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AGRICULTURAL TRADE AND FOOD SECURITY

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Abstract

Agricultural trade is vitally important for achieving the goal of ending hunger by 2030 enshrined in the second Sustainable Development Goal (SDG). While trade is frequently seen as posing threats to this vitally important goal, it can in fact play a major role in achieving it. Trade helps in a number of ways, by allowing countries to take advantage of their radically different factor endowments, with land-abundant countries providing exports and land-poor countries taking advantage of much more efficiently-produced imports. Trade liberalization can also help by raising production efficiency in agriculture, allowing improvements in dietary diversity and increasing access to food. Allowing trade substantially reduces the volatility of food prices by diversifying sources of supply. By contrast, beggar-thy-neighbor policies of price insulation such as the imposition of export bans in periods of high prices redistribute, rather than reduce, volatility. However, the tendency of other countries to use price-insulating policies creates a serious collective action problem in world markets. Proposals for Special Safeguards would exacerbate these problems by adding massive duties—and creating even larger declines in world prices—during periods of already-depressed prices.

JEL Classification: F10, F13, Q11, Q17

Contents

1. AGRICULTURAL TRADE AND FOOD SECURITY

The food security element of the second Sustainable Development Goals (SDGs) is to: "End hunger, achieve food security and improved nutrition". This is an extraordinarily important goal, and one that rightly commands a high degree of consensus. It is, however, a difficult and multi-faceted goal and one that seemingly-reasonable policies can easily put at risk. The goal of ending hunger is surely the most important, but a number of important additional challenges arise from the so-called double burden of malnutrition in a world in which more people are overweight than are undernourished (Masters et al 2016). And the topic is an emotionally-charged one on which debate is often fractious (Diaz-Bonilla 2015). However, the importance of good policy for achieving this goal is increased by the slowdown in economic growth in recent years, which will increase the difficulty of achieving the first SDG of eliminating poverty by 2030 (Laborde and Martin 2016).

Because this is a goal about domestic policy outcomes, these outcomes should, according to Tinbergen's (1952) famous principle of policy assignment, be addressed primarily using policies that are directly relevant to them, rather than to measures such as trade policy that affect them only indirectly. However, there is a great deal of interest in the effects of agricultural trade policy on food security and nutrition, with many firmly convinced that restricting trade is important in ensuring food security, while others feel that open trade is equally vitally important. Perhaps the most useful approach to this question is to retain the primary focus of ensuring good nutritional outcomes on policies that target them most directly, but to ask whether trade policy is—in general—supportive of or prejudicial to the goal. And, if trade measures are to be used, how?

The 1996 World Food Summit provided a widely-accepted definition of food security as "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". This definition focuses on peoples' access to food, rather than on whether sufficient food is available. This is because, as Sen (1981) showed very clearly, that while availability of food is necessary for food security, it is far from sufficient and massive food insecurity can arise even in the midst of plenty. Its "at all times" dimension also takes into account the fact that, while people may have access to food under normal market conditions, their food security may be challenged at times of market disruption unless policies are in place to ensure access.

At low income levels, key policies directly targeted to improving food security focus on ensuring access to food at low income levels. In poor countries, the development of social safety nets that ensure access to food is a high priority for ensuring food security. A good social safety net policy has the desirable feature of helping the poor without putting the welfare of the rest of the community at risk. In this, it is in strong contrast with measures that operate through the price of food, which are likely to create substantial numbers of both winners and losers. In examining the 2010-11 price shock, Ivanic, Martin and Zaman (2011) found, for example, that the net increase in poverty of 44 million was associated with 68 million people falling into poverty and 24 million people (mostly small farmers) moving out of poverty.

In the longer term, key influences on food security operate through the real incomes of consumers, the cost of food, the nutritional content of food and the structure of consumer preferences. Raising real incomes through economic development is the most effective approach to dealing with hunger in the long run. Promoting broad-based productivity growth in agriculture in developing countries is likely to be particularly

effective in reducing hunger associated with poverty because it operates through three channels—by raising the incomes of farmers at any level of output prices; by lowering the cost of food to poor consumers; and by raising real wages (Ivanic and Martin 2016).

The nutrition dimension of the goal is considerably more wide-ranging than the food security dimension. There is a well-known dietary transition as consumers' real incomes rise, with a move away from basic carbohydrates, towards a more diverse diet including more fruits, vegetables and livestock products (Masters et al 2016). However, consumers may choose diets that have adverse impacts on their health—whether because they are unaware of the risks or because of behavioral factors that lead them to make these choices. This has become very important and controversial as the double burden associated with diet-related conditions such as obesity and diabetes has been more clearly appreciated (Popkin 2003). Potential policies targeted to these problems include provision of information; "nudges" that address behavioral factors (Just 2015); and subsidies/taxes that attempt to change food choices.

One other perspective that influences proposals for agricultural trade reform arises from concerns about the implications of globalization for small, vulnerable, subsistence producers, and preferences for consumption of locally-produced food. Proponents of food sovereignty tend to take a negative view on trade in food, frequently seeing trade as exposing producers to price volatility and competition (Edelman et al 2014). However, an important contribution by Burnett and Murphy (2014) questions the universality of this approach, pointing out that agricultural exports are important sources of income for many small farmers, and the rising influence of developing countries in the WTO.

This paper first examines different ways in which opening to agricultural trade affects food security. Following consideration of these linkages, it turns to the impacts of trade policies on domestic prices in developing countries and ultimately on food security. The discussion first covers the potential implications of agricultural trade liberalization and the implications of current trade policy responses to changes in world prices, and then turns to the proposed Special Safeguard Mechanism (SSM) under discussion at the WTO. The concluding section brings together the overall impacts of trade and trade policies on achievement of SDG 2.

1.1 Linkages between Trade and Food Security

The first part of this paper examines the links between trade and food security. The four different channels of effect considered are: (i) income changes resulting from opening to trade, (ii) productivity gains from trade, (iii) substitution effects from trade, (iv) food price volatility, and (v) changes in dietary diversity and quality.

Income Changes from Trade

Standard economic theory shows that opening up to trade will generally raise real national income. The first demonstration of this, by David Ricardo, relied on differences in technology between countries and highlighted one vitally important—and non-obvious—point. Comparative advantage does not depend on absolute productivity levels but rather the relative productivity of countries in different products. This means that both a poor and a rich country can—at the same time—benefit from opening to trade. The classic textbook example examines economies where only labor is used for production and focusses on a poor country that uses more labor in producing each good, but still benefits by selling the good in which it is comparatively better. How can it compete despite using more labor in its export than the rich country? Because it,

unfortunately, has a lower wage rate than the rich country. The rich country similarly benefits by importing from the poor country. How does it compete in its export, despite having higher wage rates? Because it uses labor more efficiently.

More recent models take into account factor endowments as well as differences in productivity. But they still come up with the same conclusion. Both poor and rich countries can gain by trading with each other. Applied models also take into account the fact that opening to trade is not an all-or-nothing decision, and include trade barriers that influence trade flows. Regional and global trade models also take into account one potential route by which some countries may benefit from trade barriers—by improving their terms of trade, perhaps by lowering the price they pay for imports. Since these gains are beggar-thy-neighbor in nature, complete models generally find that removing all barriers will raise real incomes of all, or at least almost all, countries (see, for example, Laborde, Martin and van der Mensbrugghe 2011) and certainly raise global income, creating the possibility of compensating the losers from reform.

A simple but potentially useful indicator of the importance of trade in agricultural products is provided by the sharp diversity in the land endowments of different countries. As shown in Table 1, agricultural land per person in 2005-2009 was slightly more than twice the world average in the United States, almost as high in Brazil. At the other extreme, Japan and the Republic of Korea had land endowments one tenth of the world average. Little wonder that Brazil and the United States are large agricultural exporters while Japan and the Republic of Korea are large agricultural importers. These numbers alone are strongly suggestive of the extraordinarily high costs—to both importers and exporters—that would be associated with moving to self-sufficiency. The People's Republic of China is a particularly interesting case, with a move to agricultural import status associated with rapid demand growth related to increasing demand for animal products, although Fukase and Martin (2016) conclude that this may be a temporary phase. The Working Paper version of this study (Fukase and Martin 2014, p38) also shows how difficult it is to change the fundamental trade outcomes. While final agricultural products are highly protected in Japan and the Republic of Korea and policy makers emphasize self-sufficiency, it turns out that self-sufficiency in maize, rice, wheat and soybeans is around 25 percent because of imports of feedstuffs.

Table 1: Endowments of Agricultural Land

Country	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	1980–2009
Brazil	0.87	0.81	0.79	0.78	0.75	0.75	0.79
PRC	0.21	0.22	0.22	0.21	0.20	0.19	0.21
EU[1]	0.34	0.34	0.33	0.32	0.30	0.29	0.32
India	0.24	0.21	0.19	0.17	0.16	0.15	0.19
Japan	0.05	0.05	0.04	0.04	0.04	0.04	0.04
Korea, Rep. of	0.06	0.05	0.05	0.04	0.04	0.04	0.05
US	1.15	1.09	1.03	0.95	0.88	0.82	0.99
World	0.55	0.52	0.48	0.45	0.42	0.40	0.47

PRC = People's Republic of China, US = United States.

Source: Fukase and Martin (2016). Hectares of agricultural land per capita defined as arable land, land in permanent crops, and one-third of land in permanent pasture. [1] The data for the EU reflect the changing membership of the bloc.

Recent work by Costinot and Donaldson (2014) points to very large gains from trade within agriculture. They concluded that falling transport costs within the United States resulted in a 2.3% increase per year in the total value of output over the period 1880–1920 and a 1.5% increase per year over the period 1950–1997. These gains are of the same order of magnitude as the extraordinary gains from total factor productivity observed over these periods. Given the extraordinarily large differences in prices between countries resulting from combinations of transport costs and trade distortions (Anderson 2009), it might be expected that the income gains from agricultural trade reform would be substantial. Laborde and Martin (2012) note that, even though agricultural trade makes up only 10 percent of world trade, the potential income gains from agricultural trade reform appear to make up around 70 percent of the total potential gains from trade. This is primarily because distortions in agricultural markets are so much higher and more variable (across commodities and over time) than distortions in other products.

But factor endowments are not the only determinant of trade in agricultural products. Improvements in production technology through investments in research and development can also have a huge impact on countries' ability to export agricultural products. Brazil has emerged as an agricultural export powerhouse in large measure because of rapid improvements in agricultural productivity (Rada and Valdes 2012). The emergence of India as a large exporter of many agricultural products, despite a relatively small land endowment, also reflects considerable improvements in agricultural efficiency.

Productivity Gains from Trade

In addition to the static gains from trade considered above, much recent literature has examined the implications of trade policies for productivity in different sectors. Amiti and Konings (2007) found substantial impacts in Indonesian manufacturing. Similar findings are less also evident for agriculture in a number of 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 specific policy reforms that were critical for productivity growth, such as the liberalization of inexpensive irrigation pumps in Bangladesh in the 1980s (World Bank 1999).

When trade in agricultural goods and inputs is opened, an important role for government remains, in ensuring that these products are of the quality specified. Product quality that is far below specification appears to be a major source of costs to African farmers (Bold et al 2014). Reform of regulatory arrangements needs to take into account the possibility that the use of inferior, illegally-imported inputs is a consequence of inappropriate standards or excessive regulations. WTO standards on Technical Barriers to Trade and on Sanitary and Phyto-Sanitary barriers to trade are designed to develop a balance between the positive role of standards in ensuring quality and the risks that they will be used as hidden trade barriers.

Agricultural productivity growth is likely to have a particularly powerful influence on poverty for several reasons. One is that productivity growth in agriculture has the potential to directly increase the incomes of the poor, of whom around half are farmers (World Bank 2008; Ravallion and Datt 1996). Another is that agriculture in developing countries is particularly labor intensive so that an increase in productivity is likely to increase the wages of poor workers who are net sellers of labor (Loayaza and Raddatz 2010). The third reason is that widespread agricultural productivity growth is likely to lower the cost of basic foods, which make up a large share of the expenditures of the poor, including poor farmers (Ivanic and Martin 2016)

Substitution Effects

Trade policy will affect nutritional outcomes through substitution effects as well as income effects. In many cases, these effects will have the same sign. An increase in food prices that lowers the real income of a net food buyer will reduce demand for food through both substitution and income effects. However, the dependence of demand on substitution effects means that some whose incomes do not fall below the poverty line may slip into food insecurity following a rise in prices.

There may also be cases where food consumption and real incomes move in opposite directions. An increase in the price of food that raises the incomes of poor people who are net food sellers, has ambiguous effects on food consumption. The income effect increases demand for food either by increasing demand for the foods currently being consumed, or by encouraging a shift towards foods regarded as superior, which likely increases the resources needed to meet food demand (Fukase and Martin 2016). It is therefore possible that such a rise in price would have opposite effects on real incomes and on nutritional outcomes.

The need to take into account both income and substitution effects is also important when evaluating both the nutritional impacts and the impacts on trading partners of trade policy responses to price shocks. Do, Levchenko and Ravallion (2014), for instance, argue that price insulation against a price increase should be seen as equivalent in its effects to a social protection policy designed to protect the poor against the price increase. They consider a price increase in a two person society in which a poor person is a net buyer and a rich person a net seller. In this case, it is possible to have a transfer policy that is equivalent to a policy of price insulation in terms of the income distribution achieved—a transfer from the net seller to the net buyer. But the two are far from equivalent in their impacts on nutrition, and in their impacts on the rest of the world.

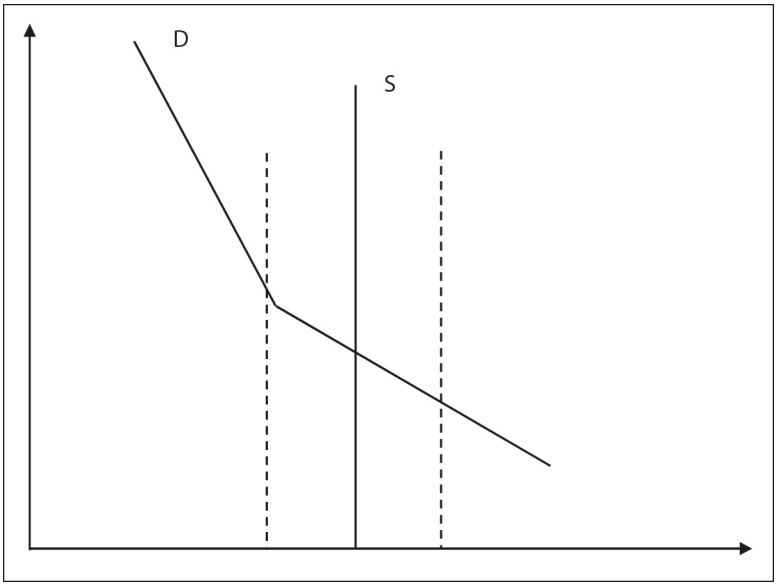
The income transfer policy increases demand for food in the country by transferring income from the rich person whose marginal propensity to consume food is almost certainly larger than that of the poor person. The price insulation policy generates these two partially-offsetting impacts but adds to this a substitution effect that increases the demand for food by both rich and poor. Given the homogeneity of degree zero of the Marshallian demand function, the price elasticity of demand for food must be greater (in absolute value) than the income elasticity by the sum of the cross price elasticities (assuming gross substitutability). If we consider only the poor person, the increase in demand due to the substitution effect must be larger than the increase due to the income effect. The price insulation policy removes the negative income effect to the rich of having to pay for the transfer, and adds a substation effect for the rich. The only uncertainty relates to the income effects of the price insulation measure. If, for instance, insulation is achieved through an import subsidy or a reduction in import duties that reduces revenues, the need to finance this intervention will reduce demand for food.

Impacts on Food Price Volatility

Another important impact of trade operates through the diversification of the production and the consequent reduction in the costs associated with the output volatility. To understand the impact of opening up trade, it is useful to begin with a small, isolated economy producing and consuming a storable food commodity. A highly simplified version of the model developed by Deaton and Laroque (1992) and Cafiero et al (2011) is represented in Figure 1. The availability of food is given by a vertical curve marked S. The position of this curve is determined by the carry-in of food from the previous

season, plus production for this marketing season. This curve is vertical, reflecting the assumption that output cannot adjust to price changes during the season.

Figure 1 Supply and Demand for a Storable Commodity, Region 1



Because production of food is typically much more volatile than consumer demand, we focus on this source of variability. The dashed lines to the left and right of the supply curve by one standard deviation of the distribution of output give an idea of the dispersion of output. The demand curve consists of two regions. The first, steeper section of the curve reflects a stockout situation in which prices are high enough for speculators to believe that it will not be profitable enough to store food into the next period and so sell all of their supplies. In this situation, the only way that demand can adjust to meet changes in availability is by causing consumers to eat less. Because consumer demand for food tends to exhibit little response to price changes, large changes in price are required to reduce consumption to match changes in availability.

The section of the demand curve below the kink reflects a situation where storers believe it will be profitable to carry food into the next season, and hence continue to hold stocks throughout the season. Whenever availability intersects the demand curve below the kink, food prices need to vary relatively little when there are unexpected changes in availability. This is because the demand for storage is much more price responsive than the demand for consumption. The situation for non-storable foods is the same except that the entire demand curve looks like the steeper curve in Figure 1.

If we move from a single, isolated, market to one with many supplying and demanding regions linked by low-cost transport, a key change is that the coefficient of variation of output is likely to come down substantially. If we consider a move from a single isolated region with a Coefficient of Variation of output of σ to n integrated regions with identical but independently distributed output linked by low cost transport, then the coefficient of variation for output will decline to $\sigma/\sqrt{n}$. With say 9 regions, the coefficient of variation falls by a factor of 3 under these circumstances, greatly reducing the frequency with which unexpected falls in output will result in price spikes. Obviously, if there is some correlation between output in the regions linked by transport, the reduction in the variance will be somewhat smaller, but the general principle that diversification reduces the risk of income volatility from a given production portfolio remains.

It appears that the practical impact of this diversification on food security can be very powerful. Burgess and Donaldson (2010) found that connecting a district in India to the railway network resulted in a very sharp decline—almost the disappearance—of famines in that region. The importance of inter-regional trade in this context was probably particularly great because, as Donaldson (2014) explains, agricultural output volatility was large and internal transport costs extremely high before connection to the rail network. However, this work is particularly suggestive about the role of trade in reducing the volatility of food prices and the risk of food insecurity. Ravallion (1987) considered the role of international trade in famines in British India, and concluded that it had a modestly favorable impact on reducing the impact of output shocks on consumption, an effect complemented by domestic storage. He found no evidence of "slump famines" in which the income decline associated with harvest failure reduces consumption enough to increase exports.

A crude indication of the importance of *international* diversification in reducing the volatility of food prices builds on the extent to which it diversifies production risk, which, in turn, depends on the distribution of production across countries for a particular commodity. For rice, for example, FAO reports production in 117 countries in 2013. Because the size of these countries varies enormously, we need to take the international distribution of output into account. One simple way to do this is to use the numbers equivalent of the Herfindahl Index, defined as the inverse of the sum of their market shares squared. For rice in 2013, this index was 6.8. This implies that international diversification reduces the variance of production by a factor of 6.8 and the average size of price shocks in the rice market by a factor of 2.6. Wheat production is more widely distributed geographically, with a numbers equivalent corresponding to 13.8 equal-sized countries in 2013. This implies that international diversification reduces the variance of price shocks associated with production shocks by a factor of 13.8 and the average size of the price shocks resulting from production shocks by a factor of 3.7.

Consideration of international diversification in production has fundamentally important implications for policy. Severe price shocks are an inherent feature of isolated economies and can be greatly mitigated by the inter-regional and international diversification of production associated with trade openness. Opening up to trade does not—as depicted in G-33 (2010)—result in increased exposure to price shocks. Unfortunately, as we will see later in this paper, there is a risk that trade policy interventions designed to protect individual countries from price shocks will—because of their beggar-thy-neighbor impacts—end up destabilizing world prices to an extent that compromises the ability of trade to reduce volatility, and forces each country to respond in the same way.

Dietary Diversity and Quality

Trade has considerable potential to improve the diversity and quality of food consumed in a country. The ability to increase diversity is likely to be greatest for countries that are small and lack agro-ecological diversity. This advantage is likely to be exploited most by higher-income countries, where people have the spending power to include more diversity in their diets. If people are very poor, they will likely be constrained to consume diets that focus heavily on starchy staples (Masters et al 2016).

Remans et al (2014) point to sharp differences between the nutritional diversity of production and of the food supply in many regions. This is particularly evident for their measure of the functional diversity of food. This rises very substantially—even for regions not very open to trade- when we move from a focus on food production to one on the supply of food available to consumers. This presumably reflects a combination

of imports of products in which regions lack a comparative advantage, such as vegetable oils in South Asia, and exports of commodities in which regions have a strong comparative advantage, such as beverages in Sub-Saharan Africa. The share of calories from non-staples in production and consumption is much less divergent in developing-country regions and appears more related to the income level of the region. Only in high income regions such as the Europe and North America are sharp differences observed.

Table 2: Differences between Nutritional Diversity in Production and in the Food Supply

	Nutritional Composition		Energy from Non-Staples	
	Production	**Supply**	**Production**	**Supply**
South Asia	0.13	0.71	40	43
East Asia and the Pacific	0.12	0.71	47	44
Sub-Saharan Africa	0.05	0.71	32	34
Middle East and North Africa	0.08	0.82	47	46
Europe and Central Asia	0.08	0.80	21	52
North America	0.44	0.94	11	66
Latin America and Caribbean	0.08	0.80	57	55

Source: Remans et al (forthcoming, Table 1).

The link between openness to trade and food quality is a much more controversial issue. While one would expect the higher incomes associated with trade to result in dietary improvements—assuming consumers are knowledgeable about what foods lead to better nutritional outcomes. But many have raised concerns about the role of trade, and globalization more generally, in creating nutritional problems, particularly those associated with obesity (Hawkes, Chopra and Friel 2009).

One strand of this literature—and related media discussion—focusses on the case of Pacific Island countries (eg Gittelsohn et al 2003; Cassels 2006; Watson and Treanor 2016). This literature frequently involves claims that the pre-contact diet in these countries was a healthy mix of carbohydrates from root crops with proteins from tropical fish. The experience of Easter Island and New Zealand (Flannery 1994) raises questions about the sustainability of such diets, particularly after the dramatic population growth likely during the demographic transition. Articles in this literature frequently raise concerns about the poor health outcomes associated with imported foods such as mutton flaps and turkey tails, and frequently advocate policies such as bans on imports of particular foods. The concerns about obesity rates, diabetes and other health concerns raised in this literature are indeed disturbing. Evans *et al* (2001) conclude that simply providing information about the nutritional value of food may not be enough to change diets, and advocate using trade policies. But trade policy is clearly an indirect and inefficient means to achieve the goals of improving these diets.

Thow et al (2011) provide perhaps the most detailed discussion of trade policies in this literature. They raise concerns that protection to domestic meat production in some countries has reduced production of traditional foods, but advocate trade policy to restrict imports of less healthy foods and to stimulate production of healthier traditional foods. This set of policy prescriptions—together with the evidence from past protection policies—reveals the problem of using indirect trade policy measures to achieve nutritional goals. Discouragement of unhealthy imports using protection is likely to result in increases in domestic production of this type of product, while protection of "healthy" domestic products to stimulate their production will reduce consumption of

these goods by raising their price. By contrast, the use of excise taxes—which they also recommend—has the ability to reduce demand for unhealthy products without increasing domestic production.

It is clear that changing diets to deal with malnutrition problems, and particularly the problems associated with excessive intake of refined foods, sugar and fat, is particularly challenging. To some degree, these problems reflect a lack of information and provision of appropriate information is surely an important component of a good policy response. This may, however, not always be enough and consideration may need to be given to taxation or to behavioral economic approaches to change outcomes. In this situation, Okrent and Alston (2012) provide a framework for evaluating alternative price-based policies. They conclude that—within the range of feasible price-based measures—a uniform tax on calories designed to reduce obesity would be much more efficient than indirect approaches involving changes in production policies or trade-based interventions. Just (2015) emphasizes the importance of taking into account behavioral considerations and points to considerable promise of "nudges" and other policies in influencing food choices.

1.2 Trade Policy and Food Security

Trade policy may have important impacts on the contribution of trade to achieving the SDGs. The outcome depends heavily upon the nature of each country's trade policies and on the interaction between these responses when the collective action problems associated with trade policy are taken into account. This section of the paper first considers the impacts of changes in the level of protection, then turns to dynamic behavior currently used in an attempt to stabilize domestic prices. Finally, it turns the potential impacts of the proposed Special Safeguard Mechanism whose negotiation was endorsed at the recent WTO Ministerial meeting in Nairobi.

The simplest form of trade policy, and the one strongly favored by the WTO, is simple *ad valorem* tariffs. These measures allow countries to provide protection to particular commodities without changing relative prices over time, and without interfering excessively with the price stabilizing consequences of the production-source diversification associated with trade openness. One important question for trade policy is the implications of lowering the level of ad valorem protection for poverty. This question is addressed very briefly here because it is the subject of another chapter in this volume. Following this, the discussion turns to the implications of policies that affect the variance of protection measures.

Changing the Level of Protection

In considering the impacts of changes in the level of protection, it is important to begin with information about the levels of support provided to agriculture. Some discussions, such as McMichael (2014) begin from the perspective that protection to agriculture was reduced in the 1980s and 1990s when many marketing boards were abolished or restructured. In fact, when careful measurement is done, the average rate of protection to agriculture in developing countries in the 1980s was strongly negative. During this period, the rate of taxation of agriculture was actually sharply reduced and developing countries have now moved to an average rate of assistance that is positive (Anderson 2009).

There is certainly a risk that changes in trade policy could—even if they increase national income—could reduce the incomes of some groups. A key question is whether this is likely to be a widespread problem. If one accepts the evidence that higher agricultural prices tend to lower poverty in the longer term (Jacoby 2015; Ivanic and Martin 2014), then poor people in countries that protect agriculture might be vulnerable. Since agricultural protection raises production costs and lowers the prices received for exports, it is likely that poverty would fall in export-oriented developing countries, particularly those where agricultural land is broadly distributed. Countries such as Cambodia and Viet Nam, in particular, appear to be ones in which higher food prices lower poverty in both the short and the long run (Ivanic and Martin 2014). If, as in Lederman and Porto's (2016) example of Mexico, the higher food prices make the poor worse off, then lower protection would lower poverty in importing countries. Overall, the available literature appears to conclude that agricultural liberalization would, on balance, lower poverty (Anderson, Cockburn and Martin 2010), but it is clear that some complementary measures to deal with the problems of particular groups are likely to be needed.

A paper by Olper, Curzi and Swinnen (2017) examines the link between trade liberalization health, and more specifically, child mortality over the period 1960 to 2010. Using a synthetic control method, they find that child health outcomes improved following overall trade liberalization in 19 of their sample countries, did not change significantly in 19, and deteriorated in three countries. At the beginning of their sample period almost all developing countries taxed their agricultural sectors and they found that reductions in agricultural taxation resulted in particularly large improvements in child health outcomes.

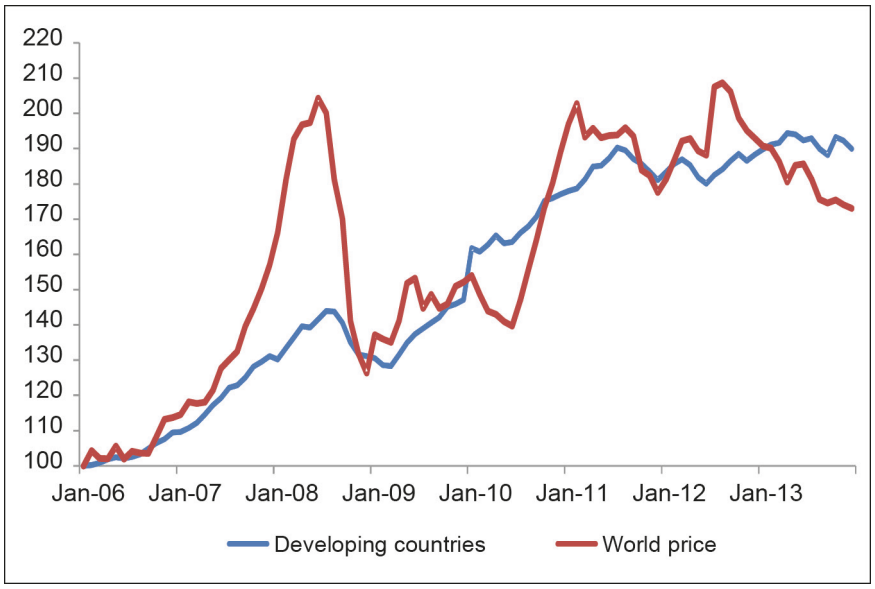
In fact, it appears that most countries—and particularly developing countries seek to insulate their markets from the price shocks. In contrast with ad valorem tariffs, this can have important implications for the ability of countries to benefit from the stabilizing consequences of production diversification. Further, as we will see, the impact of this policy on prices depends heavily upon the interaction of different countries' policies.

Price Insulation

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. To gain insights into the behavior of policy makers in developing countries, we draw on Ivanic and Martin (2014a), who 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 (Figure 2). One is that when international prices increased rapidly, policy makers in developing countries almost fully insulated their domestic markets from that rise. The other striking feature of Figure 2 is that the longer-term trends in the two series are almost identical.

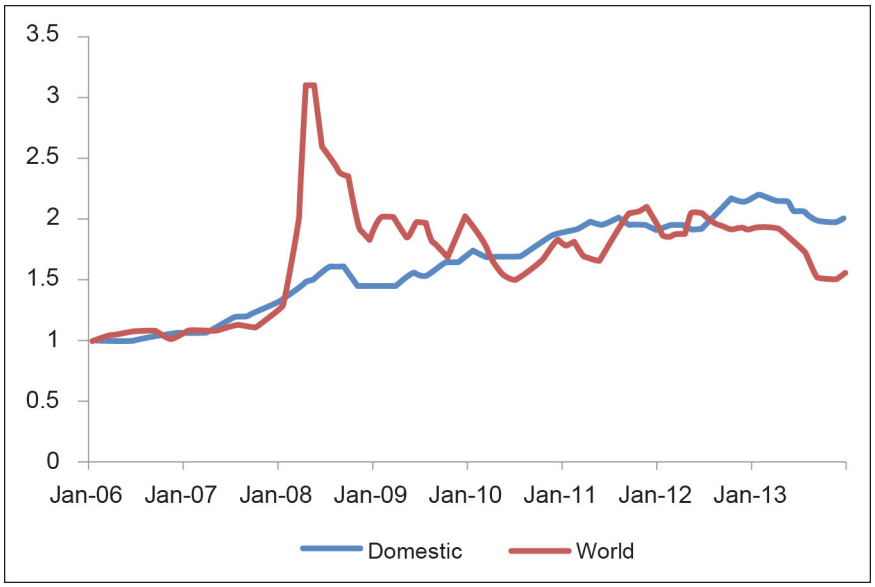
The prices of individual staple foods over the same period reveal that this behavior is particularly clear for both rice and wheat (Figures 3 and 4). By contrast, there is much less insulation of domestic markets for soybean, which is a major input into livestock feed but a minor item in expenditure by the poor (Figure 5). In all cases, however, there appears to be substantial transmission of the longer-term trend in international prices to the domestic market. This implies that countries return to their long-term trend level of taxation of or support following shocks to world prices.

Figure 2: Indexes of Staple Food Prices
(%)



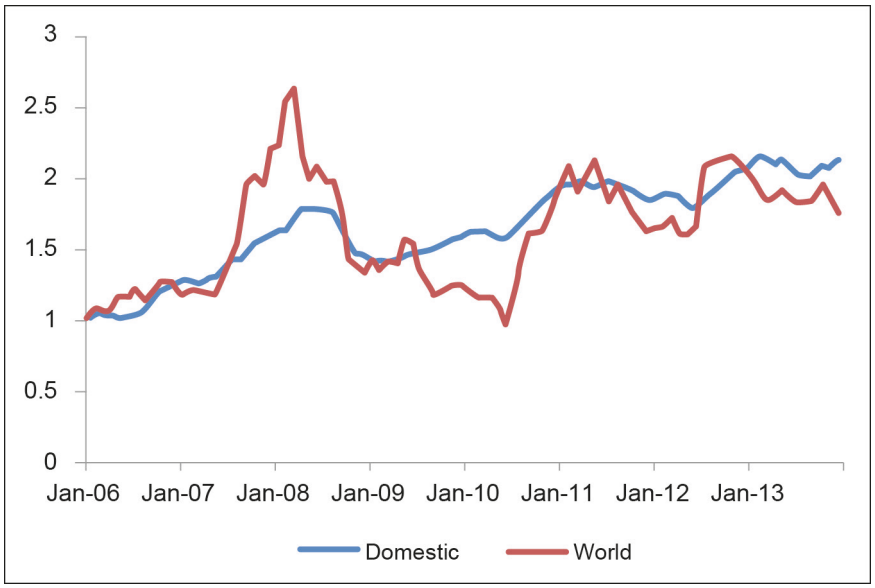
Source: Based on data from World Bank (2015) and FAO (2015).

Figure 3: Price Insulation for Rice



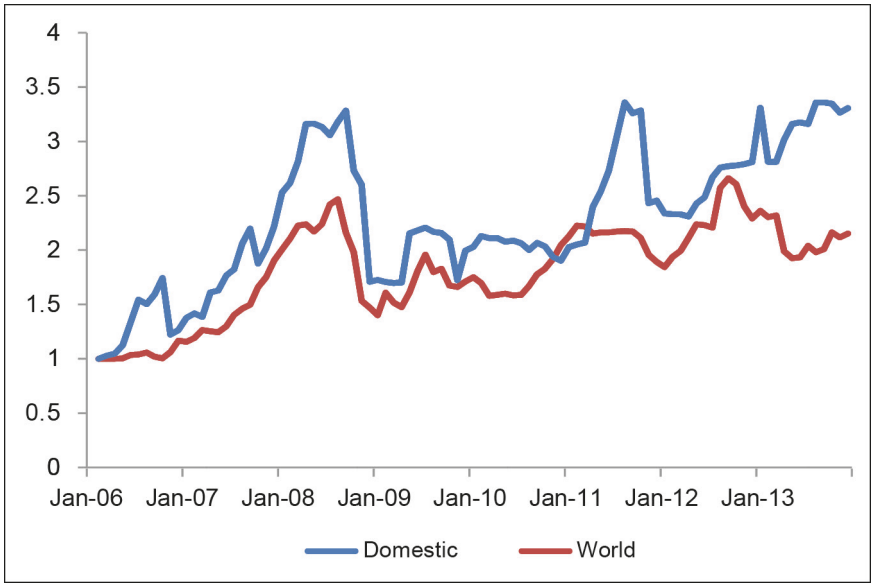
Source: Based on data from World Bank (2015) and FAO (2015).

Figure 4: Price Insulation for Wheat



Source: Based on data from World Bank (2015) and FAO (2015).

Figure 5: Price Insulation for Soybeans



Source: Based on data from World Bank (2015) and FAO (2015).

Ivanic and Martin (2014a) estimate the relationship between protection levels and world prices using the model:

$$\Delta\tau = \alpha.(p_t^w - p_{t-1}^w) + \beta.(\tau_{t-1} - \tau_{t-1}^{\circ}) \quad (1)$$

where τ is the log of the rate of protection defined as (1+t) where t is the tariff equivalent of protection provided at a country's border; p^w is the log of the world price; τ° is the log of the rate of protection desired in the absence of changes in world prices; α is the insulation coefficient, indicating the extent to which protection is used to offset the effects of changes in world prices on protection (and hence on domestic prices); and β is the error-correction coefficient indicating the extent to which policy makers

adjust protection in response to gaps between protection last year and the desired level of protection. Both α and β should be less than unity in absolute value or the system will be unstable, with any initial deviation causing explosive deviations from equilibrium.

Key findings from the analysis by Ivanic and Martin (2014a) are: (i) that insulation is partial, with average trade-weighted coefficients of insulation all substantially less than minus one in absolute value (Table 3), and (ii) that the magnitude of insulation is larger for rice and wheat, and for politically sensitive products such as sugar, than for soybeans, (yellow) maize and beef.

Table 3: Error Correction Coefficients, Simple Averages

	α	β
Rice	–0.50	–0.36
Wheat	–0.52	–0.31
Sugar	–0.53	–0.20
Maize	–0.35	–0.44
Soybeans	–0.40	–0.46
Beef	–0.39	–0.31
Poultry	–0.34	–0.46

An important question is why policy makers might respond like this? The inverse relationship between food price levels and protection rates has been long observed (Johnson 1973), but the tendency for protection rates to return to their long run level appears not to have received the same degree of attention in the literature. One possible explanation for this behavior is provided by recent work on the implications of changes in food prices for poverty—especially in the context of the price surges that can have such dramatic effects on the poor because they spend a large fraction of their income on food. This body of work (e.g., Headey 2014; Ivanic and Martin 2008) shows that unanticipated food price increases can have serious, adverse impacts for poverty (although Headey and Martin (2016) are concerned about the reliability of our evidence on the net purchasing position of poor households), while sustained increases in prices might be helpful once poor farmers' marketable output has a chance to expand and higher food prices are passed through into wage rates (Ivanic and Martin 2014b; Jacoby 2015). Seen this way, it is clear that the observed policy responses make political sense for each individual country.

However, it must be remembered that the results discussed are average responses by a wide range of developing countries, which account for the vast majority of world agricultural production. This means that much of the insulation—which looks so effective to individual country policy makers—is actually undone by the offsetting change in world agricultural prices created by the intervention. While it can stabilize the internal price in the region using it, it does this by destabilizing the price in other markets. As shown in Anderson, Martin and Ivanic (2016), the impact of this price insulation is to raise the world price by a weighted average of the degree of insulation in all markets. If, the world price rises by $50 and each importer offsets half of this increase by reducing its tariff by $25 and each exporter by adding an export tax of $25, then the effect will be to raise the world price by $25, leaving all domestic prices unchanged. If all countries attempt to completely stabilize their domestic prices, as under the EEC's Variable Levy system (Sampson and Snape 1980), the market for that product becomes unstable. A $50 rise in the world price would cause each country to reduce its border protection by $50, causing another $50 rise in the world price,

triggering another $50 decline in border measures, causing another $50 rise in the world price.

On average, price insulation is completely ineffective in stabilizing domestic prices. All it can ever achieve is to redistribute volatility from one country to another. The countries that insulate more than the average can reduce their price volatility by transferring it to other countries. This creates a collective action problem. Even if all countries recognize the problem, there is an incentive for each country to use this approach to reduce the instability of its own prices by transferring some of it to other countries. As long as any individual country insulates by more than the average degree of insulation, it ends up with reduced price volatility

A key problem is that such intervention is contagious. Once some countries insulate and the volatility of world prices increases, other countries feel compelled to insulate to protect themselves from the heightened volatility. As noted by Martin and Anderson (2012), the problem is analogous to that facing members of a football crowd. Once some members of the crowd stand to get a better view, others are forced to stand if they are not to lose their view. Since some members of the crowd are shorter than others, many will likely end up with a worse view. Returning to the real-world problem of volatile food prices, the countries who are likely to draw the short stick—and be unable to fully offset the impacts of higher prices—are likely to include many net food importers, who frequently have low initial tariffs and not likely to have sufficient fiscal resources to pay import subsidies when world prices rise.

One possible satisfactory outcome for developing countries from the use of price insulation might be for price to export volatility from poor countries to rich ones, where consumers spend much smaller shares of their incomes on food, and producers have more options for dealing with price volatility. One challenge for this solution is the very small and declining shares of rich countries in many food markets. In rice, for example, the countries self-designated as developed in agriculture accounted for only 2.5 percent of world rice production in 2013. They do account for a larger share of the world wheat market at 30 percent. Historically, of course, it was the rich countries that were the worst users of price insulation, with the Variable Import Levy of the European Union perhaps the most famous case. Fortunately, the Uruguay Round outlawed the use of Variable Import Levies and European policy has since been reformed to remove this beggar-thy-neighbor policy.

Another possible satisfactory scenario from the use of price insulation might be one where the countries where the poor are most vulnerable to price increases exported positive price shocks to the countries where the poor are less vulnerable. This need not necessarily be a transfer from the poorer to the richer countries. Some relatively low-income countries with abundant land and widely distributed land holdings, and many poor farmers who are net sellers of food, might be expected to welcome magnified price increases. In fact, countries like Viet Nam, where higher food prices generally appear to lower poverty, offset higher prices using export restrictions during the 2006-8 food price crisis. When Anderson, Ivanic and Martin (2014) took into account all of the interventions by countries in 2006-8, they found that these policies were ineffective in reducing global poverty. The countries that insulated more than the average transferred the price increase to those who insulated by less, but the reductions in poverty in the first group were offset by increases in the second. When each country's intervention was considered in isolation, however, it appeared that these actions were effective. This is, of course, only one case study of the impacts of price insulation on poverty. There might be other cases in which it is marginally effective. But it seems clear that such insulation is almost always going to be much less effective than it appears to each individual observer.

The Proposed Special Safeguard Mechanism (SSM)

The Nairobi Ministerial Declaration (WTO 2015) provides for a Special Safeguard Mechanism to be negotiated consistent with the Hong Kong Ministerial decision (WTO 2005), which provides for quantity and price-based SSM measures that allow temporary protection measures. While this negotiating mandate does not require that the SSM to be developed should be based on the Doha Proposal (WTO 2008a,b), the discussion is likely to frequently return to that proposal. Proponents of this mechanism see it as essential for food and livelihood security, and for addressing the "incessant price fluctuations" believed to be associated with openness to international markets (G-33, 2010, p2).

In assessing proposed trade rules such as this, it is important to consider both the direct impacts of the policy on the using countries, and the impact of the proposal on those countries through its impact on the market. Many studies, such as Valdes and Foster (2005) and Montemayor (2010), miss the second impact by considering only the impact on individual, countries applying the safeguard. But, if a price-based safeguard policy becomes available to all WTO developing countries, it will be available on 77 percent of world agricultural production and over 97 percent for key food products such as rice (Fukase and Martin 2016). In this context, the beggar-thy-neighbor implications of this form of price insulation must be considered. Fortunately, a number of studies that do take into account the interactions between countries imposing the safeguard are now available. See, for example, Grant and Meilke (2009, 2010) and Hertel, Martin and Leister (2010).

This has important, practical impacts in framing a safeguard rule. If a sharp price decline led many developing countries to impose safeguards, then the combined effect of their action would be to magnify the initial price decline. If, for instance, under the Doha proposal, an initial shock to world supplies caused world rice prices to fall 10 percent below the trigger, then all developing countries would be eligible to impose an 8.5 percent duty to offset this price decline. If both importers and exporters responded in this way, this would push world prices down by a further 8 percent, potentially setting in train a second round of duty increases designed to offset the now 18 percent decline in prices. Clearly, the collective action problem associated with widespread use of this measure needs to be taken into account in considering the effectiveness of changing global trade rules. While a Minister making considering using a safeguard in her own country might consider just the direct impact of her policy, it is totally misleading to consider only the direct impacts of the measure when framing rules for global trade.

Because the issues and questions involved in designing a price and a quantity-based safeguard differ sharply, it makes sense to consider them in sequence. The price based measure is considered first, followed by the quantity-based measure.

The Price-Based Safeguard

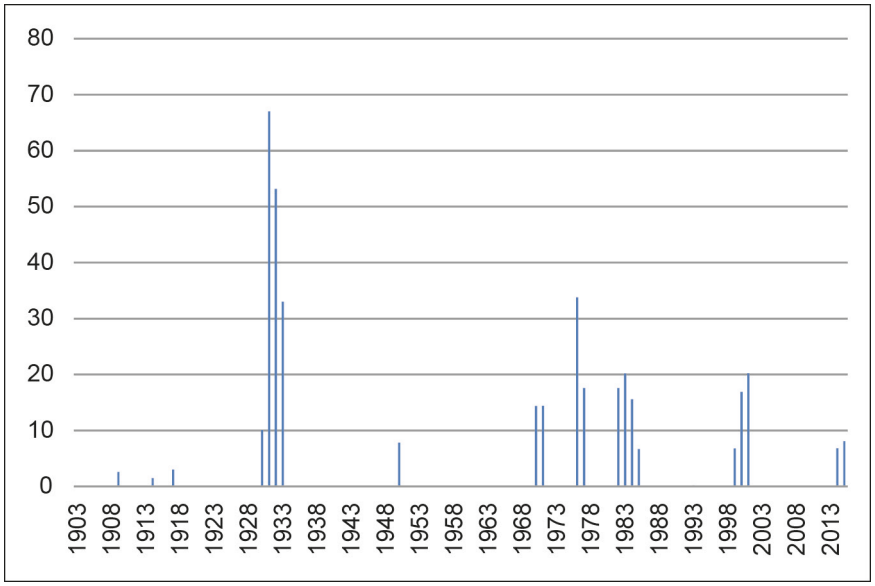
Three key parameters in a price-based safeguard are: (i) the trigger level below which countries may respond to a price decline, (ii) the insulation coefficient or extent to which a duty may be used to offset a price decline, and (iii) whether prices are shipment-by-shipment or based on a market aggregate.

The Trigger Level

The 2008 draft Modalities involved a trigger equal to 85 percent of a three year moving average of prices. The frequency with which such a trigger will allow duties to be imposed depends on the product. It will be less frequent for storable products such as rice and wheat where low-priced periods are less intense because of the ability to store unexpected output shocks. It is likely much more frequent for nonstorable products, where supply shocks frequently result in severe price drops because of the inability to store for future use.

To assess the likely frequency with which such a measure would be triggered, it is worth examining a long time period of prices, such as the Grilli-Yang price series since 1901. A quick calculation using rice prices since 1901 suggests that—had the SSM been in effect—it would have been triggered in 20 percent of years. Figure 6 shows the years and the duty rates calculated without taking into account the depressing impact of the duties on world prices. What is clear is that the duty would have been triggered in a number of episodes of sharp price declines, such as 1931–34, 1976–77, 1982–85 and 2014–15.

Figure 6: SSM Duties for Rice under the Doha Proposals, %



A key problem with the 3 year average as a basis for a trigger is that it is quite arbitrary. While the econometric evidence discussed in the previous section indicates that policy makers adjust towards the long-run trend of the world price as well as resisting short run shocks, they don't do so at the same rate as a 3 year average. For this reason, Montemayor (2010) and Finger (2009) find that the SSM proposal frequently does not trigger measures when it would be needed to preserve the observed domestic price, and frequently does trigger them when it is not needed.

The Insulation Coefficient

The insulation coefficient of 0.85 under the Doha SSM Proposals would allow very substantial duties to be applied in periods of severe market stress such as 1931–34 and 1976–77. This would not, however, be the end of the matter. Because the SSM permits only importers to insulate, the second-round fall in the world price associated with the imposition of these duties would be no more than half the duty rate. But this second-round fall would provide scope for a second-round increase in the duties as

world prices fell further below the trigger. Just as in 2008, when export restrictions and import duty reductions/import subsidies caused a cumulative increases in world prices, until many felt the market to be "on fire" (Slayton 2009) cumulatively increasing duties could turn panic into rout as world prices fell and continued to fall.

This problem of cumulatively falling prices and rising duties is a particular problem with a coefficient of insulation as high as 0.85. A rate so close to one leads to enormous magnification of world price volatility. A key problem with a beggar-thy-neighbor policy such as price insulation is that every individual policy maker knows that she can only reduce her own price volatility by insulating by more than other countries. This collective action problem—like the trivial example of standing up in the grandstand—would put pressure on policy makers to use the maximum allowed degree of insulation of 0.85 even if they would have individually been happy with a smaller degree of insulation. Such a high coefficient of insulation has very adverse consequences for exporting countries, and the net selling farmers within them, by creating risks of extremely depressed prices persisting for extended periods.

From the previous section, it appears that policy makers insulate against only half of a change in world prices of wheat, rice and sugar, and closer to a third for less sensitive products like soybeans and maize. Having such a high coefficient of insulation as 0.85 does not appear to be needed even for individual policy makers. Given that WTO rules are intended to manage and reduce collective action problems, rather than to exacerbate them, it is extremely important to have a lower coefficient of insulation than this. A coefficient of insulation of 0.5, for instance, would allow policy makers to do what they have done historically in reducing price shocks inside their markets, while greatly reducing the adverse impacts of insulation on world markets. Focusing attention on this measure would also, hopefully, help policy makers to realize the collection action problems associated with this type of intervention. Once policy makers became accustomed to the role of a lower coefficient of insulation in price shocks, it might be possible to negotiate a collective agreement to a lower coefficient of insulation. The price-based SSM might serve an important function by building recognition of the importance of this parameter, which is to negotiations about price volatility the counterpart of the tariff binding in negotiations about the price level.

Market Prices vs Shipment by Shipment

The draft Modalities (WTO 2008a) specify that a price-based safeguard should be based on the price of each individual shipment. As noted by Sampson and Snape (1980), such a policy creates massive incentives for collusion and corruption. The exporter and the importer have an incentive to over-invoice any shipment so that it will have a price above the trigger and hence will not be required to pay the duty. Incentives for corruption of this type are inherently undesirable. Further, they threaten the effectiveness of the policy by creating a situation in which duties are not collected even when the market price is below the trigger.

To the extent that such a policy can be made to operate as intended, another disadvantage is that it discriminates against lower-priced imports, which may be particularly important in the diet of the poor. While the trigger price is based on an average price over three years, the shipment by shipment approach compares this average with the price of a particular shipment. As noted by Gibson and Kim (2012) rice that has attributes like desirable color, fragrance and stickiness commands a premium of 45 percent in Viet Nam over rice that is just as nutritious. Given these large price differentials, a shipment-by-shipment approach would lead an SSM to be triggered more or less continuously for low-priced but nutritious foods likely to be favored by the poor.

Another concern with the shipment-by-shipment approach is that it tends to discriminate against developing country exports. Finger (2009, p34) examined imports of 25 different agricultural products into six large developing countries and found that variations in unit prices of imports across suppliers would trigger duties in at least one country on 59 percent of tariff lines, even without any variation in prices over time. Almost two thirds of these duties would be imposed against exports from developing countries. The continuous triggering of the price-based SSG noted by Hallaert (2005) likely results from its use of a shipment-by-shipment approach.

It seems clear that the import price used to trigger any price-based SSM should be based on an average price that is—as closely as possible—comparable with the average price used to calculate the trigger. As in the case of the EU variable levies, an average import price might be used. Alternatively, price changes and triggers might be calculated based on the market price for the primary variety of the good in a major supplying market—such as, for example, Thai 5% broken price for rice or the Randfontein maize export price. This is important partly to avoid incentives for corrupt misrepresentation of import prices, partly to avoid discriminating against foods favored by the poor, and partly to avoid discriminating against exports from developing countries.

Quantity-based Safeguards

The quantity-based SSM (Q-SSM) is based on the volume-based SSG introduced in the Uruguay Round. The Doha proposal (WTO 2008ab) involves a trigger based on a three year moving average of imports, with duties up to the higher of 50 percentage points or 50 percent of the bound rate. It would be challenging to administer because it requires keeping track of imports through the marketing year but can only be imposed once the trigger has been reached. Importers cannot impose a Q-SSM at the same time as a price-based measure, and must remove it after a year. So it seems unlikely that a quantity-based measure would be used when a price-based measure is available.

When imports are increasing but import prices have not fallen, the increase in imports must be caused by some change in the domestic market. In agriculture, the most likely domestic market disturbance to cause an increase in imports is a poor harvest. Given the lack of an injury test, the quantity-based SSM can be applied even in this situation. The South Centre (2009) concludes that more than 85 percent of import surges are not accompanied by declines in import prices, suggesting that most import surges are driven by domestic shocks, such as declines in domestic production. In a high income country, the imposition of a duty in this situation has potentially strong political support. Farmers' incomes are reduced by the decline in output and they can be compensated to some degree by a higher price. But in most low-income developing countries, the situation is completely different. Most poor farmers are close to subsistence and many are net buyers of food. During a drought, many are likely to be bigger-than-usual net buyers of food. Ivanic and Martin (2014c) found that, for this reason, use of the quantity-based SSM as proposed would increase, rather than reduce, poverty.

In terms of price volatility, the quantity-based SSM also has undesirable consequences. It would increase the overall volatility of consumer prices by raising the domestic prices of imported goods unnecessarily when import prices are stable. By closing markets to agricultural exporters—which are now primarily developing countries—it would also increase the volatility of export returns. The measure would also be likely to create within-season volatility and disorder in the market planning to use this measure. If market participants felt that the trigger was likely to be reached

during the marketing year there would be a strong incentive to bring forward imports so that they could occur before the trigger was breached.

The SSM proposal in the Doha negotiations (WTO 2008a) would allow the duty increases associated with the SSM to be large indeed. The maximum duty allowed is related to the percentage increase in imports relative to a three year average of imports, with the maximum duty of 50 percent of the bound tariff or 50 percentage points, permitted when imports rise by 35 percent of this average. Such a duty could be very large, with bound tariffs frequently in the order of 150 percent, and applied rates much lower in developing countries, increases in applied rates of over 100 percentage points would frequently be permitted. If imports were initially small, these duties could be triggered by increases in imports that were quite small as a share of consumption. If, for instance, initial imports were 5 percent of consumption, the initial applied rate 10 percent and the bound rate 150 percent, an increase in imports of less than 2 percent of consumption would allow an increase in duties of 215 percentage points.

The duty is permitted but not required and one possibility is that policy makers might not impose the maximum duties in situations such as this, when imports are actually helping to stabilize the market by compensating for a harvest shortfall. However, lobby groups of net selling producers—who are typically much better organized than poor net-buyers of food—would likely pressure governments to use the rights provided to them by the WTO and it seems likely that this pressure would become intolerable on a reasonably large number of occasions. Frequently, governments are unaware of the true supply situation and might be panicked by an apparently irrational surge of imports. The famines surveyed by Sen (1981) almost all occurred in cases where imports were restricted based on perceptions of adequate food supply.

It seems difficult to see how the quantity-based SSM could be adapted to contribute positively to the important goals of improving the food and livelihood security of the poor in developing countries. A case might have been made that the SSG introduced for developed countries in the Uruguay Round would compensate farmers for poor harvests by raising the prices they receive. But it is dangerous to transfer such a measure to the radically different situation of developing countries where many poor farmers are net buyers of food, and many more may become so during times of output decline and consequent import increases. for such a measure in raising farm incomes in developed countries, the evidence suggests that this measure would reduce food security by raising prices when poor consumers, and even poor farmers, in developing countries are at their most vulnerable.

2. CONCLUSIONS

Achievement of Sustainable Development Goal 2, which focuses on eliminating hunger by 2030 will be a difficult challenge. Taking advantage of the opportunities created by trade is essential if this is even to be contemplated. A quick examination of the differences in endowments between countries shows the difficulty involved in the absence of trade in agricultural products. Some agricultural exporters, such as Brazil and the United States, have twice the world average endowments of agricultural land per person, while key agricultural importers such as Japan and the Republic of Korea have only one tenth of the average amount of agricultural land. Clearly, some agricultural trade is needed to deal with the vastly different endowments of land resulting from geographic accidents such as the limited amount of agricultural land in mountainous countries and the abundance in countries fortunate enough to have large reserves of agricultural land. In addition to the simple differences in land availability,

there is also considerable heterogeneity within each country's agriculture, which creates opportunities for income gains from trade both within and between countries.

Trade in agricultural inputs such as seeds also has important potential to raise productivity. But both with seeds and other agricultural inputs there is an important role for government in ensuring the quality of the goods is as described. Recent work suggests that poor quality of inputs in some African countries is an important reason that farmers are (correctly) reluctant to adopt improved inputs. This can have serious adverse impacts on agricultural productivity growth, which is particularly unfortunate because agricultural productivity growth is a particularly potent force for poverty reduction.

When considering the impacts of trade reform for nutritional outcomes, it is particularly important to take into account substitution effects as well as income effects. A food price rise that lowers the real incomes of a vulnerable group such as wage workers, will have an additional substitution effect on consumption of the affected goods and may, for that reason, have a larger than anticipated impact on nutrition. This difference is also very important when considering the impacts of trade measures such as export taxes on world food prices.

Trade can generally be expected to increase dietary diversity, and there is evidence that this is the case, particularly in the higher income countries where consumers are able to afford more diverse diets. But many have raised concerns that consumers may choose foods that damage their health, an issue that has been raised with particular emphasis on Pacific Island countries and the problems associated with fatty and high sugar foods. In general, providing information about the health implications of such foods seems an important step. Indirect policy measures such as protection are likely to create collateral damage, such as expanding local production of undesired foods and reducing domestic consumption of favored, locally produced foods. Where policy makers wish to change nutritional outcomes it is generally preferable to work with policy instruments such as excise taxes or "nudges" that directly affect the desired outcomes.

Reducing the level of agricultural protection from today's levels seems likely to reduce poverty rates and to improve nutritional outcomes. This is because it would lower the overall cost of producing food and raise returns in food-exporting developing countries where there are frequently large numbers of net-selling low-income farmers. However—like all policies that work through changes in food prices, there would likely be both winners and losers and it would be important to ensure that there are measures available to compensate poor and vulnerable people disadvantaged by the change.

Policies that seek to stabilize domestic prices relative to world market prices are very widely used in developing countries. While these frequently seem very effective in protecting people in individual countries from price shocks, it must be remembered that this is a beggar-thy-neighbor that cannot stabilize prices overall but merely transfer volatility from one country to another. Only the countries that insulate more than the average can stabilize their domestic prices. This creates an unfortunate dynamic leading to greater than desirable levels of insulation and greater volatility in world market prices.

The Special Safeguard Mechanism currently under discussion at the WTO raises a number of concerns. The price-based proposal previously discussed in the Doha negotiations would allow an extraordinary degree of price insulation (85 percent) would likely be triggered during sharp downturns in world prices and would greatly intensify them if used extensively. The quantity-based proposal would also increase the volatility of world prices. But the greatest concern with this measure would lie in its impact on domestic markets where it would likely be triggered during years of domestic supply disturbances and could sharply increase and destabilize food prices, creating potentially serious risks to the food security of the poor.

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