

Submitted Article

A Research Agenda for International Agricultural Trade

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Abstract *International trade is likely to be a hugely important and interesting area for research by agricultural and applied economists in the next decade. While the questions for research are likely to change – with less emphasis on large-scale international negotiations and more on national reforms and regional agreements – there will be important challenges in understanding the driving forces for world agricultural markets, in trade policy, and in ensuring food security. New analytical techniques built on the gravity model and geospatial production data create many opportunities for innovative applications and expand the range of questions to which researchers in this field can effectively respond.*

Key words: international trade, food trade, food policy, gravity model.

JEL codes: F13, F63, Q17, Q18.

The case for international trade is essentially the same as that for trade in non-agricultural products, with participation in markets allowing producers to specialize and to take advantage of differences in resource endowments and skills, and consumers to benefit from a wider range of products. As we will see, the relevant differences in agricultural factor endowments between countries are frequently very substantial, implying that the gains in average real incomes from trade are likely to be large and the reductions in volatility from diversification of supplies particularly large.

However, international trade in agriculture is highly controversial, and trade distortions in agriculture are exceptional relative to those in other sectors (Trebilcock and Pue 2015). Attacks on agricultural trade come from many angles, including emotional, analytical, and interest-driven. On the

emotional front, who could resist the appeal of enjoying local, home-grown food year-round (Conner 2012), or overcoming worries about relying on the rest of the world for basic food staples? A frequent analytical error confuses openness to trade with trade deficits and debt accumulation, which are, of course, determined by the balance between income and spending, rather than by trade barriers. And, of course, many trade distortions are introduced—and vigorously defended—by vested interests such as producers of sugar, rice, and milk in the rich countries, whose political strength—frequently associated with being smaller in number and easier to organize than those losing from the policy—allows them to obtain astronomical levels of protection (Olson 1971; Swinnen 2010).

The research agenda for agricultural trade depends on questions such as the following: What are the potential gains from trade, now and in the foreseeable future? What are the potential gains from trade policy reform at national, regional, and global levels? And do they accrue in the form of gains in economic efficiency, equity, stability, or growth? Or, given the importance of trade in food, do they arise from improvements in the key elements of food security—availability, access, utilization, or stability? Within this, a key question is what instruments are available to achieve the goals of trade policy reform? In addition to these questions driven by the need for answers to important questions, another important influence on the research agenda comes from the supply side. That is, what new methodological approaches are available or can be developed to provide better answers to both new and old questions?

The next section of this paper covers key reasons why trade is a key topic for research and communication by agricultural and applied economists. The following section identifies some key research questions. The next section points to areas where advances in techniques and data are likely to influence the research agenda from the supply side. The last section looks at ways that research might be most effectively conducted and disseminated.

Why is International Trade a Priority Area?

International trade is particularly important partly because it is so poorly understood relative to other areas of interest to agricultural and applied economists. This is partly because the impacts of reform are frequently very substantial, redistributive and pervasive, and partly because of their importance to many of the world's poorest and most vulnerable people. The case for international trade research in agriculture needs to consider the static gains from reform, as well as productivity gains, impacts on volatility, and impacts on nutrition.

Bernhofen and Brown (2005) provide evidence on the static gains from trade from a rare case where a country (Japan) opened from near complete autarchy. These authors estimate the gains from full reform in this heavily agricultural economy at around 9% of GDP in the 1850s. Historical gains from the liberalization of agricultural trade might understate the gains from liberalization today because of the enormous changes in factor endowments since the mid-nineteenth century. Prior to the industrial revolution, trade in agricultural products was limited and the population of any region closely linked to its agricultural land base—a link that was broken by falls in transport costs in the nineteenth and twentieth centuries. Differences in the amount of available (but initially unused) land, differences in the progress of the demographic transition (Mosk 1977), and differences in immigration

and emigration have resulted in very different land endowments across countries. As an example, the United States now has around 25 times as much agricultural land per person as Japan (Fukase and Martin 2016). With such large differences in land endowments, farm prices would—in the absence of trade—be extremely high in countries with small endowments per person and extremely low in countries with larger endowments.

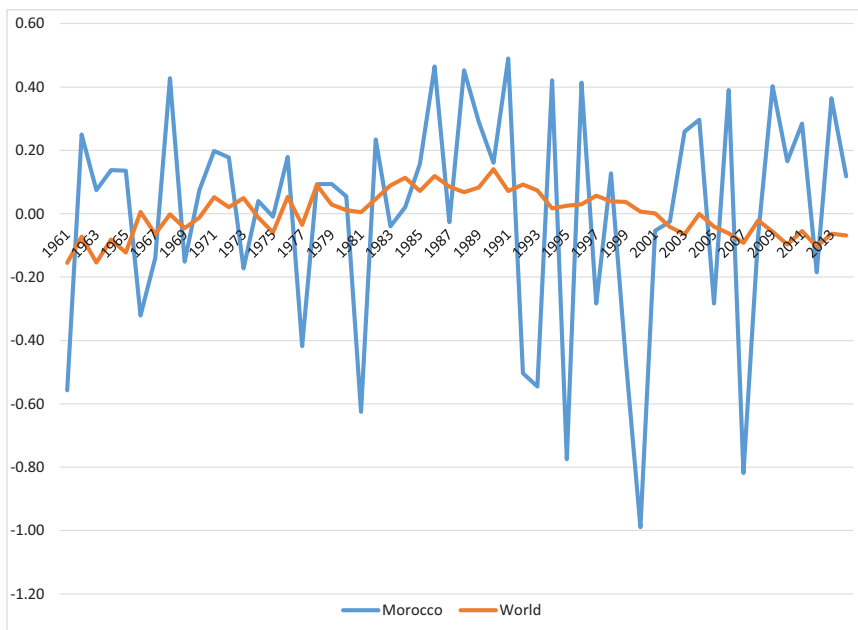
Despite the decline in the relative size of agriculture, agricultural distortions appear to account for a large fraction of the gains from further reform. Anderson and Martin (2007) find that agricultural trade now accounts for almost two-thirds of the static gains from further reform of global merchandise trade, with the small size of the sector outweighed by the higher average rates of protection and the greater variations in distortions across sectors. New evidence on the potential gains from trade by Costinot and Rodrigues-Clare (2014) suggests that these gains may be much higher than have traditionally been estimated, particularly when models allow for multiple sectors, intermediate products, and firm entry and exit.

There is considerable evidence that productivity gains from liberalization are much greater than the static gains from reform (see, e.g., Amiti and Konings 2007). Similar findings are evident for agriculture in many studies, including Kolady, Spielman, and Cavalieri (2012) for seeds in India; De Silva, Malaga, and Johnson (2014) for Sri Lanka and Hassine, Robichaud, and Decaluwe (2010) for Tunisia. There is also considerable documentation of agriculture-specific policy reforms that have been critical for productivity growth, such as the liberalization of inexpensive irrigation pumps in Bangladesh in the 1980s (World Bank 1999).

In terms of volatility, many observers think of opening to world markets as a source of price volatility, failing to realize that it can sharply reduce

Figure 1 Volatility relative to trend in the log of wheat yields, Morocco vs. World

Source: FAOSTAT.



output and hence supply volatility, the key source of volatility in markets for staple foods such as wheat. To provide an indication of the potentially enormous reduction in volatility obtainable through diversifying food supplies from domestic production to world markets, figure 1 contrasts the volatility of wheat output in Morocco—a country where wheat is the main staple—with the volatility of global wheat yields. The standard deviation of the detrended log of yields is 0.07 for the world and 0.35 for Morocco, while their correlation is a minuscule 0.1. The vastly higher volatility of national wheat output implies that a self-sufficient wheat market would be much more unstable than a market open to trade.

The importance of food to the world’s poorest people is very clear. They spend very large shares of total expenditure on food, and around half of them derive their incomes from agriculture (World Bank 2008). Because of this dual linkage, we can only assess whether large numbers of poor people are helped or hurt in the short run by changes in food prices or protection if we have access to information about their income sources and spending patterns (Deaton 1989). To assess the longer-term impacts on the poor, we also need to know how producers respond to changes in the prices of agricultural products, and the impacts of food price changes on the wages of unskilled workers (Ivanic and Martin 2014b). This means the research agenda for international trade must be very wide-ranging.

Another reason we need more research on international trade in agricultural products is the dramatic changes in these markets. Much of the literature on agricultural trade policy is conditioned on the idea that most agricultural trade barriers and most agricultural trade are in or between the industrial countries. However, there have been enormous changes in both these dimensions. Table 1 shows that, in 1992, towards the end of the Uruguay Round negotiations on agriculture, the countries not classified as developing accounted for 59% of agricultural exports, and almost 40% of agricultural trade was exports from one high-income country to another. By 2012, high-income countries contributed only 40% of world agricultural exports and 20% of world agricultural trade was between the high-income countries.

Up to the early 1990s, average agricultural protection was very high in the industrial countries, so it made sense for exporters to focus on gaining access to industrial country markets. Since that time, however, developing country trade and production have grown much more rapidly than in the industrial countries and developing countries introduced substantial agricultural protection. Clearly, this combination of a much greater market share and a move from

Table 1 Changes in World Trade Patterns for World Agriculture

1992			
<i>From</i>	High	Developing	Total
High-Income	39	20	59
Developing	28	12	41
Total	67	33	100
2013			
High-Income	20	23	42
Developing	24	34	58
Total	44	56	100

Source: COMTRADE. Note: Excludes intra-EU trade.

negative to positive protection in developing countries has enormous and, as yet not widely appreciated, implications for policy.

Priority Research Issues

Priority research topics in the coming years will involve both forecasting and what-if policy analysis. On the forecasting side, assessing the impacts of different drivers in world markets will be important and different from those in earlier periods, while on the policy side, issues will arise at the country, regional, and global levels. In addition to traditional trade policy issues, we need to understand a wide range of behind-the-border issues that affect policy outcomes.

Forecasting Agricultural Outcomes

The drivers of change in world food markets will be quite different from what they have been in past decades. On the demand side, the importance of population growth is likely to fall dramatically relative to its dominant role in the past, with most of the substantial increase in food demand between now and 2050 likely to come from increases in per capita consumption (Fukase and Martin 2017). This increases the importance of understanding the responses of food demand—both directly and through demand for livestock feeds—in understanding the likely evolution of world food prices. Fukase and Martin (2017) conclude that global food demand is likely to grow 32% faster over the period to 2050 if incomes converge as implied by the Shared Socioeconomic Pathway (SSP2) projections (Leimbach et al. 2015) than under a scenario of uniform growth across countries.

On the supply side, climate change seems likely to have substantial, but difficult to forecast, impacts on world production growth. Monitoring, measuring, and predicting these impacts seems likely to be an important priority for future work, especially since they work through so many different channels and are quite difficult to predict, particularly for individual regions (see D’Agostino and Schlenker 2016 for examples; Costinot, Donaldson, and Smith 2016 for a global analysis; and McCarl’s paper in this issue for a research agenda). There are also important policy linkages between trade policy and climate change. Because climate change is likely to be very different in its impacts across regions, open trade policies that allow some of these impacts to result in changes in trade patterns are likely to substantially lower the cost of adapting to climate change (Nelson et al. 2009).

The use of agricultural raw materials for biofuels has been particularly important in the past 15 years, in part because of the unexpected rapidity of its growth, in part because of the complexity of its linkages throughout the agricultural sector, particularly its linkages through indirect land use change (Laborde 2011), and because of the interactions between its rapid and unexpected growth with grain stock levels and commodity prices (Wright 2014). Whether biofuels continue to be an important topic will depend on what happens to oil prices, whether the blend-wall limits on the share of ethanol in U.S. blended fuel currently impeding further expansion of biofuels are breached, and whether alternative forms of portable energy reduce the demand for traditional liquid fuels in transport applications. If the blend wall is breached and political-economy considerations result in a large expansion of biofuel use, then there could be substantial upward pressure on crop

prices in the short run as stock levels adjust. If demand for liquid fuels should decline rapidly in response to improvements in electricity storage technology, there may be a sustained decline in demand for biofuel. Either of these scenarios may result in considerable pressure to analyze impacts and potential policy responses.

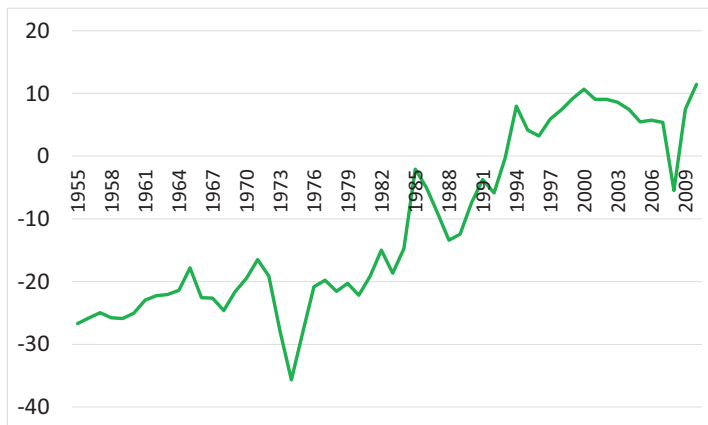
Trade Policy Reforms

The trade policy agenda going forward seems likely to be quite different from that over the past 30 years. It seems unlikely in the short term that we will see any large-scale negotiations along the lines of the Uruguay Round and Doha Agenda negotiations. There will definitely be no WTO accession negotiations on the scale of China's (Bhattasali, Li, and Martin 2004). However, there will be important trade policy issues to be addressed at national and regional levels, and a return to large-scale international negotiations cannot be ruled out once the limitations of alternative approaches to managing trade-related challenges become clear. In the short term at least, it seems likely that much more of economic policy analysis will need to be directed to questioning proposals for higher protection that would reduce—rather than enhance—economic welfare. However, this role of economist as questioner or critic of policy reforms was hardly an unfamiliar one, even during the recent period of relative openness to trade.

In industrial countries, this role of questioner seems likely to be particularly important for trade policies proposed—with little prospect of success—to combat bilateral trade imbalances and trade deficits more generally. In developing countries, where the long-term pressures to raise agricultural protection as incomes rise (Anderson 1995) are likely to be only very weakly offset by WTO disciplines, scrutiny of proposals that would raise agricultural import barriers will be sorely needed. Another area where questioning seems appropriate is in the staple food policies of many African countries, where a focus on availability and frequent use of nontariff barriers results in trade policy interventions that increase the volatility of prices within those markets (Chapoto and Jayne 2009).

On a more positive note, the UN Sustainable Development Goals (SDGs) seem likely to lead to an increase in focus on the role of trade policy reforms in ensuring goals such as the elimination of poverty, hunger, and gender inequality (UN 2017). Trade and trade policy can have powerful impacts towards—or away from—achievement of these goals by changing the relative prices of goods and factors that are important to individual households (Martin 2017) as well as by influencing the volatility of these prices. The very real concerns expressed by critics of globalization about potentially adverse impacts of globalization may also contribute to a focus on managing these potential shocks. Incorporating poverty, hunger, and gender inequality into trade analysis is essential if these goals are to be taken seriously, and will have important implications for the methodological approaches to be used.

In terms of international trade negotiations, even the strongest critics of globalization appear to envisage a role for bilateral trade negotiations to reduce the most burdensome barriers to trade. The difficulties with purely bilateral approaches—such as the enormous number of potential agreements, the difficulties in obtaining worthwhile improvements in market access, and the risks of any market access gains being undercut by future negotiations seem likely to lead—as in the past—to interest in broader agreements.

Figure 2 Nominal Rate of Protection to Agriculture in Developing Countries, %Source: Anderson (2009) and www.worldbank.org/agdistortions.

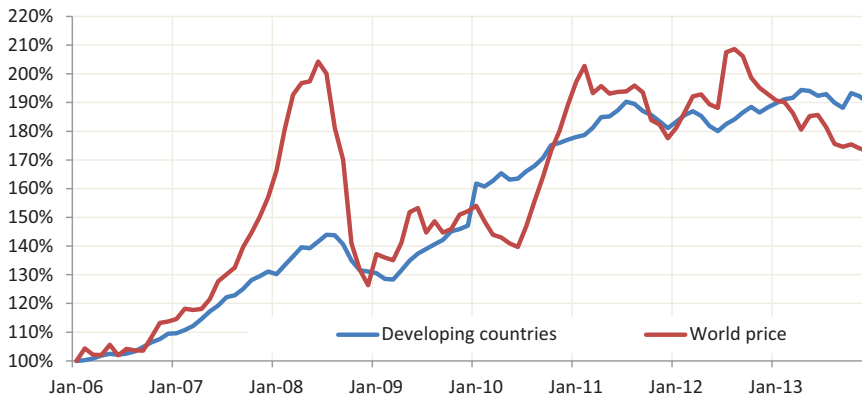
The regional trade agenda will clearly feature one development that has not been a common feature of the trade agenda in recent years—the complex and difficult issues involved in unwinding and replacing trade agreements. The first, and possibly the only, example is the United Kingdom’s decision to leave the European Union (Brexit; see [Josling 2016](#)). The economic issues here parallel many of those associated with the formation of trade agreements—the complex issues involved with trade creation and trade diversion and the need to obtain political support for new agreements that inherently involve some loss of sovereignty.

A key issue for international negotiations will be continuing to address the collective-action problems associated with countries’ trade policy choices—both in terms of the levels of distortions and their volatility over time. The political economy of each individual country may result in decisions to provide high rates of protection to commodities with strong political support. While optimal from each country’s point of view, taking the choices of other countries as given, this may well be suboptimal from the point of view of the countries considered together. Once the terms of trade gains that are obtainable from international negotiations are taken into account, it may be possible to reach an outcome that is preferred by all countries ([Bagwell and Staiger 2011](#)).

A similar collective action problem arises with the use of trade measures to insulate domestic prices against changes in world market prices. Policy makers in developing countries are very sensitive to changes in food prices, and frequently adjust trade policies in response to changes in world food prices. [Anderson and Nelgen \(2012\)](#), [Ivanic and Martin \(2014a\)](#) and [Yu et al \(2011\)](#) analyze the response of domestic prices to changes in world prices. A comparison of movements in the World Bank’s food price index for internationally traded foods with movements in a weighted average of FAO’s domestic food CPIs reveals two striking features (see [figure 3](#)). One is that when international prices increased rapidly, policy makers in developing countries insulated their domestic markets from that rise to a very substantial degree. The other striking feature of [figure 3](#) is that the longer-term trends in the two series are almost identical.

Figure 3 Indexes of staple food prices

Source: Based on data from World Bank and FAO.



Such short-run insulation can be represented using a simple insulation coefficient that shows the share of a price increase (or decline) that is not transmitted into the domestic market. While the price insulation evident in [figure 3](#) might appear to have been successful in that domestic food prices were much less volatile than external food prices, it must be remembered that price insulation is a beggar-thy-neighbor policy that does not actually reduce volatility, but rather redistributes it from the countries that insulate the most to those that insulate less than average. Since it is not possible for all countries to insulate to more than the average degree, the volatility of prices in at least some countries must be greater than it would otherwise have been ([Anderson, Martin, and Ivanic 2017](#)).

If such insulation is used more extensively by countries with substantial shares of their populations more vulnerable to price changes than in other countries, then it might reduce overall poverty by protecting people in countries where people are more vulnerable from larger price increases. [Anderson, Ivanic, and Martin \(2014\)](#) examine whether the price insulation undertaken during the 2008 food price crisis did this. These authors concluded that the price insulation actions undertaken during this crisis were not effective at reducing the short-run impacts of higher food prices on the poor. Although from the point of view of most policy makers, their own insulation helped reduce poverty, the collective impact of this insulation—which pushed up world prices—did not lead to a reduction in global poverty. Clearly, what is needed is measures to reduce the collective-action problem.

While price-based measures that offset part of a change in world prices are likely to be an effective approach to reducing price volatility for individual developing countries, quantity-based trade distortions are likely to destabilize domestic as well as world prices. Unfortunately, the proposal that was proximate cause of the collapse of the Doha Agenda negotiations in 2008—and was reaffirmed at the WTO Ministerial in 2015 ([WTO 2015](#))—was a quantity-based safeguard that would destabilize both domestic and world prices and would likely raise poverty by raising prices during periods of relatively low farm output ([Ivanic and Martin 2014c](#)). Research that highlights the adverse impacts of this type of policy at the global and national levels ([Chapoto and Jayne 2009](#)) will be a high priority.

Food Security and Nutrition

Achieving food security requires more than trade policy, but trade policy has an important role to play. The well-known, and extremely powerful, definition of food security has four dimensions: (a) availability, (b) access, (c) utilization, and (d) volatility.

Traditional views of food security have focused on the first dimension, availability, and tended to conflate that with food self-sufficiency. The FAO World Food Summit of 1974 defined food security solely in terms of the availability of sufficient food. Amartya Sen's (1981) influential contribution focused on the importance of access by vulnerable people to the available food. By the 1996 World Food Summit (see FAO 2006), the definition of food security had been broadened to include the four dimensions above: "Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (the research agenda for dealing with food insecurity in the United States is discussed by Gundersen and Ziliak (2018) in this issue).

As emphasized by Sen (1981), food security cannot be achieved through trade policy alone, and policy must ensure that vulnerable people have access to food. On the other hand, many of the major famines that he surveyed were a consequence of policy makers—thinking that adequate food was available—refusing to allow food to be imported when the need turned out to be greater than expected and people starved. The experiences highlighted in this book emphasize the need for trade to help avoid creating situations where access to food is put at risk. Burgess and Donaldson (2010) showed how important this can be with their finding that opening regions in India to trade resulted in a sharp decline in the incidence of famines. Unfortunately, a strong focus on targeting availability using quantitative trade policies continues to result in more interventionist countries in Africa choosing policies that result in greater price volatility—and hence more risk of adverse distributional outcomes and food access challenges—than countries that adopt less interventionist policies (Chapoto and Jayne 2009).

The continuing strong interest of developing countries in stabilizing the prices of food staples (Gouel 2014), despite reservations about the welfare impacts of this focus by Bellemare, Barrett, and Just (2013), requires careful analysis of policy options. This is particularly the case in countries close to self-sufficiency where there is a substantial gap between the fob price (relevant when exporting) and the cif price (relevant when importing) so that trade policy alone cannot be used to stabilize prices. Coordinating trade and stockholding policies to stabilize prices in this situation is challenging, even for small countries but Gouel and Jean (2013) show how it can be done successfully in the presence of private storers who form rational expectations about future prices. Gouel, Gautam, and Martin (2016) show how this approach can be applied to a large economy (India). More analysis of these issues is clearly needed.

Trade policy can also play an important role in helping deal with nutritional problems associated with a lack of dietary diversity, as well as from inadequate calorie consumption. Remans et al. (2014) show that the diversity of food consumption is much greater than the diversity of food production, even when countries are only slightly open to trade. The link between

openness to trade and food quality is much more controversial, with many raising questions about whether trade openness contributes to nutritional problems, particularly those associated with obesity (Hawkes, Chopra, and Friel 2009). Clearly, these challenges sometimes exist, particularly if consumers are not well-informed about the nutritional consequences of dietary choices. However, the central problem is one of consumption choices so policies that target these choices will almost always be better than policies that work indirectly through trade policies. Okrent and Alston (2012) conclude that policies focused on consumption, such as a tax on calories, would be more efficient than trade-based interventions, although Muller et al. (2017) raise concerns about potentially adverse distributional implications. Just and Gabrielyan (2016) also emphasize the potential importance of behavioral “nudges” as a complement to, or substitute for, price-based policies.

Product standards can play an important role both in ensuring food safety—and hence utilization—and in influencing the market opportunities for food exporters. Both standards required by governments and those implemented by private players are now important. Key questions include whether these standards are appropriate for achieving their goals, whether they provide flexibility in doing so, and whether they create disguised trade barriers.

Trade Costs and Behind-the-Border Issues

Analysis of trade issues frequently must go beyond traditional border measures. Key areas where this is important for agriculture include domestic price and support policies, market structure, price transmission, infrastructure, and social safety nets. Price and support policies frequently require trade interventions if they are to function as intended and an important role for research is to assess the existence, nature, and impacts of such interventions (see, e.g., Glauber and Westhoff 2014).

Trade costs are an important influence on both the existence and the level of bilateral trade flows. Anderson and van Wincoop (2004) estimate that transport costs average about 21% of the average value of trade for rich countries, but note that these costs are likely higher for low value-to-weight agricultural commodities. These costs appear to be vastly higher for trade in Africa, where transport infrastructure is relatively poor (Porteous 2017). Border-related trade costs, including the time costs associated with delays in clearance, are also likely to be much higher in developing countries. Clearly, more work like that of Porteous (2017) on international trade costs, and Sotelo (2016) on internal trade costs, is needed to help devise feasible approaches to their reduction.

Imperfectly competitive market structures can fundamentally change the impacts of trade policy measures (Maskus and Lahouel 2001) and outcomes for producers and consumers (Piyapromdee, Hillberry, and MacLaren 2013). McCorriston (2002) highlights the ways that imperfect competition may affect the impacts of reform, and lays out an agenda for research in this area. Imperfect price transmission—which may or may not be related to imperfectly competitive market structures—also has potentially important implications for the impacts of trade reform. Valdes, von Cramon, and Engler (2015) is a recent paper showing some of the key implications of this phenomenon for trade liberalization. Poor infrastructure resulting in high

internal trade costs may greatly reduce—or occasionally increase—the impacts of trade policy reform (Atkin and Donaldson 2015).

Social safety net policies are an important complement to trade policy reform. Understanding what can, or cannot, be done to deal with the needs of the poor and the vulnerable is essential when advocating trade reforms that will—almost inevitably—have both winners and losers. Clearly, recent developments in electronic payments have greatly improved the ability of safety net policies to target their recipients, but many challenges remain (Ravallion 2016), particularly when targeting food needs (Alderman, Gentilini, and Yemtsov 2018).

Methodological Approaches

The methodological approaches of greatest use in research on trade and development depend on the demand for research and on the approaches that can best supply answers to both old and new research questions. Our discussion of the policy issues to be addressed has revealed several important demand-side considerations, including interest in the following: (a) impacts at the level of the household (especially poverty, hunger, nutrition, and gender), (b) productivity impacts of trade reforms, and (c) the extent of price insulation implied by trade policies other than ad valorem tariffs. On the supply side, new approaches help us to supply answers to questions such as the role of trade in reducing the costs of responding to climate change.

Measurement of agricultural trade distortions is complicated by the prevalence of non-ad-valorem trade distortions and non-tariff measures more generally, such as specific tariffs, seasonal tariffs, export bans and other restrictions, tariff-rate-quotas, and discretionary adjustments to tariff rates designed to achieve goals such as the insulation of domestic from world prices. Given these complications, the predominant approach to measuring agricultural distortions is the price-comparison approach, under which the domestic price is compared with an external reference price to obtain an estimate of the ad valorem equivalent of the trade distortion. The World Bank has undertaken two large-scale studies of agricultural distortions—the first being the Krueger, Schiff, and Valdes study (1988) and the second the Anderson (2009) study. To provide continuous access to estimates of global agricultural protection on a consistent basis, a consortium of interested international organizations has been formed to provide access to estimates of agricultural distortions now produced by several organizations, including the FAO, the Inter-American Development Bank, The International Food Policy Research Institute the OECD, and the World Bank.¹

The progress on the measurement of agricultural distortions has probably been offset by a deterioration in the quality of our estimates of key behavioral parameters. Where once econometricians competed to supply estimates of elasticities for output supply and input demand functions, there now appears to be much less interest in estimating such seemingly-pedestrian parameters. This leaves the key modeling efforts, such as the GTAP model project (www.gtap.org)—and everyone else—depending on

¹The International Food Policy Research Institute curates and hosts these data at <http://www.ag-incentives.org/>. The Ag-Incentives portal was undertaken as part of, and funded by, the CGIAR Research Program on Policies, Institutions, and Markets (PIM) led by the International Food Policy Research Institute (IFPRI).

now-dated estimates of critical behavioral parameters such as the elasticities of substitution between primary factors obtained from [Jomini et al. \(1991\)](#).

Many of the challenges identified in this paper benefit from economy-wide modeling frameworks such as the GTAP model ([Hertel 1997](#); [Aguiar, Narayanan, and McDougall 2016](#)) and related global general equilibrium models that build on its database, such as MIRAGE ([Decreux and Valin 2007](#)) and MIRAGRODEP ([Laborde, Robichaud, and Tokgoz 2013](#)). The Agricultural Model Intercomparison Process (AgMIP) plays an extremely important role in making simulation analyses from different models transparent, and in promoting understanding of why results differ (see [Rosenzweig and Hillel 2015](#)).

An economy-wide treatment is important for many of the problems considered here because the shocks or policy changes under consideration are likely to affect not only producer returns and prices but also factor prices, and particularly the wage rate for unskilled labor that is very important for welfare impacts on low-income households ([Ivanic and Martin 2014b](#)). In many cases, the detail included in the large-scale models will be extremely important for capturing policy reforms, especially if appropriate approaches to aggregating these details can be used (e.g., [Laborde, Martin, and van der Mensbrugge 2017](#)). In other cases, much simpler approaches will make the mechanisms under study much more transparent (e.g., [Hertel 2011](#); [Fukase and Martin 2017](#)).

The rapid growth of value chain analysis in recent years has highlighted the potential leverage of upstream and downstream policies and/or omissions in affecting the profitability and even the existence of links in value chains ([Webber 2007](#)). Tariffs on inputs used in processing may, for example, result in the non-existence—or the disappearance—of a processing activity that would otherwise have been highly-profitable. This may result in the export of unprocessed products where processed products would otherwise have made a greater contribution to the economy, or to the non-existence of the primary production activity for lack of a processing chain. Value chain analysis may also have implications for nutritional outcomes (see [Hawkes and Ruel 2011](#)).

From the supply side, the much greater availability of survey and census data has important implications for research, as does the greater availability of geo-referenced data. Improvements in modeling approaches that take advantage of these data also have important consequences. The availability of household data that provide information on the income sources and expenditure patterns of individual households allows researchers to better assess the impacts of reforms and exogenous shocks on household welfare (see, e.g., [Ivanic and Martin 2014b](#)). Household data may also allow investigation of the impacts of marketing costs on adoption of more profitable export commodities, rather than continuing with subsistence production ([Balat, Brambilla, and Porto 2009](#)). [Minten et al. \(2017\)](#) show how developing the export value chain can raise returns to farmers and help raise farm productivity.

The availability of geo-referenced data on agricultural production and estimates of the productivity of different crops by agroecological zone similarly allows estimates of the impacts of different shocks on the global supply and demand for agricultural products (see [Costinot, Donaldson, and Smith 2016](#)). The availability of transaction-level data on sales by firms to domestic and export markets allows investigation of the [Melitz \(2003\)](#) type productivity gains from trade reform ([Olper, Curzi, and Raimondi 2017](#)).

The recent upsurge in the use of randomized control trials has had relatively little impact on research in international trade. As noted by [Goldberg and Pavcnik \(2016\)](#), the economy-wide nature of trade reforms has resulted in their being relatively few applications of this approach within trade policy analysis, although it has been used for reforms such as export promotion, where interventions are firm-specific and can be targeted. Some innovative new work combines impact evaluation and broader models of local economies to capture the broader impacts of interventions at the household levels ([Taylor and Filipowski 2014](#)).

Another major development in international trade is the wider use of gravity-type models, and particularly the [Eaton and Kortum \(2002\)](#) model, to assess the welfare impacts of trade policy and other changes ([Head and Mayer 2014](#)). [Tombe \(2017\)](#) applies this approach to capturing the interaction between trade costs and productivity differentials between agriculture and other sectors in developing countries. [Heerman, Arita, and Munisamy \(2015\)](#) use this approach to estimate agricultural trade costs in the Asia-Pacific region, and assess the implications of different regional trade initiatives in that region. [Costinot and Donaldson \(2016\)](#) use the Eaton-Kortum model together with GAEZ data to assess the productivity gains from increased agricultural trade within the United States, finding these gains to be in the same order of magnitude as the gains from increases in farm-level productivity. It seems likely that the use of these approaches will increase in the coming years because of their ability to provide answers to many policy questions, such as the gains from improvements in infrastructure and regionally-differentiated changes in climatic conditions.

A related development is the revival of the Ricardian model or, more specifically, the development of Ricardo-Roy models that allow compact representation of agricultural production technology ([Costinot and Vogel 2015](#)). These approaches were used in [Costinot, Donaldson, and Smith \(2016\)](#) and [Gouel and Laborde \(2017\)](#) to specify global agricultural production and estimate the implications of climate change at both finely-disaggregated levels of production and globally.

What Is to Be Done?

Much of what needs to be done to provide research that will inform the upcoming policy challenges in agricultural trade and development follows the standard pattern for applied economic research: (a) identify the decision makers who need to be influenced if policy improvements are to be made, (b) identify the key questions that need to be answered if policies are to be improved, (c), identify the appropriate theoretical framework for answering those questions, (d) identify the key parameters and data needed to answer the question(s), (e) estimate the needed parameters or test the underlying hypotheses that allow the question(s) to be answered, (f) present the results in a form that allows scientific verification, and (g) present the conclusions in a form that allows communication with the policy makers who would be in a position to implement the changes suggested by policy analysis.

For many policy questions, a key difference from the past will be a much greater need to communicate research results to policy makers in developing countries. This will be particularly the case for trade policy negotiations where the much greater importance of developing countries in world trade and the increase in their use of trade barriers mean that developing

countries will be much more important in both multilateral and regional trade negotiations. In the Uruguay Round of the WTO, the key policy makers were those in the United States, Europe, and other high-income countries, such as Japan. By the time the Doha Agenda was launched in 2001, it had become clear that this was no longer sufficient, but neither the proposals under discussion nor the research communication had fully adapted to this change (Anderson and Martin 2006). For questions about food security and nutrition, the focus will also be strongly on developing countries.

The answers to many other questions will, however, depend on outcomes in both developed and developing countries. Assessing the impacts of climate change on agriculture, for instance, will require paying considerable attention to impacts in both poor and rich countries. A key difference is that climate change in poor countries is much more likely to put at risk the livelihoods of very poor people (Jacoby, Rabassa, and Skoufias 2015).

With many pressing questions and new tools available to address them, it seems likely that international agricultural trade will be a very active area for research in the coming years. Approaches to research that include careful field work to ensure that the questions are correctly identified and the analysis is well-founded are likely to be much more useful than approaches that simply apply off-the-shelf techniques. Further, publication in high-quality refereed journals will continue to convey a strong quality signal, even though the peer-review system is coming under pressure because improvements in the productivity of researchers as analysts and authors are unmatched by improvements in their productivity as reviewers and readers.

A key, continuing challenge will be to reach the policy makers whose decisions would benefit from the answers provided by research. Here, the gold standard is to identify and, if possible, engage with decision makers before producing research. Not only does this help refine the questions, but it also helps to communicate the answers effectively. Where this is not possible, or the audience is not so clearly defined, then it becomes necessary to identify the questions as well as possible, and to communicate the results as effectively as possible to what are likely to be multiple audiences.

Conclusions

International trade and development issues are likely to be important for agricultural and applied economists in the coming years. This is because there is a set of important policy questions for which answers are likely to be required. Some of the broad questions, such as the driving forces for agricultural markets, are not new, although the specific hypotheses that need to be examined are. The trade policy agenda seems likely to be quite different, given the emergence of questions such as how the U.K. should best exit from Europe, and the low probability of a global trade Round like the Doha Development Agenda. But important questions will remain at national and regional levels, and key challenges such as the collective action problems associated with high and volatile trade distortions will remain.

Analysts will be able to confront the policy questions in international trade and development with a new set of data and analytical tools. Greater availability of transaction-level data will allow the investigation of many key hypotheses about trade and productivity growth, while improved availability of household survey data and geospatial data and models will allow

assessment of impacts at the household and sometimes even the individual levels. The challenges of effectively communicating research results will remain, although best-practice approaches such as engaging with decision makers before undertaking the analysis may help to better target research and to disseminate it more effectively.

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