [Krugman's \(1979\)](#) article on a "new" theory of trade, where the decision to trade is developed within a context of the theory of the firm. He created a general equilibrium model of "noncomparative advantage" trade. Such trade is driven by economies of scale, which are internal to firms. Because of the scale economies, markets are imperfectly competitive. Thus the structure of the sector and the relation between the actors became a matter of relevance.

This advance was taken up by several agricultural economists who had become uneasy with theories that rested on the notion that

competitive conditions applied when many commodity markets appeared to be less than perfectly competitive. Large corporations presumably had market power in the grain trade, and many markets were dominated by state trading firms. Later, the growing complexity of supply chains added a new dimension where a single firm might have many suppliers in foreign countries and possibly also be exporting the resulting final products to other parts of the world.¹²

Marketing Boards and Export Cartels

The early work on market structure and agricultural trade focused on market instability, storage, tariffs, and marketing boards. The wheat market offered an important example of where marketing institutions did not fit easily into the competitive model, and several influential studies focused on this product. McCalla (1966) developed a cooperative duopoly model of world wheat pricing where Canada and the United States are the duopolists, with Canada being the price leader. The article suggested that price stability in the world wheat market from 1956 to 1965 was due mainly to the stabilizing actions of Canada and the United States. In a follow-up article, McCalla (1979) generalizes the strategic choices facing primary product marketing agencies.

Bieri and Schmitz (1973) analyzed export instability in the presence of market power. They found that the welfare consequences of price instability for internationally traded goods critically depend on whether tariffs or marketing boards are present. For example (unlike the free trade case), when the source of price instability is external, the importing country prefers price stability where trade is restricted by tariffs. The opposite is true, however, when trade is restricted by marketing boards. Just, Schmitz, and Zilberman (1979), extending the optimal tariff literature, develop a model that consisted of four sectors: competitive producers, competitive consumers, the government, and noncompetitive international trading institutions. In the model, a marketing firm with both monopoly and monopsony power is considered where the firm operates independently from producers and consumers to maximize its own profits. They also deal with international transactions carried out by producer cartels. If the activities of

international marketing institutions result in noncompetitive pricing, domestic price controls do not result in the optimal allocation of resources.

In the early 1980s, this work was extended as political interest focused on issues of export cartels. Sarris and Schmitz (1981) analyzed trade in an imperfectly competitive setting and demonstrated how a cartel could have brought about a competitive solution. There is a significant change in income distributions from consumers to producers under cartel conditions. The theoretical foundation and extensions for cartels and applications were developed by Schmitz et al. (1981). Karp and McCalla (1983) extend this to make use of the emerging development of game theory as a way of examining trade policies.

Industrial Organization

For a number of commodities, international trade has for decades been dominated by multinational corporations. More recently, retail firms and food processors have developed extensive supply chains for food products, raw materials, and ingredients. Therefore, it became necessary for economists to understand the vertical and horizontal linkages that exist among markets. Standard tariff theory does not deal specifically with vertical markets that include producers, processors, and wholesalers. For that, one needs to incorporate some insights from the literature on industrial organization and market structure.

Agricultural economists have responded in innovative ways to the challenge of modeling international trade under imperfect competition. Some of the major studies include those of Paarlberg and Abbott (1986), Karp and Perloff (1989), McCorriston and Sheldon (1991), Schmitz and Gray (2000), and Schmitz, Schmitz, and Seale (2009). The prevailing conclusion from these papers is that the degree of market power, which can take several forms, has a significant impact on prices and commodity flows.

Contribution #4: Quantifying the trade effects of agricultural policies

Trade distortions from agricultural protection were treated as a fact of life for much of the twentieth century. A valuable contribution to the understanding of the longer-term trends in agricultural protection was made by McCalla (1969). But it has been in only the past

¹² A full discussion of these developments is given by Karp and Perloff (2002).

thirty years that there has been any consistent effort to quantify the impact of protective domestic and trade policies of developed countries on world markets. Meanwhile, as developing countries became independent, they began to discourage their agricultural sectors directly with export taxes and indirectly with protection from import competition for their infant industrial sectors and with overvalued exchange rates. This disarray in world agriculture, as D. Gale Johnson (1973) described it in the title of his seminal book, meant there was overproduction of farm products in high-income countries and underproduction in more needy developing countries. Johnson also stressed the fact that both groups of countries added to the antitrade bias of their policies by varying the extent of their trade barriers so as to stabilize through time domestic prices and quantities of food. In so doing, that insulating behavior added to international price instability.

While Johnson did not provide comprehensive empirical estimates of the economic effects of these price- and trade-distorting policies, the past three decades have seen major contributions by other analysts emerge to fill this lacuna. This section discusses the direct effects of price-distorting farm policies on producer and consumer incentives, the indirect effects on farmer incentives of nonfarm trade and exchange rate policies, and the attempts to estimate the effects of those distortionary policies on national trade and economic welfare and on prices and quantities traded in the international marketplace.

Direct Effects of Price-Distorting Farm Policies on Incentives

Haberler's (1958) expert group report to the GATT called for a comprehensive measure of support to capture the various ways in which governments influence incentives to produce. Attempts to measure comprehensively the extent to which farm policies distort prices and trade began with analyses conducted for the Food and Agriculture Organization of the United Nations (FAO 1973) by Josling with assistance from Earley and Hillman.¹³ This work calculated estimates of producer and consumer subsidy equivalents (PSEs and CSEs) of policies in 1968–70 for five products in five high-income countries: Canada, France,

Germany, the United Kingdom, and the United States. That series was extended to 1974 for eleven high-income countries by the FAO (1975). Around the same time, an official annual series of nominal and effective rates of assistance began to be estimated for Australia (reported for the 1970s by the Industries Assistance Commission 1983), using a generalization of the nominal and effective protection concepts developed by Balassa (1965, 1970) and Corden (1966, 1971). But it was not until the mid-1980s that more complete time series estimates of distortions to agricultural incentives began to appear. A series for advanced and newly industrializing economies from 1955 is reported in Anderson and Hayami (1986). The Economic Research Service (ERS) of the USDA began to calculate PSEs for their trading partners. Then a regular exercise of monitoring all high-income countries' farm policies began at the OECD Secretariat with the annual publication of empirical indicators for the preceding year of farm sector support (now called producer and consumer support estimates, but still abbreviated as PSEs and CSEs). These measures reveal a break in the long-run trend of agricultural protection growth for some of those countries since the late 1980s, although some of their price-distorting measures have been replaced by more direct forms of income support that are more or less decoupled from production. The OECD PSEs and CSEs have been used widely (if sometimes incorrectly) as representing a proxy for the sum of domestic and border policy measures in trade models.

As for countries outside the OECD, a major effort was launched by Krueger, Schiff, and Valdés (1988, 1991) under the auspices of the World Bank that involved the creation of empirical indicators of producer price distortions for eighteen developing countries for the twenty-five years to the mid-1980s (discussed further below). Few comparable time series estimates were generated for developing countries in the following two decades. To fill the gap, a team led by Kym Anderson for the World Bank recently developed the Database of Agricultural Distortions, which complements and extends those efforts by the OECD and Krueger, Schiff, and Valdés. Summarized in Anderson (2009), it builds on them by providing similar estimates for other significant (including many low-income) developing economies, by taking estimates for OECD countries back as far as the mid-1950s and by developing and estimating new, more comprehensive policy indicators. The findings

¹³ The 1973 study was heavily influenced by Corden (1971), who discussed the subsidy equivalence of tariffs and cited calculations from Canada and Australia of these equivalents.

from this latest World Bank effort at transparency are very consistent with those from Krueger, Schiff, and Valdés, but when more products and more countries are included in the sample, the estimated extent of past discrimination by governments of developing countries against their farmers is even greater (Anderson 2010). However, the new estimates indicate that from the mid-1980s, more and more developing countries have begun to reform their farm policies. As for high-income countries, the study also reveals that the high levels of direct assistance to their farmers in the mid-1980s was the culmination of three decades of agricultural protection growth, consistent with the earlier findings of Anderson and Hayami (1986).

Indirect Effects of Nonfarm Policies on Farmer Incentives

Nonfarm policies have had significant impacts on agricultural incentives too. Drawing on the theoretical insight from Lerner (1936) that taxing imports has a similar effect on the exporting sector as does taxing exports, Krueger, Schiff, and Valdés (1988, 1991) sought to estimate for their eighteen developing countries the adverse effect on farmer incentives resulting from each country's manufacturing protection policies and overvalued exchange rates. They revealed that there was indeed an additional anti-agricultural bias in those countries' price-distorting policies and that these indirect effects of nonfarm policies were even more debilitating than the direct effects of agricultural policies. They also revealed a strong antitrade bias, with the exporting subsector being much more harmed than the import-competing part of the agricultural sector. The more recent World Bank study again confirms that tendency up to the mid-1980s, but does so by estimating a so-called relative rate of assistance (RRA), a function of the nominal rate of assistance both for agricultural tradables and for nonagricultural tradable goods. The estimates of the RRA averaged around 50% for developing countries as a group during the 1960s and 1970s. For the period since the mid-1980s, however, that severe disincentive to produce farm products gradually disappeared on average, although there remains a wide dispersion of RRAs across the spectrum of developing countries. Roughly half of the change in the average RRA is due to reforms in nonagricultural sectors of those developing countries, suggesting that general reforms that

brought down manufacturing protection rates and removed multiple exchange rate regimes were at least as important for reducing the anti-agricultural bias as were reforms to agricultural policies themselves (Anderson 2009).

Modeling the Effects of Price-Distorting Policies on International Trade

Myriad partial equilibrium studies have been published over the past century reporting estimates of the market and welfare effects of individual farm commodity programs, and no attempt is made to survey them here. Until the mid-1970s, economists had incorporated trade into commodity models mainly through the addition of an export demand or import supply function to the domestic demand and supply framework. As Thompson (1981) pointed out in a useful survey, such models have only limited use for trade analysis, as they do not in general allow for specific policy changes in the rest of the world. Following Samuelson's (1952) formulation of spatial price equilibrium models and the work by Takayama and Judge (1964), other agricultural economists began to quantify the impact of policies on bilateral trade flows in a more systematic way.

With the provision of comprehensive estimates of the level of protection and the subsidy equivalent of domestic policies, the opportunity opened up to develop multiproduct models covering the agricultural sector as a whole for trading economies. An early static model that captured the interactions between livestock and feed markets globally was developed by Roningen (1986) for the USDA. Around the same time, a dynamic and stochastic model of world food and feed markets was built to provide *ex ante* estimates of the effects of farm policies in the lead-up to the Uruguay Round of multilateral trade negotiations (Tyers and Anderson 1986). This was used in the World Bank's *World Development Report 1986* to indicate, among other things, the extent to which developing-country farmers were discriminated against not only by their own governments' agricultural policies but also by those of high-income countries, and the extent to which international food price instability in the 1980s was due to policies that lowered the transmission of price movements between domestic and international markets (World Bank 1986).

Such sectoral studies suffered from the inherent limitation that they did not include all farm products and did not capture the effects

of distortions in other sectors of each economy. The possibility of economy-wide analysis emerged from the pioneering work of Leontief and others in input-output analysis and linear programming and then of Johansen (1960) in developing a multisector model of the Norwegian economy. That, combined with advances in computing hardware, led to a revolution in computable general equilibrium (CGE) modeling for policy analysis, not least because such models were admired for their theoretical completeness in linking factor and product markets for all sectors of the economy.

The first national government to fund the development and sustain the routine use of such a CGE model in agricultural and other policy formulation and reform was that of Australia (see Dixon et al. 1977). Among the pioneers of CGE modeling in the United States was Sherman Robinson, who in cooperation with economists at ERS produced a CGE model specifically for focusing on agricultural policy analysis (Robinson 1990; Robinson, Kilkenny, and Hanson 1990; Kilkenny 1991). Robinson later moved to the International Food Policy Research Institute and for a decade led a team there that produced many national CGE models for food and other policy analyses of various developing countries.

With the inclusion of agriculture high on the agenda of the GATT's Uruguay Round of trade negotiations from its launch in 1986, there was a demand from governments for economy-wide analysis of multilateral trade and subsidy reform. To that end, the Australian government funded the development of a global CGE model (SALTER) in which a replica of the national ORANI model was used as the prototype for the other national economies represented in that global model (Jomini et al. 1991). Tom Hertel's sabbatical in 1990–91 at the University of Melbourne stimulated an effort to build a global CGE model (which is open source) and global database upon his return to Purdue University. From that humble beginning, he created the Global Trade Analysis Project (GTAP) and in particular its model and associated global database (Hertel 1997). That model now has thousands of users in more than 150 countries, thanks to the training courses offered by Purdue's GTAP Center over the past fifteen years. Its database is also used in most other models of the global economy. The fact that the GTAP model was housed in an agricultural economics department, and was heavily used at the outset for analyzing agricultural policy

reform, meant that it retained a considerable degree of product disaggregation within the agricultural sector.

Global CGE models have been used for estimating the benefits of trade liberalization, including the removal of domestic farm support that distorts trade flows. They have been especially successful in providing *ex ante* simulations of trade negotiations, both regional and multilateral. Examples include analyses of the Uruguay Round at the beginning of its ten-year implementation period (see, e.g., Martin and Winters 1996) and of the WTO's Doha Round at the time of the Hong Kong Ministerial Meeting in late 2005 when the most comprehensive proposals were being discussed (see, e.g., Anderson and Martin 2006). Those models have also been successfully used to point out that agricultural policies currently account for around two-thirds of the cost to the world of all merchandise trade-distorting policies, even though agriculture accounts for less than 7% of global output and trade in goods and services (Anderson and Martin 2006; Anderson 2009).

Contribution #5: Understanding the Political Economy of Agricultural Trade

Agricultural trade and its interaction with national policies is a domain where agricultural economists have always been keen to provide advice to governments, and sometimes this advice has actually been heeded. At the same time, the preponderance of political interests in agriculture imposes tight constraints on the extent to which economic reasoning can determine the choice of policies. Agricultural economists have always been aware of this tension. For example, Theodor Heidhues (1979) emphasizes that as a wider and growing set of policy objectives is brought into play and the role of governments changes as they are torn between domestic concerns and international pressures, the policy choices become more complex. These involve simultaneous attempts to achieve security of food supply, market stability, solutions to domestic adjustment problems, and macroeconomic balance. For Heidhues, the conclusion is that as economists we need to understand the realm of politics and to be modest in striving for economically rational directions for international trade policies.

The understanding of the political context in which agricultural trade takes place led economists to attempt to model such political

behavior. Sometimes they used the insights of political science to assess the strength of lobby groups, the interplay of political ideas and ideologies, and the linkages among seemingly diverse issues that is common in democracies. Robert Paarlberg, a political scientist, has been a productive contributor to this part of the literature both in conjunction with economists and in his own right. His analysis of the Uruguay Round negotiations as a two-level game has been particularly insightful (Paarlberg 1997). At other times economists have used the more homegrown framework of political economy, the rational behavior of political actors in pursuit of some goal, to understand trade policy.

Rent Seeking in Agricultural Trade

Anne Krueger's (1974) seminal paper on rent-seeking behavior underlies a considerable body of empirical work in international agricultural trade. In many agricultural settings, significant sums of money are spent by those who gain from protectionism to lobby government for tariff and nontariff barriers to trade. Thus rent seeking is visible and pervasive.

Several studies have made use of the concept of rent seeking to explain policy actions.¹⁴ Carter and Schmitz (1979) quantified the role of EU wheat tariffs and suggested that the European Union may have followed a strategy of using optimal welfare tariffs for the betterment of producers. Rausser (1982) sought to explain the coexistence of agricultural policies that hurt with ones that boost a national economy or even an individual industry. Bredhal, Schmitz, and Hillman (1987) considered border disputes between the United States and Mexico in tomatoes. They demonstrated the impact of both cooperative and competitive policy strategies and concluded that the United States had been pursuing a competitive strategy. Later, the United States adopted a cooperative strategy in the price agreement with Mexico in early 2000. Rent-seeking behavior continues to be studied by agricultural economists, particularly in the area of trade strategies and trade conflicts.

¹⁴ Studies have also focused on how regulations affect trade flows and comparative advantage through the eyes of rent-seeking behavior. For example, Ulrich, Furtan, and Schmitz (1987) show how a variety-licensing regulation totally stopped the adoption of a yield-increasing technology that had the potential to increase economic rents flowing to western Canadian farmers by 15–25%. Canadian farmers lost some of their edge in the international wheat market due to increased competition from other exporters.

Cross-Country Studies

The 1980s and early 1990s was an active period in the development of political economy of agricultural trade policy, particularly in broad cross-country comparisons. Economists drew on emerging general theories of the economics of politics that were coming out from the University of Chicago and from the public choice and collective action schools. Also stimulating this research was the arrival of new data, such as the developing-country dataset assembled by [Krueger, Schiff, and Valdés (1988, 1981) and the high-income and newly industrialized economies' dataset compiled by Anderson and Hayami (1986) as discussed above.

After the early 1990s, research interest in the political economy of agricultural policies waned, but it is beginning to flourish once again—and for similar reasons to the first wave, namely, new data and new theoretical developments. In addition to the new World Bank Distortions dataset, there is a new and expanding dataset on some (potential) explanatory variables in the World Bank's Database of Political Institutions (Beck et al. 2001 and subsequent updates).

Applications of these new theories have aimed at explaining the evolution of distortions to agricultural incentives, and new econometric testing using the recent panel datasets can be expected over the next decade or so to address such questions as: How important have domestic institutional and political reforms been in explaining agricultural and trade policy reforms since the 1980s? What has been the contribution of changes in international organizations and international trade agreements, including the Uruguay Round Agreement on Agriculture, the establishment of the WTO, EU enlargement, and preferential trading agreements such as the North American Free Trade Agreement? And why have countries been so willing to undertake unilateral reforms and sign preferential trading agreements and yet so unwilling to conclude the WTO's current Doha Round of multilateral trade negotiations in which agriculture is a major stumbling block?

Contribution #6: Studying the roles of international institutions

Agricultural trade economists have contributed in several ways to our understanding

of the roles that international institutions can play and have played in fostering agricultural trade. This section focuses on international commodity market management, multilateral trade negotiations, preferential trade arrangements, international organizations, and the emergence of ad hoc institutions to stimulate trade analysis.

Management of International Commodity Markets

Recent large swings in commodity prices have revived interest in what can be done to calm down global markets for agricultural raw materials. The theme has always attracted the attention of agricultural economists, and their ample contributions to the literature on international commodity arrangements provide examples of practical contributions to the design of international institutions. One such contribution was made by Joseph S. Davis (1942), who focused on what role there might be, if any, for commodity agreements in the postwar world, following the maxim “In time of war, prepare for peace.” Starting from a set of assumptions on how the world might look once the war was over, Davis provided a detailed picture of the activities through which the U.S. administration and the British government prepared for that much hoped for peace period. Provision of food, not the least for the German and Austrian peoples, was a central concern, as expressed in the slogan “Food will win the war and write the peace.” But Davis warned against expectations that restrictive commodity agreements might work. He pointed to the unsatisfactory experiences made with several past agreements, and concluded that “[b]y and large, they have constituted elements in an increasingly complex system of restrictions on production, international trade, and consumption” (p. 400). While not fundamentally opposed to thinking about what could be done to make commodity markets work properly in the interest of the international community, Davis warned that in practice, “stabilization of prices commonly means boosting prices above equilibrium level, not moderating fluctuations around an economic level” (p. 401).

While such warnings by skeptics like Davis were widely accepted, other economists were more favorably disposed to bringing some form of policy to bear on international commodity markets. Commenting on the debates that had taken place at the 1943 Hot Springs

Conference on Food and Agriculture, Stanley S. Tsou and John D. Black (1944) stated “three important purposes that may be served by rationally conceived commodity arrangements of one form or another, namely, securing a wider distribution of food and similar products, adjustments in the direction of a better ordered production, and the dissipation of chronic surpluses. Attaining any of these will at the same time contribute to better price structures and more rational price movements” (p. 540). However, Tsou and Black did not have any illusions regarding the dangers of price manipulation. While considering it desirable to assist readjustment in an industry suffering from “chronic surplus” production, they warned that “[t]o do this by raising prices in any one country above the export level will rarely be good strategy; and it may be equally dubious strategy, except in limited degree, on an international basis. If there are to be subsidies, they should be in the form of income payments, rather than of price supports; and they best take the form of specific aid in shifting production to other lines” (p. 546). Seemingly “modern” concepts such as decoupled payments and adjustment assistance have apparently been around for some time.

In the 1960s, commodity issues did indeed become the subject of international action, mainly in UNCTAD, but in other fora as well. In addition to price volatility, an imputed secular deterioration in the terms of trade for commodity-exporting developing countries (discussed above) and related concerns regarding the distribution of welfare between rich and poor countries appeared to many governments to call for remedies. In addition to commodity arrangements of the more traditional manifestation, new schemes of compensatory financing had also been tried. Vernon L. Sorenson (1975), however, warned that any income transfer to commodity-exporting countries under schemes such as commodity agreements “means that the greatest amount of aid or income supplements go to those who sell the most. This is not necessarily the best way to redistribute income, either domestically or internationally” (p. 173). Here again, the parallel between international and domestic policy conclusions is striking. International commodity agreements dropped from the trade policy agenda after the failure of the UNCTAD Integrated Programme for Commodities to incorporate any agreement except one for tin under its administrative and financial umbrella.

Multilateral Negotiations on Trade in Farm Products

Political factors are, of course, particularly prevalent when it comes to international negotiations on agricultural trade, be it at the multilateral, regional, or bilateral level. The ability to combine institutional knowledge, a feel for political economy and sound economic analysis is one of the objectives of agricultural economists, and it is particularly useful in this domain. While the Tokyo Round of GATT negotiations was under way in 1976, Warley provided a wealth of information on the nature and implications of agricultural policies in rich countries, on approaches to international policy coordination in the GATT and other fora, and on the agricultural component of the previous round of GATT negotiations, i.e., the Kennedy Round (Warley 1976a). He emphasized the close links between domestic agricultural policies and the international agenda and the negative spillovers from agricultural protectionism to the international economic order overall. Warley's invited address to the AAEA of the same year, "Agriculture in International Relations," also firmly placed agricultural issues in the wider context of global economic and foreign policy issues. He pointedly remarked: "It is a cause for both surprise and concern that so few agricultural economists have chosen to make a sustained commitment to the study of the international dimensions of national agricultural policy or of international commodity policy" (p. 827) (Warley 1976b).

This criticism certainly did not apply to James P. Houck, who published an insightful explanation of the Toyo Round of GATT trade talks (Houck 1979) and followed this with a widely used textbook on agricultural trade (Houck 1986). Nor did it apply to Dale E. Hathaway: His 1987 book *Agriculture in the GATT: Rewriting the Rules* explained the objectives of the Uruguay Round of GATT negotiations which had recently been launched. For the first time in the history of multilateral trade negotiations, a serious attempt was to be made to come more effectively to grips with the distortions that plagued agricultural trade, by rewriting the GATT rules for agriculture (Hathaway 1987). Like Warley and Houck, Hathaway provides ample factual information on the structure and development of agricultural trade in temperate zone products and the policies pursued by major nations. He also spelled out the

GATT's existing rules in agriculture. But the core of Hathaway's perspective was that the Uruguay Round could achieve a reduction of subsidies and import barriers while leaving enough flexibility for national agricultural policies. Interpreting the process and outcome of the agricultural negotiations in the Uruguay Round, against the background of past GATT negotiations, Josling, Tangermann, and Warley (1996) showed how fundamental the change was that the Uruguay Round brought to the GATT's dealings with agriculture. The difficulties now faced by the agricultural negotiations in the Doha Round mirror the fact that governments know that the teeth generated through the Uruguay Round Agreement on Agriculture are now expected to bite, and they fear the pain.¹⁵

Understanding Agricultural Trade Issues in Regional Integration

Bilateral or plurilateral trade negotiations aiming at preferential treatment within (often regional) trading blocs have always had an ambivalent relation with the multilateral approach to trade liberalization. Is the positive effect of opening up trade between members of the trading bloc worth more than the negative implication of discrimination against outsiders? McCalla (1992) addresses regional trading blocs and agriculture and looks at that question. Reviewing a large body of literature on preferential trade, following from Viner's pioneering work on customs unions, McCalla finds that there is no unequivocal answer to this question—as in other cases of second-best policies, it all depends on the circumstances. Things become even more complicated if one moves from a static to a dynamic view of the world. However, McCalla finds somewhat less ambiguous results in his review of numerous empirical studies on the issue, most of which found the positive trade creation effects of preferential arrangements to have been larger than the negative trade diversion implications. As McCalla clearly points out, agriculture serves as a notable exception. Trading blocs tend to provide high levels of protection to their agricultural producers, the EU's Common Agricultural Policy being the major

¹⁵ For a fuller treatment of the contributions of agricultural economists to the area of trade negotiations, see Sumner and Tangermann (2006).

case in point.¹⁶ Hence, for countries outside any of the trading blocs, seeing more and more discriminatory trading blocs being established is not a happy affair, in particular if they have important export interests in agriculture. For them, multilateral liberalization remains the preferred option.

A more optimistic picture is painted by Josling (1993), who focused on the agricultural policy dynamics within trading blocs. While agriculture always creates political difficulties in negotiating the establishment, or enlargement, of a trading bloc, once the bloc is established, agricultural policies can begin to change. Since many products are relatively homogeneous, agricultural commodities lend themselves easily to arbitrage across member nations of the trading bloc, which tends to undermine the intended functioning of many instruments of national agricultural policies in the bloc's member countries, for both border and domestic measures. However, the political dynamics resulting from common financing and limited parliamentary control may well lead the bloc to develop a more protectionist policy than the average of its member countries might have had in the absence of a common policy.

Research in International Organizations

While this review has focused on individual contributions to the literature on agricultural trade matters, it would not be complete if it were to neglect the work done in international organizations, where documents and reports produced are typically attributed to the organization rather than to individual authors. These organizations include the International Monetary Fund, with a long history of studies on commodity prices, the World Bank, with extensive support for global models and trade analysis, and the FAO, with a range of studies on commodity policy and trade. A particular contribution has been the work done on agricultural policies and trade in the OECD. Over the years, and in particular since its 1982 Ministerial Trade Mandate, the OECD has developed a strong and consistent paradigm on the benefits of market-oriented agricultural

policy reform and trade liberalization and has provided a platform for dialogue among governments on how to put that paradigm into policy practice. One of the strengths of the OECD's work is that it is based not just on philosophy, but on hard evidence, generated through a host of quantitative analyses of the nature of existing policies and the implications of reforming them. Work done in the OECD, firmly grounded in the premise that governments should be able to pursue their domestic objectives, but in a way that minimizes international spillovers and trade distortions, has contributed to promoting among policymakers concepts such as decoupling and targeting of agricultural support, in the interest of allowing trade to respond as much as possible to market forces rather than government intervention. The OECD has also helped to dispel the myth of multifunctionality of agriculture and the related calls for allowing trade policies to respond to nontrade concerns.

Ad Hoc Institutions and the Reform of Agricultural Trade Policies

It is understood in the political science literature that institutions can arise in an ad hoc way as groups with similar interests and approaches congregate and share common experiences. An example of such an ad hoc institution (or epistemic community) that has been active in the area of agricultural trade, in theory, analysis, and policy, is the International Agricultural Trade Research Consortium (IATRC). Founded in 1980 by six agricultural economists, the membership has since grown to about 200 economists from academia, government, and other research institutions in 31 countries, for whom it serves as a platform for discussing and publicizing their research, advancing the frontiers of knowledge on agricultural trade and trade policy, and informing both policy formulation and public debate. Core funding for the IATRC has been secured over the years from the USDA (both the ERS and the Foreign Agricultural Service) and from Agriculture and Agri-food Canada. The IATRC has played an important and effective role in creating an international community of researchers interested in agricultural trade matters and in overcoming the dearth of work on agricultural trade issues in the profession, as earlier bemoaned by Warley. It has also contributed substantially—and not the least through its series of Commissioned Papers and Trade Issues Papers—to the global pool of knowledge

¹⁶ There is a large body of literature on the EUs Common Agricultural Policy, including its effect on both internal and external trade. We have chosen not to review that literature here, though many of the problems faced by countries at a multilateral level are also found at the level of integration of economies in a customs union.

on options for, and implications of, internationally agreed disciplines for agricultural and trade policies. Many of the papers cited in this present article first saw the light of day as presentations at the IATRC.

There have been times when policymakers faced with choices regarding trade policies in agriculture have turned to economists for analysis and advice. The IATRC has been instrumental in bringing economists together on at least two occasions to explore policy choices and provide an impartial analysis of an issue. These issues included the use of embargoes and various methods of surplus disposal by the United States and the “rebalancing” of protection by the EU among commodities.¹⁷

Conclusion and Future Directions

It is clear from this selective survey of the work of agricultural economists on matters related to international trade that the issues of the day act as the driver of demand for professional services. The theoretical constructs and analytical techniques, gleaned largely from the wider profession of international economics, provide the technology available; and the supply of studies is governed by the funding of university and government research. But even though agricultural trade economists mainly react to current issues, they have also contributed incidentally to the advance of theory and empirical methodologies used by the international economics profession. This has provided an externality of trade work done by agricultural economics, to the benefit of the wider study of international trade.¹⁸

One obvious but important aspect of the nature of international trade specialists is that they work in an arena with professionals from

other countries. This adds to research costs but also broadens the range of contacts and assists the spread of ideas: The common appreciation of problems and the sharing of solutions ensures a high payoff globally from such international research. It also ensures that trade research is less tied to production patterns than many areas of agricultural economics. To be sure, export-market development will be of importance to individual states (and countries) with export capacity. But beyond the analysis of market potential, there is likely to be little interest in the more systemic aspects of trade; and research on imports is not likely to be a high priority for farm states. This leads to a system of communication within the profession that is less regionally based and more likely to cross borders. The success of the IATRC as discussed above has shown that trade researchers both benefit from and contribute to a collective epistemic community.¹⁹

Trade research is by its nature data intensive. This has been perhaps the biggest challenge that has faced those wishing to model trade and trade policy for groups of countries of the world. The situation is rapidly changing. Large volumes of comparable and carefully scrutinized data are now available (most notably through GTAP), although there is still a long way to go in terms of improving the quality of data for developing countries. While the partial and general equilibrium modeling community has moved forward by leaps and bounds in the past two decades in terms of providing estimates of the likely economic effects of agricultural price and trade policies, there are more than 100 smaller developing countries for which no such models have yet been built. Even in countries for which models are available, their data refer to a base period that is several years old.

There is still a demand by governments and advocacy groups for simple indicators that can be used for up-to-date monitoring of the trade and welfare effects of farm or trade policies. The estimation of distortions to agricultural incentives for developing countries needs to be institutionalized in the way it has for high-income countries at the OECD Secretariat.²⁰

¹⁷ The study “Embargoes, Surplus Disposal, and U.S. Agriculture” was commissioned by Congress (USDA/ERS 1986). In a situation of economic stress for U.S. agriculture, resulting from depressed markets, the question was asked whether a number of U.S. agricultural export embargoes beginning in the early 1970s were among the causes, but also whether disposal of surpluses through export subsidies might be one of the solutions. The other group study, “Disharmonies in EC and US Agricultural Policy Measures” (Koester et al. 1988), was done on behalf of the Commission of the European Communities, which was looking for an assessment of one aspect of its position (its request for “rebalancing” protection levels) in the Uruguay Round negotiations.

¹⁸ These theoretical contributions have not been given full weight in this article. Many of them have involved students and faculty at the major centers that focus on agricultural trade, including UC Berkeley, UC Davis, Minnesota, Purdue, Saskatchewan, Guelph, Florida, and a similar number of institutions in Australia and Europe.

¹⁹ The scholars that have used GTAP (G-tappers) also constitute an epistemic community.

²⁰ A promising start has been made to do that for Africa, with a new grant from the Bill and Melinda Gates Foundation to the FAO (in collaboration with the OECD) to update and expand the estimates of historical distortion indicators.

Better coverage of countries and their policies will be crucial to improving the understanding of the benefits of open trade. The issues of measuring and understanding trade distortions are far from settled. And, as always, theoretical and analytical advances will be needed to guide the empirical studies.

Emerging Trends and Issues

In this regard several new trends are emerging that will give agricultural economists adequate employment for the next few decades.

- There is evidence that developing countries are increasingly providing protection to the import-competing subsector of their agricultural sector. This suggests that the switch from taxing to subsidizing agriculture relative to other tradable sectors in the course of economic development, clearly observed in the newly industrialized countries of East Asia, may be spreading to later-developing countries. Moreover, in both developing and high-income countries, the dispersion of assistance rates across industries within the farm sector has not diminished over time, even though the sectoral average rate of distortion has been falling. This means that there are still resources wasted as countries support some of their least competitive farm industries, thereby contributing to the relatively slow productivity growth of the sector.
- Many trade barriers are hidden among the regulatory processes that accompany international commerce. Databases on standards affecting trade, such as sanitary and phytosanitary measures and those affecting genetically modified products, are still lacking, and their incorporation into models is still at an early stage. Cooperation among agencies and institutions in this area needs to be expanded.
- Significant challenges face the trade modelers in representing the new reality of world trade. Global economy-wide simulation models need to capture the varying extent of imperfection in competition along the food value chain as concentration increases in farm input supplies, processing, and supermarket retailing. More attention is needed to the activities of multinational agricultural firms, including the significance of patent arrangements that might restrict trade and the purchase of farmland abroad.
- Account needs to be taken of consumer concerns for food quality, food safety, and the environment, especially for high-income countries. Environmental concerns affecting such things as the disposal of packaging or the carbon footprint associated with transport of goods need to be carefully modeled. Increasing numbers of consumers wish to know how products are produced on-farm and processed, so as to assess whether they are causing environmental damage, given that many environmental externalities are not correctly priced.
- The continuing preference of some consumers to avoid foods containing genetically modified organisms (GMOs) remains a challenge to agricultural trade economists. This consumer concern has already led to significant government barriers to trade based on production processes, and to constraints on domestic production. Now that traceability information along with other attributes can be stored on barcodes, those concerns can get reflected in the demands the large supermarket chains place on their suppliers.
- Biofuels policy has added another dimension to the equation of how crude oil prices influence food prices. With new biofuel technologies coming on stream over the coming decades, thereby lowering the threshold price of crude oil at which food prices become linked to it, the speed of that development will be faster and governments will continue to subsidize and mandate the use of biofuels. Will this lead to further trade tensions? Are we incorporating the demand for biofuels adequately in trade models?
- Finally, much more attention will be needed in the coming decades to the trade effects of climate change mitigation policies, as well as to the benefits that trade offers as part of the process of adaptation. A first step will be to improve and make publicly available the necessary data and projections on the impacts of climate change and of possible endogenous policy and technological innovations on agricultural production. It would include an analysis of water markets so as to be able to explore the combined effects of water policies and climate change on

the aggregate level and location around the world of production of various farm products. Modelers are beginning to move in this direction, but a great deal more research is needed.

References

- American Economics Association. 1969. *Readings in the Economics of Agriculture*. Republished Articles on Economics Volume XIII, Homewood, IL: Richard D. Irwin, Inc.
- Anderson, K. ed. 2009. *Distortions to Agricultural Incentives: A Global Perspective, 1955–2007*. London: Palgrave Macmillan; Washington DC: World Bank.
- Anderson, K. 2010. Krueger/Schiff/Valdés Revisited: Agricultural Price and Trade Policy Reform in Developing Countries Since 1960. *Applied Economic Perspectives and Policy* 1 (2), forthcoming.
- Anderson, K., and Y. Hayami, eds. 1986. *The Political Economy of Agricultural Protection: East Asia in International Perspective*. London: Allen and Unwin.
- Anderson, K., and W. Martin, eds. 2006. *Agricultural Trade Reform and the Doha Development Agenda*. London: Palgrave Macmillan; Washington DC: World Bank.
- Balassa, B. 1965. Tariff Protection in Industrial Countries: An Evaluation. *Journal of Political Economy* 73 (6): 573–594.
- Beck, T., G. Clarke, A. Groff, P. Keefer, and P. Walsh. 2001. New Tools in Comparative Political Economy: The Database of Political Institutions. *World Bank Economic Review* 15 (1): 165–176.
- Bieri, J., and A. Schmitz. 1973. Export Instability, Monopoly Power, and Welfare. *Journal of International Economics* 3(4): 389–396.
- Black, J. D. 1928. The McNary–Haugen Movement. *American Economic Review* 18 (3): 406–427.
- Bredahl, M., A. Schmitz, and J. S. Hillman. 1987. Rent Seeking In International Trade: The Great Tomato War. *American Journal of Agricultural Economics* 69 (1): 1–10.
- Carter, C., and A. Schmitz. 1979. Import Tariffs and Price Formation in the World Wheat Market. *American Journal of Agricultural Economics* 61 (3): 517–522.
- Cashin, P., and C. J. Mc Dermott. 2002. The Long-run Behaviour of Commodity Prices: Small Trends and Big Variability. *IMF Staff Papers* 49 (2): 175–199.
- . 2006. Properties of International Commodity Prices: Identifying Trends, Cycles and Shocks. In A. Sarris and D. Hallam, eds., *Agricultural Commodity Markets and Trade*, Rome: FAO; Cheltenham, UK: Edward Elgar.
- Chambers, R. G., and R. E. Just. 1981. Effects of Exchange Rate Changes on U.S. Agriculture: A Dynamic Analysis. *American Journal of Agricultural Economics* 63: 32–46.
- Condliffe, J. B. 1951. *The Commerce of Nations*. George Allen and Unwin.
- Corden, W. M. 1966. The Structure of a Tariff System and the Effective Protection Rate. *Journal of Political Economy* 74 (3): 221–237.
- . 1971. *The Theory of Protection*. Oxford, UK: Clarendon.
- Cuddington, J. T. 1992. Long-Run Trends in 26 Primary Commodity Prices: A Disaggregated Look at the Prebisch-Singer Hypothesis. *Journal of Development Economics* 39 (2): 207–227.
- Davis, J. S. 1942. International Commodity Agreements in the Postwar World. *American Economic Review* 32: 391–403.
- Dixon, P. B., B. R. Parmenter, G. J. Ryland, and J. Sutton. 1977. *ORANI: A General Equilibrium Model of the Australian Economy*. First Progress Report of the Impact Project, Vol. 2. Canberra: Australian Government Publishing Service.
- FAO. 1973. Agricultural Protection: Domestic Policy and International Trade. International Agricultural Adjustment Supporting Study No. 9, FAO Conference Document C 73/LIM/9, Food and Agriculture Organization, Rome, November.
- . 1975. Agricultural Protection and Stabilization Policies: A Framework of Measurement in the Context of Agricultural Adjustment, 18th Session of the FAO Conference, Food and Agriculture Organization, 8–27 November.
- Feder, G., R. E. Just, and A. Schmitz. 1977. Storage with Price Uncertainty in International Trade. *International Economic Review* 18 (3): 553–568.
- Gilbert, C. L. 2008. Commodity Speculation and Commodity Investment. Working Paper 0820, Department of Economics, University of Trento, Italy.
- Gregory, R. G. 1975. Some Implications of the Growth of the Mining Boom. *Australian Journal of Agricultural Economics* 20 (2): 71–91.

- Grilli, E. R. and M. C. Yang. 1988. Primary Commodity Prices, Manufactured Goods Prices, and the Terms of Trade of Developing Countries: What Long Run Shows. *World Bank Economic Review* 2 (1): 1–47.
- Haberler, G. 1958. *Trends in International Trade: A Report by a Panel of Experts*. Geneva: General Agreement on Tariffs and Trade, October.
- Hathaway, D. E., 1987. *Agriculture and the GATT: Rewriting the Rules*. Policy Analyses in International Economics No. 20. Washington DC: Institute for International Economics.
- Heidhues, T. 1979. The Gains from Trade: An Applied Political Analysis. In J. S. Hillman and A. Schmitz, eds., *International Trade and Agriculture: Theory and Policy*, Boulder, CO: Westview Press.
- Heidhues, T., T. E. Josling, C. Ritson, and S. Tangermann. 1978. *Common Prices and Europe's Farm Policy*. Thames Essay No. 14. London: Trade Policy Research Centre.
- Hertel, T. ed. 1997. *Global Trade Analysis: Modeling and Applications*. Cambridge and New York: Cambridge University Press.
- Hillman, J. S. 1996. Nontariff Agricultural Trade Barriers Revisited. IATRC Working Paper 96-2. St. Paul, MN: International Agricultural Trade Research Consortium.
- Houck, J. P. 1979. Agricultural Trade: Protectionism, Policy, and the Tokyo/Geneva Negotiating Round. *American Journal of Agricultural Economics* 61 (5): 860–873.
- . 1986. *Elements of Agricultural Trade Policies*. New York: Macmillan.
- Hueth, D. L., and A. Schmitz. 1972. International Trade in Intermediate and Final Goods: Some Welfare Implications of Destabilized Prices. *Quarterly Journal of Economics* 84 (3): 351–365.
- Industries Assistance Commission. 1983. *Assistance to Australian Agriculture*. Canberra: Australian Government Publishing Service.
- Johansen, L. 1960. *A Multisectoral Study of Economic Growth*. Amsterdam: North-Holland.
- Johnson, D. G. 1950. *Trade and Agriculture: A Study of Inconsistent Policies*. New York: John Wiley and Son.
- . 1973. *World Agriculture in Disarray*. London: Macmillan; New York: St Martin's Press (revised in 1991).
- . 1974. *The Sugar Program: Large Costs and Small Benefits*. Washington DC: American Enterprise Institute.
- . 1975. World Agriculture, Commodity Policy, and Price Variability. *American Journal of Agricultural Economics* 57 (5): 823–828.
- . 1977. Postwar Policies Related to Trade in Agricultural Products. In L. R. Martin, ed., *A Survey of Agricultural Economics Literature, Volume 1*, pp. 295–325. St Paul: University of Minnesota Press for the American Agricultural Economics Association.
- Jomini, P., J. F. Zeitsch, R. McDougall, A. Welsh, S. Brown, J. Harnbley, and J. Kelly. 1991. *SALTER: A General Equilibrium Model of the World Economy, Vol. I, Model Structure, Database and Parameters*. Canberra, Australia: Industry Commission.
- Josling, T. E. 1993. Agriculture in a World of Trading Blocs. *Australian Journal of Agricultural Economics* 37: 155–179.
- . 1970. Exchange Rate Flexibility and the Common Agricultural Policy of the EEC. *Weltwirtschaftliches Archiv* 104: 57–95.
- Josling, T. E., S. Tangermann, and T. K. Warley. 1996. *Agriculture in the GATT*. London: Macmillan; New York: St. Martin's Press.
- Just, R. E., A. Schmitz, and D. Zilberman. 1979. Price Controls and Optimal Export Policies Under Alternative Market Structures. *American Economic Review* 69 (4): 706–714.
- Just, R. E., E. Lutz, A. Schmitz, and S. J. Turnovsky. 1978. The Distribution of Welfare Gains From Price Stabilization: An International Perspective. *Journal of International Economics* 8 (4): 551–563.
- Karp, L. S., and A. F. McCalla. 1983. Dynamic Games and International Trade: An Application to the World Corn Market. *American Journal of Agricultural Economics* 65 (4): 641–650.
- Karp, L. S., and J. M. Perloff. 1989. Dynamic Oligopoly in the Rice Export Market. *Review of Economics and Statistics* 71: 462–470.
- Karp, L. S., and J. M. Perloff. 2002. A Synthesis of Agricultural Trade Economics. In B. Gardner and G. Rausser, eds., *Handbook*

- of *Agricultural Economics*, Volume 2, pp. 1945–1998. Amsterdam: Elsevier.
- Kilkenny, M. 1991. Computable General Equilibrium Modeling of Agricultural Policies: Documentation of the 30-Sector FPGE GAMS Model of the United States. Staff Report No. AGES 9125, ERS US Department of Agriculture, Washington DC.
- Kindleberger, C. P. 1951. Group Behavior and International Trade. *Journal of Political Economy* 59: 30–46.
- Koester, U., et al. 1988. *Disharmonies in EC and US Agricultural Policy Measures*. Report prepared for the Commission of the European Community. Brussels: EC Commission.
- Krueger, A. O. 1974. The Political Economy of the Rent-Seeking Society. *American Economic Review* 64 (3): 291–303.
- Krueger, A. O., M. Schiff, and A. Valdés. 1988. Agricultural Incentives in Developing Countries: Measuring the Effect of Sectoral and Economy-Wide Policies. *World Bank Economic Review* 2 (3): 255–272.
- Krueger, A. O., M. Schiff, and A. Valdés. 1991. *The Political Economy of Agricultural Pricing Policy, Volume 1: Latin America, Volume 2: Asia, and Volume 3: Africa and the Mediterranean*. Baltimore: Johns Hopkins University Press for the World Bank.
- Krugman, P., 1979. Increasing Returns, Monopolistic Competition, and International Trade. *Journal of International Economics* 9: 469–479.
- Lerner, A. 1936. The Symmetry Between Import and Export Taxes. *Economica* 3 (11): 306–313.
- Martin, L. R. ed., 1977. *A Survey of Agricultural Economics Literature, Volume 1*. St Paul: University of Minnesota Press for the American Agricultural Economics Association.
- Martin, W., and L. A. Winters, eds. 1996. *The Uruguay Round and the Developing Countries*. Cambridge and New York: Cambridge University Press.
- McCalla, A. 1966. A Duopoly Model of World Wheat Pricing. *Journal of Farm Economics* 48: 711–727.
- . 1969. Protectionism in International Agricultural Trade, 1850–1968, *Agricultural History* 43 (3): 329–344.
- . 1979. Strategies in International Agricultural Marketing: Public vs. Private Sector. In J. S. Hillman and A. Schmitz, eds., *International Trade and Agriculture: Theory and Policy*, Boulder, CO: Westview Press.
- . 1983. Impact of Macroeconomic Policies upon Agricultural Trade and International Agricultural Development. *American Journal of Agricultural Economics* 64 (5): 861–868.
- . 1992. GATT, Preferential/Regional Trading Blocs and Agriculture. *Review of International Economics* 1: 73–89.
- McCorriston, S., and I. M. Sheldon. 1991. Government Intervention in Imperfectly Competitive Agricultural Input Markets. *American Journal of Agricultural Economics* 73: 621–32.
- . 1991. Intra-Industry Trade and Specialization in Processed Agricultural Products: The Case of the U.S. and the E.C. *Review of Agricultural Economics* 13: 173–184.
- Newberry, D. M. G., and J. E. Stiglitz. 1981. *The Theory of Commodity Price Stabilisation: A Study in the Economics of Risk*. Oxford, UK: Clarendon Press.
- Nourse, E. G. 1924. *American Agriculture and the World Market*. New York: McGraw Hill.
- Ocampo, J. A., and M. A. Parra. 2002. The Terms of Trade for Commodities in the Twentieth Century. Background paper for the ECLAC Report on *Globalization and Development*. Santiago: Economic Commission for Latin America and the Caribbean.
- OECD and Food and Agriculture Organization. 2008. *OECD–FAO Agricultural Outlook 2008–2017*. Paris: Authors.
- Paarlberg, R. L. 1997. Agricultural Policy Reform and the Uruguay Round: Synergistic Linkage in a Two-Level Game? *International Organization* 51: 413–444.
- Paarlberg, P. L., and P. C. Abbott. 1986. Oligopolistic Behavior by Public Agencies in International Trade: The World Wheat Market. *American Journal of Agricultural Economics* 68: 528–542.
- Pfaffenzeller, S., P. Newbolt, and A. Rayner. 2007. A Short Note on Updating the Grilli and Yang Commodity Price Index. *World Bank Economic Review* 21 (1): 151–163.
- Prebisch, R. 1950. *The Economic Development of Latin America and its Principal Problems*. New York: United Nations.

- Rausser, G. C. 1982. Political Economic Markets: PERTs and PESTs in Food and Agriculture. *American Journal of Agricultural Economics* 64 (5): 821–833.
- Robinson, S. 1990. Analysing Agricultural Trade with Single-Country Computable General Equilibrium Models. In I. Goldin and O. Knudsen, eds., *Agricultural Trade Liberalization*, pp. 201–224. Paris: OECD.
- Robinson, S., M. Kilkeny, and K. Hanson. 1990. The USDA/ERS Computable General Equilibrium (CGE) Model of the United States. Staff Report No. AGES 9049, Economic Research Service, U.S. Department of Agriculture, Washington DC.
- Roningen, V. O. 1986. A Static World Policy Simulation (SWOPSIM) Modelling Framework, ERS Staff Report No. AGES 860652, U.S. Department of Agriculture, Washington DC, July.
- Samuelson, P. A. 1948. International Trade and the Equalization of Factor Prices. *Economic Journal* 58 (230): 163–184.
- . 1952. Spatial Price Equilibrium and Linear Programming. *American Economic Review* 42 (3): 283–303.
- Sarris, A. H., and A. Schmitz. 1981. Price Formation in International Agricultural Trade. In A. McCalla and T. Josling, eds., *Imperfect Markets in Agricultural Trade*, Montclair, NJ: Allanheld, Osmun, and Company.
- Schiff, M., and A. Valdés. 2002. Agriculture and the Macroeconomy, with Emphasis on Developing Countries. In B. L. Gardner and G. C. Rausser, eds., *Handbook of Agricultural Economics, Volume 2A*, Amsterdam: Elsevier.
- Schmitz, A., and P. Helmberger. 1970. Factor Mobility and International Trade: The Case of Complementarity. *American Economic Review* 60 (4): 761–767.
- Schmitz, A., A. F. McCalla, D. Mitchell, and C. Carter. 1981. *Grain Export Cartels*. Cambridge, MA: Ballinger Press.
- Schmitz, T. G., and R. Gray. 2000. State Trading and Enterprises and Revenue Gains from Market Power: The Case of Barley Marketing and the Canadian Wheat Board. *Journal of Agricultural and Resource Economics* 25 (2): 596–615.
- Schmitz, T. G., A. Schmitz, and J. L. Seale. 2009. The Optimal Byrd Tariff in Vertical Markets. *International Journal of Applied Economics* 6 (1): 1–10.
- Schuh, G. E. 1974. The Exchange Rate and US Agriculture. *American Journal of Agricultural Economics* 56 (1): 1–13.
- . 1976. The New Macroeconomics of Agriculture. *American Journal of Agricultural Economics* 58: 802–811.
- Schultz, T. W. 1935. *Vanishing Farm Markets and Our World Trade*. Cambridge, MA: World Peace Foundation.
- Singer, H. W. 1950. U.S. Foreign Investment in Underdeveloped Areas, the Distribution of Gains between Investing and Borrowing Countries. *American Economic Review* 40 (2): 473–485.
- Sorenson, V. L. 1975. *International Trade Policy: Agriculture and Development*. East Lansing, MI: MSU International Business and Economic Studies.
- Sumner, D. A., and S. Tangermann. 2002. International Trade Policy and Negotiations. In B. Gardner and G. Rausser, eds., *Handbook of Agricultural Economics, Volume 2*, pp. 1999–2055. Amsterdam: Elsevier.
- Takayama, T., and G. G. Judge. 1964. An Inter-temporal Price Equilibrium Model. *Journal of Farm Economics* 46 (2): 477–484.
- Taylor, H. C., and A. D. Taylor. 1943. *World Trade in Agricultural Products*. New York: Macmillan.
- Thompson, R. L. 1981. *A Survey of Recent Developments in International Agricultural Trade Models*. Bibliographies and Literature of Agriculture No. 21, Economic Research Service, United States Department of Agriculture, Washington DC.
- Tsou, S. S., and J. D. Black. 1944. International Commodity Arrangements. *Quarterly Journal of Economics* 58: 521–552.
- Tyers, R., and K. Anderson 1986. Distortions in World Food Markets. Background Paper No. 22 for the *World Development Report 1996*, World Bank, Washington DC, January.
- Ulrich, A., W. H. Furtan, and A. Schmitz. 1987. The Cost of a Licensing System Regulation: An Example from Canadian Prairie Agriculture. *Journal of Political Economy* 95 (1): 160–178.
- USDA/ERS. 1986. *Embargoes, Surplus Disposal, and U.S. Agriculture*. Economic Research Service Report 564.
- Warley, T. K. 1976a. Agriculture in International Relations. *American Journal of Agricultural Economics* 58: 820–830.

- Warley, T. K. 1976b. Western Trade in Agricultural Products. In A. Shonfield, ed., *International Economic Relations of the Western World 1959–1971. Volume 1: Politics and Trade*, London, New York, Toronto: Oxford University Press for the Royal Institute of International Affairs.
- Williams, J. C., and B. D. Wright. 1991. *Storage and Commodity Markets*. Cambridge and New York: Cambridge University Press.
- Williamson, J. C. 2008. Globalization and the Great Divergence: Terms of Trade Booms and Volatility in the Poor Periphery, 1782 to 1913. *European Review of Economic History* 12 (3): 355–391.
- World Bank. 1986. *World Development Report 1986*. New York: Oxford University Press.