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Potential Implications of a Special Safeguard Mechanism in the World Trade Organization: the Case of Wheat

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The special safeguard mechanism—both quantity- and price-based—was key in the July 2008 failure to reach agreement in the World Trade Organization negotiations under the Doha Development Agenda. A stochastic simulation model of the world wheat market is used to investigate the effects of the special safeguard mechanism. As expected, the quantity-based safeguard is found to reduce imports, raise domestic prices, and boost mean domestic production in the countries that implement it. However, rather than insulating developing countries in those regions from price volatility, the quantity-based safeguard increases domestic price volatility, largely by restricting imports when domestic output is low and prices are high. The quantity-based safeguard shrinks average wheat imports nearly 50 percent in some regions, and global wheat trade falls by 4.7 percent. The price-based safeguard discriminates against lower price exporters and contributes to producer price instability. G33, Doha Development Agenda, Gaussian quadrature, safeguard, special safeguard mechanism, SSM, wheat, World Trade Organization, WTO, trade and development. JEL codes: F1, F13, F51, O24, Q1, Q17.

The special safeguard mechanism was key in the July 2008 failure to reach agreement in the World Trade Organization (WTO) negotiations under the Doha Development Agenda. The draft agreement would allow members to impose specified additional duties when the volume of imports of an agricultural product exceeds a specified level or when import prices from a particular supplier fall below a specified price (WTO 2008a). Given the substantial gains available under the Doha Development Agenda (Martin and Mattoo 2008), the fact that the negotiations were unable to proceed for lack of consensus on this issue highlights its importance to many WTO members. Wolfe (2009)

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attributes the breakdown of negotiations primarily to inadequate analysis of the safeguard operation and implications. Analysis based specifically on the proposed measure was limited because the proposed safeguard mechanism is one of the most technically complex aspects of the entire modalities, because it attempts to deal with variations in prices rather than—as with tariffs—merely their level, and because it was presented to ministers only a few days before the meeting.

Agricultural producers in developing countries are vulnerable to both domestic shocks—particularly from weather-related shocks to output—and shocks to international markets. However, developing country consumers are also particularly vulnerable to shocks to food prices, given that the poorest people spend as much as 75 percent of their incomes on food. Policies that raise food prices by imposing an import duty may help farmers whose incomes have fallen due to a harvest shortfall but do so at the expense of net buyers of food—including many farmers. Farmers isolated from world markets by poor infrastructure and communications receive little or no benefit from protection that raises the cost of food to poor consumers linked to world markets. This highlights the need for careful analysis of the impact of the special safeguard mechanism that takes into account the differences between imported and domestic goods.

It is important to consider the implications of the special safeguard mechanism for global markets because they would apply to all developing countries, which account for about two-thirds of the value of world agricultural production. Thus, this article assesses the global implications of the proposed price- and quantity-based safeguards for a key agricultural staple, wheat, taking into account not just their direct impacts on import prices but also the resulting impacts on world prices when many developing countries use them at the same time. The analysis also traces the resulting impacts on key variables such as the volume of imports, domestic producer prices, and the returns to land on which the incomes of many farm households depend. Both the average impact and the volatility of these variables are considered, since part of the motivation for the safeguard is to reduce volatility by offsetting shocks from international markets.

Countries can use either a quantity-based or price-based safeguard in a given year. While it would be interesting to consider a situation where countries could choose between the two types at each point in time, it is unclear which option policymakers would choose when both are available. Therefore, the article focuses on the important prior objective of assessing each type separately.

The article is organized as follows. Section I examines some of the key prior contributions to the literature on the use of special safeguards. Section II considers the nature of the specific proposals under consideration. Section III introduces a diagrammatic assessment of the qualitative effects of such interventions, including an analysis of the extent to which it might be used.

Section IV discusses how the special safeguard mechanism can be used. Section V explains the empirical model used to estimate the potential implications of the safeguard for domestic and global markets. Section VI applies the model to the quantity-based safeguard, and section VII applies it to the price-based safeguard. Section VIII compares the two sets of results. Section IX offers suggestions for future research.

I. What the Literature Says about the Special Safeguard Mechanism

While much technical work was available at the time of the Doha ministerial, many key questions either had not been asked or had not been satisfactorily resolved. Montemayor (2007, 2008) and Valdés and Foster (2005) focus on the broad impacts of different duty rates on imports into individual countries without taking into account the impacts on world markets. Not surprising, much of this initial work examines the frequency with which the special safeguard measure could be used rather than on whether it would achieve its underlying economic goals, such as moderating the impact of commodity market volatility on the incomes of farmers and the living costs of poor consumers.

Valdés and Foster (2005) rule out the quantity-based safeguard a priori, arguing that increased import quantities are likely to be due to declines in harvests, making it difficult to justify import restrictions. They also express concern about developing countries' difficulties in maintaining data on imports, and the inevitable lags between increases in imports and the implementation of safeguards.

Finger (2009) raises several other important questions about the proposed special safeguard mechanism. For instance, would the mechanical trigger rules allow import duties to be imposed when import prices are constant or rising? What objectives of the safeguard would be consistent with such mechanical rules? And would use of a quantity-based trigger reduce—or actually increase—the variability of domestic prices by raising duties during periods of short domestic supply? He also raises questions about the shipment-by-shipment nature of the duty calculation of the price-based safeguard. After calculating duties under the safeguard by comparing the price of each shipment with the average price of all shipments, he finds that countries that export lower price products—typically developing countries—would likely face considerably above average safeguard tariffs.

De Gorter, Kliauga, and Nassar (2009) suggest that under both the quantity- and price- based triggers most invocations of the safeguard in China, India, Indonesia, and the Republic of Korea would be against exports from developing countries.

Grant and Meilke (2009) made an important step forward in the analysis of the proposed special safeguard mechanism by taking into account the potential impact of the safeguard as proposed in the July 2008 modalities on international and domestic prices. They find that the safeguard increases the volatility of world prices. Although they believe that the impacts on world markets overall would be fairly modest, several developing countries—most notably in the Middle East and North Africa—would experience large increases in the volatility of domestic prices. Because Grant and Meilke use a net trade model (where imports are not linked to particular exporters), they were unable to deal with the issue raised by Finger (2009) regarding the discriminatory nature of a price-based safeguard toward lower price developing country exports.

The framework outlined in section II enriches the analysis of Grant and Meilke (2009) by incorporating the important features of key agricultural products such as wheat, which show evidence of strong differentiation by country of origin (Uri and Beach 1997). This differentiation, due partly to differences in physical qualities of wheat from different countries and partly to less tangible factors such as differences in the terms and conditions of sale, results in price differences that influence the extent to which the price-based safeguard is invoked. Therefore, this article examines the price- and quantity-based safeguards within a modeling framework, as proposed in the draft WTO modalities of December 2008, that allows for differences in relative prices of exports from different suppliers, thereby permitting Finger's (2009) hypothesis of discrimination against developing country exporters to be tested.

II. Features of the Proposed Special Safeguard Mechanism

The impacts of the special safeguard mechanism likely depend substantially on its design. The one under discussion is based broadly on the current special agricultural safeguard, which includes two triggers—one based on the price of imports and one on the quantity of imports (GATT 1994). In contrast with standard WTO safeguards under Article XIX of the General Agreement on Tariffs and Trade, there is no requirement to demonstrate that imports have caused injury to domestic producers.

The price-based safeguard uses a reference price based on a three-year moving average of import prices from all sources (WTO 2008a). When the price of an individual shipment falls below 85 percent of the reference price, a duty can be used to remove 85 percent of the shortfall. One important feature of this shipment-by-shipment trigger is that it imposes higher duties on imports from lower price exporters. Finger (2009) and de Gorter, Kliauga, and Nassar (2009) argue that a price-based safeguard generally imposes higher duties on exports from developing countries.

The quantity-based safeguard can be used when imports in a year exceed base imports—a three-year moving average of imports.[1] The duty that can be

1. Since imports in any one year are compared with a three-year moving average of past imports, steady annual import growth of 5 percent compounds to a "surge" in imports of more than 10 percent, against which a safeguard can be imposed.

applied increases as imports exceed this base. Imports of 110–115 percent of the base allow an additional duty of 25 percent of the current binding or 25 percentage points, imports of 115–135 percent of the base allow an additional duty of 40 percent of the binding or 40 percentage points, and imports of more than 135 percent of the base allow an additional duty of 50 percent of the binding or 50 percentage points. A quantity-based safeguard can be imposed for only two years, and if used four years in a row, cannot be used for another two years. If a safeguard duty is imposed and imports fall below the level in the period before imposition, the trigger level is not reduced—thus preventing the duty itself from causing the trigger level to decline.

The draft modalities do not, in general, permit total applied duties to exceed the pre-Doha limit. A major focus of debate has been on exceptions to this limit for the quantity-based safeguard, and two specific proposals have been advanced. The “Lamy compromise” would permit duties to exceed the bindings by 15 percentage points on 2.5 percent of tariff lines when imports exceed the base by 40 percent (ICTSD 2008). The compromise proposed by the G-33 (2008) and its negotiating partners would permit tariffs up to 30 percent (or percentage points) above the pre-Doha bindings on 7 percent of tariff lines when imports exceed 110 percent of base levels. The draft modalities consider increases of 12 percent and 15 percent above the bound rate (WHO 2008a, para. 145).

The next section examines the qualitative implications of using the quantity and price-based safeguards as a guide to understanding the model-based results in subsequent sections.

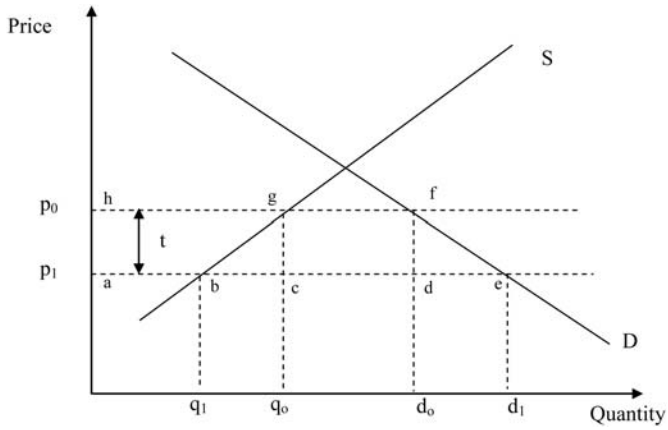
III. Qualitative Impacts of Using the Price- and Quantity-Based Safeguards

The impacts of a price-based safeguard in a small trading economy are straightforward. First, consider the market for a single imported food crop, as shown in figure 1. The domestic supply of the good is shown by the curve S, while the demand is represented by curve D. The world price falls from an initial level of p_0 to p_1. Introducing a duty of t completely offsets the decline in the domestic price.[2] A partially offsetting duty that diminished the size of the reduction in domestic prices by 85 percent would reduce the variance of domestic prices in response to this type of shock to 2 percent of its original level.

Imports would, of course, decline relative to their level without the safeguard. Had domestic prices fallen from p_0 to p_1, imports would have increased from $(q_0 - d_0)$ to $(q_1 - d_1)$. For a small economy in which producer output is distributed independently of world output, average farm income would rise and the variability of farm income would decline. The average cost of food to consumers would rise because of the safeguard tariff, but the variability in the

2. Complete stabilization would require a full set of taxes and subsidies on imports and exports.

FIGURE 1. Impacts of a Decline in World Prices in a Single Country

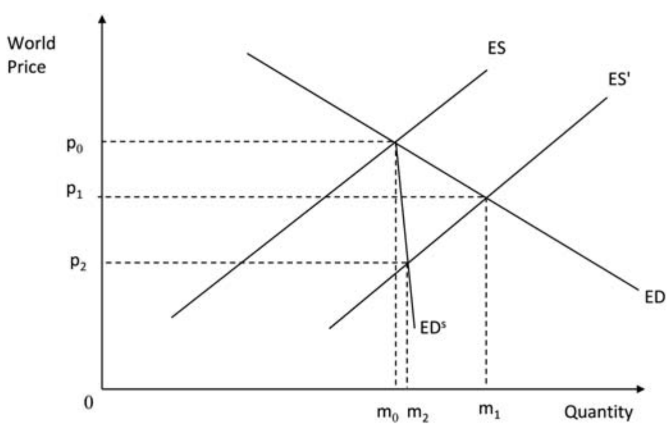


Source: Authors' design.

cost of food would decline. Consumers eat less food because of its higher price, which generates an economic cost measured by area *def* in figure 1. Another cost—measured by area *bcg*—arises because lower cost imports are replaced by higher cost domestic production.

If a safeguard is introduced in a large group of countries, the world market price for the commodity is no longer constant. In this case, it is useful to consider import demand from the group of countries using the safeguard (ED) together with the export supply (ES) from the rest of the world, as illustrated in figure 2. An increase in supply—perhaps from a large harvest—that shifts the excess supply curve from the rest of the world from ES to ES′ would,

FIGURE 2. Implications of a Price-Based Safeguard for the World Market



Source: Authors' design.

without a safeguard, cause the world price to decline from p_0 to p_1. The decline in prices in importing countries would cause their imports to increase from m_0 to m_1. If a safeguard reduces the decline in import prices in importing markets, the decline in world prices must be larger, because more of the price adjustment is forced onto the exporting countries. If 85 percent of the decline in world prices is offset by a safeguard, the increase in imports for a given reduction in world prices is reduced to 15 percent of its level in the absence of a safeguard. Thus, world prices would decline further, as illustrated by p_2 in figure 2.

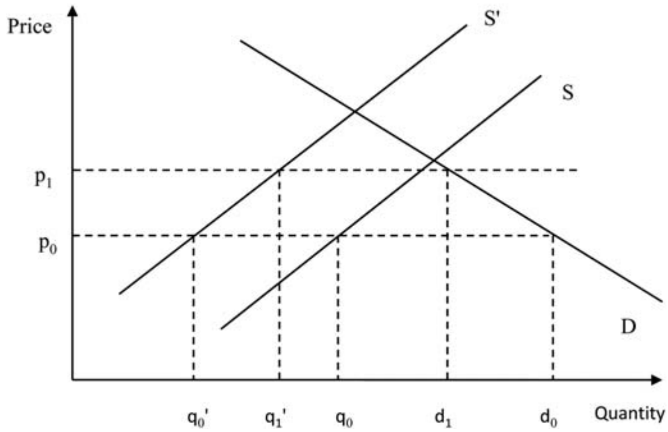
For the importing countries, the reduction in the world price to p_2 resulting from the safeguard requires a second-round increase in the safeguard duty on top of that shown in figure 1. For each country, the decline in the world price is not just the initial reduction from p_0 to p_1 but that from p_0 to p_2 shown in figure 2. Average world prices decline, since the safeguard sometimes increases—and never reduces—duties. Another key impact of the widespread use of a safeguard in importing countries is an increase in the volatility of world prices (see Tyers and Anderson 1992).

An important implication of the analysis in figure 2 is that, when analyzing the impacts of introducing a safeguard that covers all developing countries, it may not be enough to simply consider experience in the absence of a safeguard. Once the safeguard is introduced in several important markets, the volatility of world prices is likely to be greater than would otherwise be the case. If this effect is large, it will increase the probability that the safeguard will be triggered in any period.

As noted in Fraser and Martin (2008) and Valdés and Foster (2005), the implications of a quantity-based safeguard depend heavily on the cause of the shock. If the cause is a decline in world prices of the type shown in figure 1, for instance, imports rise from $(q_0 - d_0)$ to $(q_1 - d_1)$. If this decline is large enough to trigger the quantity-based safeguard, a quantity-based safeguard could be an alternative to a price-based safeguard. If the same additional duty were generated by both safeguards, there is no effective difference. Because the link between the size of the price decline and the tariff imposed under the quantity-based safeguard is weak, this safeguard may permit a larger response than the price-based safeguard and may even cause the domestic price to rise when the import price falls.

If the world price does not decline but imports increase, the quantity-based safeguard can be triggered even though the price-based safeguard is not. In this situation, it is important to examine the cause of the increase in imports. In agriculture, such an increase is likely due either to a shift in the domestic supply curve—such as a decline in the harvest associated with poor weather conditions—or to an increase in demand, as considered by Sen (1981). 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.

FIGURE 3. Potential Effects of a Quantity-Based Safeguard



Source: Authors' design.

Figure 3 focuses on a reduction in domestic supply. Domestic supply is initially shown by the supply curve S, which shows domestic production of q_0 at price p_0. Domestic demand is represented by curve D, and demand at price p_0 by d_0. Imports are initially given by $(q_0 - d_0)$. Without a quantity-based safeguard, a decline in domestic supply from S to S′ does not affect the domestic price. Imports increase to make up the larger gap between domestic demand and supply, allowing the domestic price to remain stable. If a quantity-based safeguard is used, the effect is to apply an additional duty—and thus to raise the domestic price.

The effect of a quantity-based safeguard in this situation is to destabilize the domestic price. For consumers, the adverse impact on prices can be avoided by importing to make up the shortfall. For producers, prices are destabilized, but revenues and net returns may be stabilized or destabilized.[3] If the tariff imposed is slightly larger than the decline in the quantity of output, producer gross revenues will be stabilized.[4] However, the effect on producer net returns may differ, depending on the nature of the shift in the supply curve (Martin and Alston 1994, 1997).

Imposing a quantity-based safeguard would reduce imports below the level that would have prevailed in the absence of such a measure. In figure 3, the initial level of imports is given by $(d_0 - q_0)$. Without a safeguard, imports would rise to $(d_0 - q_0')$. A safeguard would reduce imports below this level,

3. Consumers and producers are typically not distinct groups—particularly in poor countries. Many farmers are net buyers of staple foods, and some households classified as urban for survey purposes are net sellers of these products (Ivanic and Martin 2008).

4. For a small change in output, the proportional effect on producer revenues is given by $\partial p/p + \partial q/q$ where ∂p is the change in price and ∂q the changes in quantity. For larger changes, the interaction effect between the change in price and quantity becomes significant.

perhaps to a level similar to $(d_1 - q_1')$. Whether this is greater than or less than the initial level of imports is unclear. With the quantity-based safeguard, there is a link between the extent of import penetration before the safeguard and the size of the duty that can be imposed during the following 12 months. A 35 percent increase in imports would allow an additional duty of 50 percentage points to be imposed. A relatively high elasticity of demand for imports at the tariff-line level, as is usually assumed, may be enough to reduce imports substantially. However, the short-term nature of the measure makes significant supply response unlikely, lowering the probability that imports would be reduced below their initial level.

IV. How the Special Safeguard Mechanism Might Be Used

Because the special safeguard mechanism provides an option, but not an obligation, to protect, it is difficult to be sure how frequently it would be used. One view is that most developing countries have considerable binding overhang, with their bound tariffs considerably above their applied rates, so it is unlikely that a safeguard would make a significant difference to the protection allowed under WTO rules. Another is that decisions about the duties applied under a safeguard are likely to be taken in a different forum from those regarding ordinary tariffs, which may have real implications for choices about border protection. In many countries, applied tariff levels are decided by a tariff committee, which includes representatives from different parts of government and which frequently takes a broad view about the desirability of low tariffs for export competitiveness and the overall efficiency of the economy. A body with a narrower focus may be more willing to provide protection that benefits producers in a particular sector.

One promising approach to assessing the likely use of the special safeguard mechanism is to examine the frequency with which the special agricultural safeguard provided under the Uruguay Round has been used. Morrison and Sharma (2005) conclude that the ratio of times that the special agricultural safeguard was invoked to times that it could have been invoked was about 1 percent. They suggested three reasons for nonapplication: the complexity of the formulas; high tariff bindings in many developing countries, which make it feasible to raise applied tariffs or apply additional duties without exceeding bound rates; and a judgment that the costs of introducing such measures exceed the benefits.

Several other reasons for the limited use of the special agricultural safeguard have been offered. Finger (2009) notes that many major users of the special agricultural safeguard posted minimum prices when the Uruguay Round agreement came into effect. Under these circumstances, exporters knew that pricing at a lower level would result in a duty and thus had a strong incentive to price at the minimum posted price so that the safeguard would not be invoked. Hallaert (2005) suggests that many members have ignored the requirement to report use of the special agricultural safeguard to the WTO's Committee on Agriculture within 10 days of implementation, though he concludes that the use of the safeguard has increased as WTO members become more familiar with its provisions.

Another possible reason is that the special agricultural safeguard was often politically unattractive because of the weak relationship between its mechanical formulas and policymaker goals. While the quantity-based special agricultural safeguard might permit the use of safeguards following a crop failure, policymakers may not have wanted to use the safeguard under those circumstances because of pressure from consumers concerned about high food prices.

The next section turns to the empirical framework, which permits a more thorough assessment and comparison of the implications of the proposed quantity- and price-based safeguards.

V. Empirical Framework and Scenario Design

The analysis builds on Valenzuela and others (2007), who use a stochastic simulation approach to validating computable general equilibrium models, with a focus on the world wheat market. This study employs a more recent version of the Global Trade Analysis Project model that has been specifically tailored to agricultural applications (Keeney and Hertel 2005). It incorporates segmented factor markets to mimic short-run rigidities in supply response and more detailed information about supply and demand elasticities pertinent to agricultural production and food consumption.[5] The Armington import demand specification with econometrically estimated elasticities of substitution between varieties of wheat in the model is used to allow for differentiation between wheat produced in different countries (Hertel and others 2007). As seen below, product differentiation by origin plays an important role in the price-based safeguard.

Since demand for wheat is relatively stable and most shocks to the wheat market come from weather-induced shocks to production, supply-side shocks are introduced into the model. Specifically, total factor productivity in wheat in each model region is shocked by sampling from historical distributions of supply deviations from trend in all world regions.[6] The approach used in this stochastic simulation ensures that each time the impacts of a new policy regime

5. This model is first validated based on historical variation in production and prices, following the approach proposed by Valenzuela and others (2007). For more details, see the working paper version of this article (Hertel, Martin, and Leister 2010).

6. Standard stochastic simulation techniques such as Monte Carlo procedures are cumbersome at best, given the large number of variables in the model so Valenzuela and others (2007) are followed in approximating the distribution of supply shocks using Gaussian quadrature. This has been shown to be an efficient means of assessing the consequences of stochastic variation in parameters of the shocks to computable general equilibrium models (DeVuyst and Preckel 1997) and its implementation has been automated in the GEMPACK software used to solve the model (Arndt 1996; Pearson and Arndt 2000).

are simulated, an identical set of stochastic shocks is administered. This eliminates the possibility that differences in the sample of supply-side shocks contribute to differences in outcomes across policy regimes.

Three sets of stochastic simulations are performed. The first set establishes the baseline (no safeguard). This case assumes that tariffs remain fixed at the level of scheduled applied tariff rates for 2001, except when countries made international commitments to lower their WTO bound tariff rates—as in the case of China's accession to the WTO—or to lower tariffs on a preferential basis.

The second set of stochastic simulations permits developing countries to invoke the quantity-based safeguard, as detailed in the next section. The analysis focuses on the differences between the expected mean and standard deviation of key variables, which are computed as the outcome under the quantity-based safeguard minus the outcome under the baseline. The third set of stochastic simulations allows developing countries to implement the price-based safeguard, as detailed below. Again, the focus is on differences in the expected percentage change in the mean and standard deviation, computed as the price-based safeguard value minus the baseline value. The percentage change in the mean and standard deviation of model variables under any individual policy regime are in appendix tables A1–A5.

The special safeguard mechanism duties considered in the second and third sets are distinct from—and additional to—initial applied tariff rates, in the same way that antidumping duties and Article XIX safeguard duties are in addition to scheduled applied tariff rates. Many developing countries can raise applied rates relative to bound rates, with China a notable exception (see below). All other regions are modeled according to the draft modalities, and applied tariffs plus the endogenously determined safeguard remain below the bound rates in all cases.

VI. Implementing the Quantity-Based Special Safeguard Mechanism

The quantity-based trigger permits developing countries to apply a tariff on imports whenever trade volumes reach 110 percent of a three-year moving average. The resulting tariff can be as high as 25 percent of the bound tariff or 25 percentage points, whichever is higher (tier 1). If imports exceed 115 percent of the baseline, the additional duty can be as high as 40 percent of the bound tariff or 40 percentage points (tier 2). And if imports reach 135 percent of the baseline, the additional duty can be as high as 50 percent of the bound tariff or 50 percentage points (tier 3). For China, where binding overhang has largely been eliminated, a duty of up to 30 percentage points is allowed for, as proposed by the G-33,when the combination of applied tariffs and the safeguard duty exceeds the bound tariff.

This quantity-based safeguard is modeled as a nonlinear complementarity problem. More specifically, letting T_i be the safeguard tariff and QR_i be the ratio of observed imports to the trigger level of imports for the safeguard tier $i = 1, 2, 3$ yields the complementary slackness condition $T_i \geq 0 \perp (1 - QR_i) \geq 0$, which implies that either $T_i \geq 0, (1 - QR_i) = 0$ (the safeguard is binding) or $T_i = 0, (1 - QR_i) \geq 0$ (the safeguard is nonbinding).

The benchmark year for the baseline level of imports is 2001. With the quantity-based safeguard, it is assumed that when imports reach but do not exceed a trigger level, the duty is adjusted to keep imports at that trigger level.[7] The full duty permitted at a given trigger level is imposed only when imports exceed the specified trigger level. Attention then focuses on whether the next higher trigger is reached and the next higher duty imposed.

Table 1 reports on the power of the safeguard tariff (that is, 1 + the ad valorem tariff rate) for both the quantity- and price-based safeguards. The quantity-based safeguard columns relate to the tier 1 and tier 2 tariffs applied to imports from all sources, while the price-based safeguard columns report the bilateral changes in the power of the safeguard tariff. This section focuses on the quantity-based safeguard. For example, the mean power of the tier 1 safeguard tariff in China is 9.7 percent higher than its baseline value (1.0).

When cost, insurance, and freight (c.i.f.) prices are held constant, a 1 percentage point change in the power of the safeguard tariff translates directly into a one percentage point change in the domestic price of imported wheat. In the absence of the safeguard, this tariff—and hence the power of the tariff—is unchanged. However, when the safeguard is present, all regions except Other East Asia (where the safeguard is always nonbinding) show a positive mean change in the power of the tier 1 safeguard tariff, ranging from 2.9 percent in the Middle East and North Africa to 10.7 percent in Brazil, where domestic production is extremely volatile. Only Brazil and China invoke the tier 2 safeguard tariff; the tier 3 tariff is not used in the simulations.[8]

Table 2 reports the changes in the mean and standard deviations of key variables in developing countries that are permitted to apply the safeguard. It is assumed that they do so when imports reach 110 percent of baseline levels and that they apply an additional tariff when imports reach 115 percent of the baseline.

By frequently invoking the safeguard tariff, developing countries raise the mean tariff-inclusive price of imported wheat over the course of the stochastic simulations. When the quantity-based safeguard is imposed, the mean import price in China rises by 10.2 percent (see table 2). By restricting imports when domestic

7. An alternative, and potentially much more trade-restrictive, scenario involves imposing the full duty permitted whenever imports reached the trigger in the past 12 months, even if doing so results in imports falling below the trigger.

8. It is also of interest how the safeguard tariff would change if only a single region used the safeguard. Separate simulations that permitted only one region to impose the tariffs were undertaken (but are not reported here). Not surprising, this results in lower mean tariffs in the country invoking the safeguard—that is, the effect of all developing countries using the safeguard is to increase the frequency and intensity of single-region safeguard tariffs.

TABLE 1. Means and Standard Deviations for quantity-based and bilateral price-based Safeguards: percent change in power of the tariff

	Percentage Changes in Means																	
	Quantity-based SSM		Price-based SSM															
			Wheat Exporters															
Importing Regions	Tier 1 duty	Tier 2 duty	AUS	CHN	JPN	OEASIA	STHASIA	CAN	USA	MEX	ARG	BRZ	RLAmer	EU15	OEUR	RUS	MENA	SSA
CHN	9.7	1.2	0.44	9.96	0.07	0.37	5.11	0.03	0	0.63	4.47	2.83	3.26	0.63	7.68	13.12	1.47	0.01
OEASIA	0	0	0.38	8.15	0.01	0.07	4.07	0.02	0	0.47	5.17	1.36	3.08	0.4	7.67	13.12	0.87	0
STHASIA	4.2	0	0.38	8.99	0.01	0.04	3.87	0.02	0	0.47	4.49	0.75	3.1	0.4	7.95	12.19	0.87	0
MEX	4.3	0	0.46	9.96	0.07	0.21	5.11	0.03	0	0.63	4.81	2.83	3.26	0.7	8.13	13.12	1.15	0.01
ARG	5.7	0	0.12	0	0	0	0.03	0	0	0	3.13	0	0	0	4.5	8.95	0	0
BRZ	10.7	3.9	0.14	0.1	0	0	0.08	0	0	0	3.01	0	0	0	4.92	9.49	0	0
RLAmer	3.9	0	0.35	7.32	0	0	3.65	0	0	0.27	4.49	0.71	3.07	0.06	8.18	12.39	0.48	0
MENA	2.9	0	0.33	6.52	0	0	2.91	0	0	0.24	4.51	0.01	3.1	0.01	7.7	12.16	0.28	0
SSA	3.7	0	0.3	5.02	0	0	2.46	0	0	0.22	4.52	0	2.75	0	7.8	13.07	0.15	0

	Percentage Changes in Standard Deviation																	
	Quantity-based SSM		Price-based SSM															
			Wheat Exporters															
Importing Regions	Tier 1 duty	Tier 2 duty	AUS	CHN	JPN	OEASIA	STHASIA	CAN	USA	MEX	ARG	BRZ	RLAmer	EU15	OEUR	RUS	MENA	SSA
CHN	11.6	1.8	1.68	12.79	0.39	0.88	6.66	0.19	0	1.31	6.2	5.15	4.09	1.2	9.38	15.92	2.72	0.05
OEASIA	0	0	1.55	10.93	0.07	0.24	5.65	0.1	0	1.1	6.9	2.83	3.89	0.81	9.37	15.92	2.02	0
STHASIA	6.6	0	1.55	11.78	0.05	0.16	5.43	0.1	0	1.1	6.23	1.93	3.92	0.82	9.7	14.75	2.02	0
MEX	6.1	0	1.69	12.79	0.39	0.54	6.66	0.19	0	1.31	6.66	5.15	4.09	1.31	9.92	15.92	2.36	0.05
ARG	8	0	0.57	0	0	0	0.13	0	0	0	4.72	0	0	0	6.58	12.24	0	0
BRZ	11.8	5.5	0.61	0.28	0	0	0.33	0	0	0	4.53	0	0.02	0	7.02	12.74	0	0
RLAmer	5.9	0	1.42	10.04	0	0	5.27	0.02	0	0.76	6.23	1.86	3.89	0.24	9.98	15.01	1.41	0
MENA	4.7	0	1.36	9.18	0	0	4.48	0	0	0.7	6.24	0.05	3.91	0.05	9.4	14.72	1.03	0
SSA	6	0	1.24	7.57	0	0	3.98	0	0	0.63	6.26	0	3.63	0	9.52	15.86	0.72	0

Source: Authors' simulations

TABLE 2. Difference in Percentage Changes of Mean and Standard Deviation between Baseline and Quantity- and Price-Based Safeguards for Key Variables in Developing Country Wheat Markets (percentage points)

	Import Price[a]		Import Quantity		Producer Price		Land Rents		Output	
Country or Region	Quantity-based Safeguard	Price-based Safeguard	Quantity-based Safeguard	Price-based Safeguard	Quantity-based Safeguard	Price-based Safeguard	Quantity-based Safeguard	Price-based Safeguard	Quantity-based Safeguard	Price-based Safeguard
Mean										
ARG	5.8	0.5	−46.9	−7.3	−1.9	−1.5	−7.6	−6.7	−2.5	−2.6
BRZ	14.3	0.7	−23.1	−1.3	3.5	0.1	20.4	0.6	4.6	0.3
CHN	10.2	0.5	−44.4	−1.6	4.7	0.1	13.9	0.3	3.4	0.0
MEX	3.5	0.3	−5.8	−0.5	1.7	0.1	6.2	0.5	2.3	0.2
MENA	2.1	0.8	−4.7	−1.6	0.7	0.2	3.4	1.2	1.2	0.5
OEASIA	−0.8	0.7	0.2	0.0	−0.5	0.4	−2.8	2.4	−0.9	0.7
RLAmer	3.0	0.6	−6.4	−1.2	1.0	0.2	3.9	0.8	1.3	0.3
STHASIA	3.3	0.6	−5.5	−1.0	1.0	0.1	2.7	0.3	0.8	0.1
SSA	3.0	0.6	−7	−1.2	0.7	0.1	7.5	1.5	3.1	0.7
Standard deviation										
ARG	2.6	1.4	−48.3	51.7	−0.2	5.6	−4.8	10	−1.1	5.1
BRZ	13.0	2.1	−24.7	10.2	4.3	34.3	17.8	−19.1	−5.5	11.5
CHN	10.0	−3.8	−54.2	51.4	5.8	18.8	15.8	−28.9	−4.0	−15.8
MEX	2.1	0.3	−7.7	−0.1	2.3	2.0	−6.3	1.7	−3.3	2.5
MENA	1.4	−11.5	−6.9	−49.4	1.1	−23.1	−2.8	−5.7	−2	−6.6
OEASIA	0.2	0.3	0.0	−1.1	0.1	1.1	−0.2	−4.0	0.0	1.3
RLAmer	2.1	−4.4	−7.6	−57.5	1.9	−37.8	−5.1	2.2	−3.2	−21.9
STHASIA	2.8	−0.1	−7.5	19.6	1.3	7.5	3.4	−23.5	−1.0	−8.2
SSA	2.1	0.2	−9.9	5.1	1.0	1.6	−6.4	7.3	−4.6	5.1

a. Including the duty.

Source: Authors' calculations based on data described in the text.

production is low and prices are high, the expected domestic price of imports rises significantly across all regions except Other East Asia. This is expected to adversely affect the urban poor in particular because they tend to spend a larger share of their income on staple foods than do wealthier households.

The expected quantity of imports into China is reduced under the quantity-based safeguard. Without the safeguard, the expected value of imports in China is 41.1 percent above the baseline (see appendix table A1). This large positive mean value arises because, when domestic production is low, the demand for imports is very strong; hence there is a large percentage increase from the base level. However, when domestic production is high, gross imports cannot fall below zero. So, the expected value of imports in a stochastic environment is higher than in the baseline. When the quantity-triggered safeguard regime is overlaid on this same stochastic production environment, the mean change in imports is 3.3 percent below the baseline import value for China (see appendix table A1). So the difference is 44.4 percentage points. Other regions with large reductions in mean imports due to the quantity-based safeguard are Argentina (46.9 percentage points) and Brazil (23.1 percentage points). All developing countries and regions except Other East Asia show lower mean import quantities under the quantity-based safeguard.

Higher prices for imports translate into higher mean prices for domestic products (although the two are imperfectly linked due to the Armington product differentiation assumption) and higher mean returns to wheat producers under the special safeguard mechanism. For example, in China, mean wheat prices rise from 3.7 percent to 8.4 percent (see appendix table A1), a difference of 4.7 percentage points (see table 2). This in turn boosts mean land rents under the quantity-based safeguard in China's wheat sector by 13.9 percent, which then boosts expected output 3.4 percent. Land rents rise in all developing countries and regions except Argentina and Other East Asia (see above), where they fall 7.6 percent because Argentina is a net exporter of wheat and because producers are hurt by the safeguard in other countries. The largest increase in land rents between the two policy regimes is for Brazilian wheat producers (20.4 percent rise in mean land rents), but other gains are also substantial. The quantity-based safeguard also results in higher mean wheat output in these regions, with the largest deviation from the nonsafeguard mean change in Brazil (4.6 percent higher under the safeguard; see table 2).

Table 3 reports changes in the mean and standard deviation for key variables in developed country wheat markets. These changes are the opposite of the developing country results. Mean output prices and mean land rents and output are lower in all developed countries and regions, and mean import quantities are higher except in Australia and Canada. On average, producers in these countries are adversely affected by the protection imposed in developing countries. For Canadian wheat producers, for example, wheat land rents fall 0.7 percent rather than rising an average of 8.1 percent (see appendix table A1), a difference of 8.8 percentage points. Australian wheat producers show

TABLE 3. Difference in Percentage Changes of Mean and Standard Deviation between Baseline and Quantity- and Price-Based Safeguards for Key Variables in Developed Country Wheat Markets (percentage points)

	Import Price[a]		Import Quantity		Producer Price		Land Rents		Output	
Country or Region	Quantity-based Safeguard	Price-based Safeguard	Quantity-based Safeguard	Price-based Safeguard	Quantity-based Safeguard	Price-based Safeguard	Quantity-based Safeguard	Price-based Safeguard	Quantity-based Safeguard	Price-based Safeguard
Mean										
Australia	−0.1	−0.3	−5.0	4.5	−0.9	0.2	−6.7	0.6	−3.0	0.3
Canada	−0.6	0.1	−2.0	0.4	−1.0	0.3	−8.8	2.0	−4.5	1.0
European Union	−0.3	0.0	0.3	0.1	−0.2	0.0	−2.2	0.4	−1.3	0.2
Japan	−0.8	0.2	0.2	−0.1	−0.5	0.1	−4.2	1.0	−1.4	0.3
Other Europe	−0.5	−0.5	1.8	1.3	−0.1	−0.2	−0.6	−1.0	−0.3	−0.6
Russian Federation	−0.2	−0.2	1.0	0.2	−0.1	−0.2	−0.3	−0.8	−0.2	−0.5
United States	−1.0	0.2	0.7	0.3	−0.7	0.2	−4.1	1.3	−1.8	0.6
Standard deviation										
Australia	0.2	0.3	−0.3	4.9	0.2	0.2	−2.5	−1.9	−0.8	−0.7
Canada	0.1	0.0	−0.2	0.0	0.0	0.0	−1.9	0.2	−0.8	0.0
European Union	0.0	0.0	0.1	0.0	0.0	0.0	−0.2	−0.1	−0.3	0.0
Japan	0.1	0.0	0.1	0.0	0.1	0.0	−0.4	0.3	0.0	0.0
Other Europe	0.0	0.1	1.0	0.7	−0.1	0.1	0.0	0.2	−0.1	−0.5
Russian Federation	−0.1	0.1	1.2	0.3	−0.1	0.1	0.0	0.7	0.0	−0.6
United States	0.0	0.0	0.4	0.0	0.2	0.1	−1.5	0.0	−0.7	−0.1

a. Including the duty.

Source: Authors' calculations based on data described in the text.

TABLE 4. Changes in Mean and Standard Deviation between Baseline and Quantity- and Price-Based Safeguards in World Wheat Markets (percentage points)

Trade Measure	Quantity-based Safeguard	Price-based Safeguard
Mean		
Quantity	−4.7	−0.5
Price	−0.8	0.0
Standard deviation		
Quantity	−2.1	0.1
Price	0.1	0.1

Source: Authors' calculations based on data described in the text.

nearly as large a change in mean land rents. Consequently, expected output in developed countries and regions is also lower.

Globally, mean wheat trade quantity falls sharply, from 7.3 percent to 2.6 percent (see appendix table A5), a difference of 4.7 percentage points (table 4).[9] The expected decline in global wheat prices due to the quantity-based safeguard is 0.8 percentage points.

The bottom panels of tables 2-4 show the volatility of key variables in the global wheat market, as measured by the changes in standard deviations. For example, the percentage changes in the standard deviation of the power of safeguard tariffs on wheat imports into China are 11.6 percent for the tier 1 tariff and 1.8 percent for the tier 2 tariff (see table 1, bottom panel).

Volatility in the power of the safeguard tariff, translates directly into volatility in import prices (inclusive of the tariff). The percentage change in the standard deviation of the domestic price of imports in China is 14.1 percent with the safeguard and 4.1 percent without (see appendix table A1), a difference of 10 percentage points (see table 2, bottom panel). Import quantities are inherently volatile in many of these countries, with the change in standard deviation suggesting that all countries and regions (except Other East Asia) will regularly exceed the 110 percent tier 1 threshold under the quantity-based safeguard. Without the safeguard, the greatest import volatility is in China, where the expected change in standard deviation of import volume equals 110.3 percent of baseline imports (see appendix table A1). The safeguard substantially reduces the volatility of imports into China, cutting the change in standard deviation to roughly half the nonsafeguard value (to 56.1 percent; see appendix table A1). Argentina shows a significant drop in wheat import volatility, with a change in standard deviation that is 48.3 percentage points lower with the safeguard, as does Brazil (79.2 percent to 54.5 percent, a difference of 24.7 percentage points;

9. The impact on global wheat trade of the special safeguard mechanism in only one country or region was also considered, as has been the case in most previous studies with single-country analyses. In this case, the change in world wheat trade is very similar to the nonsafeguard case.

see table 2, bottom panel). All the other countries and regions except Other East Asia cut their import volume volatility by nearly half, translating into drops in expected change in standard deviation ranging from 6.9 percentage points to 9.9 percentage points.

When duties are imposed on import surges, producer prices become more volatile (see figure 3). In China, the standard deviation of domestic prices rises from 25 percent to 30.8 percent (see appendix table A1), a difference of 5.8 percentage points, and in Brazil it rises from 46.2 percent to 50.5 percent, a difference of 4.3 percentage points (see table 2). The impact on land rents is more complex, with volatility increasing sharply in China and Brazil, but falling in Argentina, Mexico, Middle East and North Africa, Other East Asia, Rest of Latin America, and Sub-Saharan Africa. Finally, domestic output may be more stable under the safeguard because in a bad year, when production is low and there is a strong incentive for imports to surge, this competing source of supply is frustrated by rising tariffs, thereby lending extra incentive for producers to offset the weather-induced decline in output.

The bottom panel of table 3 reports changes in the standard deviation of key market variables in developed countries, which are little affected by the safeguards in developing countries. Prices are slightly more volatile in the wheat-exporting regions of Australia, Canada, and the United States as well as in Japan, and output slightly more stable with the quantity-based safeguard than with no safeguard, but the differences are small. This reflects the predominance of developed countries in global wheat trade. Globally, the volatility of wheat trade volume is slightly lower with the quantity-based safeguard, while price volatility is slightly higher (see table 4).

VII. Implementing The Price-Based Special Safeguard Mechanism

Under the price-based safeguard, countries can implement a safeguard tariff when the import price on a shipment falls below 85 percent of the baseline level (three-year moving average). Retaining the previous notation of T for the safeguard tariff and introducing PR as the ratio of observed price per shipment to the price trigger yields the complementarity problem $T \geq 0 \perp (PR - 1) \geq 0$, which implies that either $T \geq 0$, $(PR - 1) = 0$ (the safeguard is binding) or $T = 0, (PR - 1) \geq 0$ (the safeguard is nonbinding).

Unlike the quantity-based system, there is only one tier in the price-based safeguard. In addition, the safeguard tariff imposed can amount to only 85 percent of the difference between the shipment price and the baseline price.

There are two key differences between the quantity- and price-based safeguards. The first has to do with bilateral price differences for wheat, and the second has to do with the price-based safeguard's focus on shipments instead of average annual imports. Both features are important to the findings and thus deserve discussion at this point. Turning first to the bilateral price issue, because the price of each shipment of wheat is compared to a most favored nation average price to evaluate whether the safeguard has been triggered, it is important to account for bilateral differences in commodity prices.

To better understand these bilateral price differences, average unit values for wheat exports from each region in the model over 2000–04 are computed as the ratio of each region's export unit value to the global average export unit value (table 5, first column). Developing countries show a general tendency for lower prices and developed countries for higher ones, as shown by Schott (2004) for exports in general. But this is not always the case, with some high-income regions specializing in lower price varieties of wheat and some poorer countries having higher unit values. The countries and regions with below average wheat export prices are Argentina, China, Rest of Latin America, South Asia, the European Union, Rest of Europe, and the Russian Federation. Countries and regions with above average unit values are Brazil, Mexico, Sub-Saharan Africa (largely South Africa), Australia, Canada, Japan, and the United States.

The remainder of table 5 uses these unit values and the bilateral trade pattern from 2001 to compute the ratio of a given bilateral exporter price to the average import price in each importing market. Some exporters show significant variation in the price of their product, relative to other suppliers, across destination markets. For example, Australian bilateral relative prices range from 0.98 in China to 1.19 in Argentina. Canadian export price ratios range from 1.02 to 1.24. In some cases the ratio falls below the 0.85 trigger point specified in the special safeguard mechanism. Therefore, these values were truncated at 85 percent of the average import price for use in the empirical model, since values below 0.85 are not permitted. For such exporter-importer pairs, any further decline in price will immediately trigger the special safeguard mechanism. In the case of high unit value exporters (such as Canada), export prices will have to fall by more than 15 percent to trigger the special safeguard mechanism.

The second key difference between the two safeguards has to do with the application of the price trigger on a shipment-by-shipment basis. This contrasts with the year-to-year price volatility reproduced by the model. The price of grain varies considerably both within a given year and across suppliers, but much of this variability is averaged out in the annual statistics used in the model. Thus, without any adjustments, the model would not invoke the bilateral, shipment-based safeguards with sufficient frequency.

To remedy this problem while retaining the same basic model structure and the capability to compare results between the quantity- and price-based safeguards, a multiplicative factor was introduced, $k_r = \alpha\beta_r$, that operates on the bilateral c.i.f. prices in the model to compute the appropriate price trigger, $ptrigger_{rs} = k_r\ pcif_{rs}$. Setting the parameter $\alpha = 1.15$ bridges the gap between annual price volatility and the monthly price variations used as a proxy for the shipment-by-shipment volatility data that were unavailable. This factor was

TABLE 5. Relative Global Export Price Ratio and Bilateral Import Price Ratios Developing Country Exporters

Exporter	Global Export Price Ratio	Bilateral Import Price Ratios (Developing Country Wheat Importers)								
		Argentina	Brazil	China	Mexico	Middle East and North Africa	Other East Asia	Rest of Latin America	South Asia	Sub-Saharan Africa
Argentina	0.89	0.97	0.96	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*
Australia	1.10	1.19	1.18	0.98	0.99	1.03	1.00	1.02	1.00	1.05
Brazil	1.05	1.14	1.13	0.94	0.94	0.99	0.96	0.97	0.96	1.00
Canada	1.14	1.24	1.23	1.02	1.02	1.07	1.04	1.06	1.04	1.09
China	0.97	1.05	1.04	0.87	0.87	0.91	0.89	0.90	0.88	0.93
European Union	0.98	1.06	1.05	0.88	0.88	0.92	0.89	0.91	0.89	0.94
Japan	1.03	1.12	1.11	0.92	0.92	0.97	0.94	0.95	0.94	0.99
Mexico	1.15	1.25	1.24	1.03	1.03	1.08	1.05	1.07	1.05	1.10
Middle East and North Africa	1.00	1.09	1.08	0.89	0.90	0.94	0.91	0.93	0.91	0.96
Other East Asia	1.00	1.09	1.08	0.89	0.90	0.94	0.91	0.93	0.91	0.96
Other Europe	*0.85*	0.92	0.91	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*
Rest of Latin America	0.9	0.98	0.97	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*	0.86
South Asia	0.96	1.04	1.03	0.86	0.86	0.90	0.88	0.89	0.88	0.92
Sub-Saharan Africa	1.15	1.25	1.24	1.03	1.03	1.08	1.05	1.07	1.05	1.10
Russian Federation	*0.85*	0.92	0.91	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*	*0.85*
United States	1.10	1.19	1.18	0.98	0.99	1.03	1.00	1.02	1.00	1.05

Note: Italicized numbers have been truncated to 0.85, the trigger for the price-based safeguard, so that they can be incorporated into the model.

Source: Authors' calculations based on data from the United Nations Statistics Division's Commodity Trade Statistics Database and the Global Trade Analysis Project's GTAP6 Data Base.

estimated using monthly price data for Canadian wheat for January 1983–June 2008 as a proxy for the prices of individual shipments.[10] The second adjustment factor, β_r, is indexed by exporting region and brings bilateral annual prices in line with those observed over the historical period. Together these ensure that the frequency with which the bilateral price trigger is activated more accurately represents the reality of this bilateral, shipment-based measure.

Table 1 also reports the changes in the mean and the standard deviation of the power of the bilateral safeguard tariff for eight developing countries and regions. The safeguard tariff now varies, not only by importer (rows) but also by the source country or region (columns). The highest mean tariffs are imposed on the low unit value exporters: Argentina, China, Other Europe, Russian Federation, and South Asia. The volatility ranking for the safeguard tariffs is similar, as shown in the bottom panel of table 1, which reports the standard deviation in the percentage change in the power of the price-based safeguard tariff on each bilateral flow.

The price-based safeguard columns in tables 2-4 report the changes in means and standard deviations of key variables in developing and developed country markets. The price-based safeguard has a much more uniform impact on import prices than the quantity-based safeguard does—slightly raising mean prices in nearly all regions. This is because the bilateral safeguard duty levied against an individual exporter is less likely to vary across importers. With free on board (f.o.b.) prices to all destinations changing at the same rate, the only differences in these price-based safeguard duties arise due to differential trade and transport costs as well as differences in the weights determining the average import price for each region. Whereas the quantity-based safeguard is driven largely by domestic supply shocks, the price-based safeguard is driven primarily by supply volatility in the exporting countries. Since the composite import price is a blend of products from different exporters, there is much less variation in the mean import price changes under the price-based safeguard regime. The rise in mean import prices is also smaller because the price-based safeguard is imposed on only a subset of the exporting regions, and most importers are diversified in their export sourcing of wheat. This stands in sharp contrast to the quantity-based safeguard, which applies to all import sources. With marginally higher mean (tariff-inclusive) import prices, mean import volumes are lower than in the non-safeguard case, and mean domestic prices are higher in each developing country region except Argentina, which relies heavily on exports that are now facing safeguard tariffs in other developing countries. Higher domestic prices boost land rents, which translate into slightly higher mean output in all developing country regions except Argentina (see

10. The variability of prices across shipments is largely captured by the variability across suppliers and the intertemporal variability across months included in the analysis. However, other elements, such as variation across wheat varieties, can make the variance across prices of shipments even greater than is captured in the analysis. Given this, the analysis is expected to provide a lower bound estimate of the frequency with which the price-based safeguard is invoked.

table 2, top panel). The expected change in global wheat exports falls from 7.3 percent to 6.8 percent (see appendix table A5), a difference of 0.5 percentage point (see table 4), and there is no difference in the mean global export price.

The bottom panels of tables 2–4 report the changes in standard deviations associated with the percentage changes in market variables in the developing and developed country markets, as well as for global trade, as a result of the price-based safeguard. Import quantities are more volatile in five of the nine developing country regions, while domestic prices are more volatile in seven developing country regions. Global wheat export price volatility rises slightly—from 4.1 percent to 4.2 percent (see appendix table A5), for a difference of 0.1 percentage point (see table 4). Once this is taken into account, this measure appears to actually increase the volatility of domestic prices in most developing countries. This result highlights the pitfalls of approaches such as that used by Valdés and Foster (2005) that ignore the impacts of such a measure on world prices.

VIII. Comparison of Price- and Quantity-Based Safeguards

Having analyzed the quantity- and price-based safeguards separately, the discussion now turns to comparing the two types of safeguards using the results in tables 2–4.

The quantity-based safeguard tends to boost tariff-laden import prices by much more than the price-based safeguard in developing countries, and the impacts vary more across importing countries. In China, the quantity-based safeguard boosts mean duty-laden import prices 10.2 percent while the price-based safeguard raises them less than 1 percent. Higher mean prices for imports in the domestic market translate into lower mean import quantities. The quantity-based safeguard also boosts domestic prices, land rents, and output by a larger amount in all but two developing country regions (Argentina and Other East Asia). These larger changes are mirrored by larger output reductions in developed countries because the price-based safeguard tends to discriminate against low unit value exporters, which tend to be developing countries (as well as the European Union).

While the quantity-based safeguard boosts import price variability in all developing country cases (see table 2, bottom panel), the price-based safeguard has a mixed effect on the standard deviation of tariff-laden import prices. The standard deviation of import prices is lower in four of the nine developing country regions but in none of the developed country regions. Import volatility decreases sharply with the quantity-based safeguard for all developing country regions but increases under the price-based safeguard in five of them. Domestic price volatility rises in seven developing country regions because of the increased volatility of export prices resulting from the price-based safeguard. The quantity-based safeguard increases domestic price volatility for all developing country regions except Argentina.

Finally, with the quantity-based safeguard, the expected volume of world trade is substantially reduced, whereas the price-based safeguard appears to be less damaging to global trade levels. Both types of safeguards boost world price volatility (see table 4).

IX. Conclusions

The special safeguard mechanism has been a controversial feature of the recent WTO negotiations under the Doha Development Agenda. Some advocates argue that it is needed to protect low-income domestic producers from the vagaries of world markets. However, economic principles suggest that widespread use could destabilize world prices and deny domestic consumers access to affordable imports in the case of domestic shortages. This article investigates the key components of the special safeguard mechanism proposed in the draft WTO modalities of December 2008. It includes provisions for both quantity- and price-based safeguard measures and shows that these safeguards operate in very different ways.

The empirical analysis is conducted by stochastically simulating a model of the world wheat market. The findings suggest that the quantity-based safeguard is an order of magnitude more damaging to world trade than the price-based safeguard is. The quantity-based safeguard reduces imports, raises domestic prices, and boosts mean domestic production in the countries and regions that use it. Rather than insulating countries that use it from price volatility, the measure could increase price volatility in developing countries by restricting imports when they would otherwise alleviate the adverse impacts of harvest shortfalls. Based on the specified triggers and duties, the quantity-based safeguard would shrink the expected value of wheat imports by nearly 50 percent in some regions, with overall world wheat trade falling by 4.7 percent. A more restrictive scenario under which the full permitted duty is used whenever imports have reached the trigger in the past 12 months could result in even larger reductions in imports and greater volatility.

The price-based safeguard is less damaging to world trade because it is applied on a bilateral basis and since countries import wheat from a variety of sources, the impact of a safeguard tariff on some suppliers is diluted. The same is true of the impacts of the price-based safeguard on prices and production. The results suggest that the price-based safeguard would actually increase the volatility of producer prices in seven of the nine developing country regions considered, with trading partners potentially applying the safeguard when the country has a good harvest and increases its exports.

Part of the rationale for the special safeguard mechanism is a concern that shocks from world markets could have adverse impacts on vulnerable producers and consumers in developing countries. However, by imposing the duties permitted under the safeguard, developing countries are likely to increase, rather than decrease, the volatility of prices in domestic markets. If the flexibility it provides to raise protection on agricultural products is to be used, it is important to consider the actual impacts of such duties on domestic outcomes, rather than to mechanically implement the duties provided for under the special safeguard mechanism proposal.

Unfortunately, developing countries that opt not to use the safeguard may still see the volatility of their producer prices increase as a result of greater world price instability induced by countries that do employ the safeguard. This is particularly troublesome if increased greenhouse gas concentrations in the atmosphere give rise to greater climate volatility and hence greater volatility in the production of staple food products (Ahmed, Diffenbaugh, and Hertel 2009).

In closing, many of the main arguments in favor of the special safeguard mechanism focus on the well-being of vulnerable agricultural producers. Yet many rural residents of poor countries are net purchasers of food, and in many countries urban poverty is growing ever more significant. In this context, the potential for policies based on the safeguard rules to lessen poverty vulnerability seems very questionable. Future work should take into account the poverty dimension of the special safeguard mechanism as well as the broad dynamics considered in this article.

APPENDIX

TABLE A1. Percentage Change in Mean and Standard Deviation for Key Variables in Developing Country Wheat Markets with Quantity-Based Safeguard

Country or Region	Import price[a]		Import quantity		Producer price		Land rents		Output	
	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard
Mean										
Argentina	−1.7	4.1	41.3	−5.6	4.2	2.3	10.9	3.3	3.9	1.4
Brazil	2.3	16.6	19.4	−3.7	16.1	19.6	2.7	23.1	0.7	5.3
China	0.5	10.7	41.1	−3.3	3.7	8.4	−3.7	10.2	−2.1	1.3
Mexico	0.6	4.1	1.8	−4.0	1.0	2.7	1.5	7.7	0.7	3.0
Middle East and North Africa	−0.2	1.9	2.5	−2.2	0.5	1.2	−1.0	2.4	−0.3	0.9
Other East Asia	0.3	−0.5	0.0	0.2	0.7	0.2	2.8	0.0	0.4	−0.5
Rest of Latin America	0.3	3.3	3.3	−3.1	1.2	2.2	2.2	6.1	0.9	2.2
South Asia	0.1	3.4	3.3	−2.2	1.3	2.3	−0.1	2.6	−0.3	0.5
Sub-Saharan Africa	−0.1	2.9	3.1	−3.9	0.8	1.5	−2.0	5.5	−0.7	2.4
Standard deviation										
Argentina	6.0	8.6	69.5	21.2	11.9	11.7	29.6	24.8	23.7	22.6
Brazil	8.7	21.7	79.2	54.5	46.2	50.5	11.2	29.0	35.2	29.7
China	4.1	14.1	110.3	56.1	25.0	30.8	11.6	27.4	12.8	8.8
Mexico	4.7	6.8	22.1	14.4	8.1	10.4	17.6	11.3	16.4	13.1
Middle East and North Africa	3.9	5.3	20.0	13.1	8.0	9.1	8.6	5.8	11.1	9.1
Other East Asia	4.6	4.8	0.9	0.9	5.5	5.6	29.8	29.6	16.9	16.9
Rest of Latin America	4.2	6.3	21.6	14.0	8.3	10.2	13.8	8.7	13.4	10.2
South Asia	4.4	7.2	20.4	12.9	12.9	14.2	6.1	9.5	8.7	7.7
Sub-Saharan Africa	4.0	6.1	25.3	15.4	9.6	10.6	15.8	9.4	16.1	11.5

a. Including the duty.

Source: Authors' calculations based on data described in the text.

TABLE A2. Percentage Change in Mean and Standard Deviation for Key Variables in Developed Country Wheat Markets with Quantity-Based Safeguard

Country or Region	Import Price[a]		Import Quantity		Producer Price		Land Rents		Output	
	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard
Mean										
Australia	−7.4	−7.5	57.7	52.7	1.0	0.1	6.1	−0.6	2.5	−0.5
Canada	−1.0	−1.6	10.7	8.7	1.0	0.0	8.1	−0.7	3.8	−0.7
European Union	−0.2	−0.5	1.7	2.0	0.6	0.4	2.0	−0.2	1.2	−0.1
Japan	0.4	−0.4	0.0	0.2	0.6	0.1	4.6	0.4	0.6	−0.8
Other Europe	−2.0	−2.5	28.7	30.5	3.2	3.1	0.2	−0.4	0.0	−0.3
Russian Federation	−3.1	−3.3	42.7	43.7	7.3	7.2	0.5	0.2	−1.5	−1.7
United States	0.5	−0.5	4.1	4.8	1.0	0.3	3.3	−0.8	1.5	−0.3
Standard deviation										
Australia	8.0	8.2	58.2	57.9	6.4	6.6	41.0	38.5	28.5	27.7
Canada	5.1	5.2	20.8	20.6	4.8	4.8	30.2	28.3	20.7	19.9
European Union	4.6	4.6	3.8	3.9	6.0	6.0	11.5	11.3	11.3	11.0
Japan	4.5	4.6	2.0	2.1	4.5	4.6	34.6	34.2	15.6	15.6
Other Europe	4.6	4.6	68.0	69.0	19.1	19.0	5.6	5.6	16.8	16.7
Russian Federation	15.5	15.4	69.3	70.5	31.1	31.0	14.2	14.2	17.7	17.7
United States	4.4	4.4	22.2	22.6	6.1	6.3	16.0	14.5	13.9	13.2

a. Including the duty.

Source: Authors' calculations based on data described in the text.

Table A3. Percentage Change in Mean and Standard Deviation for Key Variables in Developing Country Wheat Markets with Price-Based Safeguard

Country or Region	Import Price[a]		Import Quantity		Producer Price		Land Rents		Output	
	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard
Mean										
Argentina	−1.7	−1.2	41.3	34	4.2	2.7	10.9	4.2	3.9	1.3
Brazil	2.3	3.0	19.4	18.1	16	16.1	2.7	3.3	0.7	1.0
China	0.5	1.0	41.1	39.5	3.7	3.8	−3.7	−3.4	−2.1	−2.1
Mexico	0.6	0.9	1.8	1.3	1.0	1.1	1.5	2.0	0.7	0.9
Middle East and North Africa	−0.2	0.6	2.5	0.9	0.5	0.7	−1.0	0.2	−0.3	0.2
Other East Asia	0.3	1.0	0.0	0.0	0.7	1.1	2.8	5.2	0.4	1.1
Rest of Latin America	0.3	0.9	3.3	2.1	1.2	1.4	2.2	3.0	0.9	1.2
South Asia	0.1	0.7	3.3	2.3	1.3	1.4	−0.1	0.2	−0.3	−0.2
Sub-Saharan Africa	−0.1	0.5	3.1	1.9	0.8	0.9	−2.0	−0.5	−0.7	0.0
Standard deviation										
Argentina	4.7	6.1	22.1	73.8	8.1	13.7	17.6	27.6	16.4	21.5
Brazil	6.0	8.1	69.5	79.7	11.9	46.2	29.6	10.5	23.7	35.2
China	8.0	4.2	58.2	109.6	6.4	25.2	41.0	12.1	28.5	12.7
Mexico	4.4	4.7	22.2	22.1	6.1	8.1	16.0	17.7	13.9	16.4
Middle East and North Africa	15.5	4.0	69.3	19.9	31.1	8.0	14.2	8.5	17.7	11.1
Other East Asia	4.5	4.8	2.0	0.9	4.5	5.6	34.6	30.6	15.6	16.9
Rest of Latin America	8.7	4.3	79.2	21.7	46.2	8.4	11.2	13.4	35.2	13.3
South Asia	4.6	4.5	0.9	20.5	5.5	13.0	29.8	6.3	16.9	8.7
Sub-Saharan Africa	3.9	4.1	20.0	25.1	8.0	9.6	8.6	15.9	11.1	16.2

a. Including the duty.

Source: Authors' calculations based on data described in the text.

TABLE A4. Percentage Change in Mean and Standard Deviation for Key Variables in Developed Country Wheat Markets with Price-Based Safeguard

Country or Region	Import Price[a]		Import Quantity		Producer Price		Land Rents		Output	
	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard	No Safeguard	Safeguard
Mean										
Australia	−7.4	−7.7	57.7	62.2	1.0	1.2	6.1	6.7	2.5	2.8
Canada	−1.0	−0.9	10.7	11.1	1.0	1.3	8.1	10.1	3.8	4.8
European Union	−0.2	−0.2	1.7	1.8	0.6	0.6	2.0	2.4	1.2	1.4
Japan	0.4	0.6	0.0	−0.1	0.6	0.7	4.6	5.6	0.6	0.9
Other Europe	−2.0	−2.5	28.7	30.0	3.2	3.0	0.2	−0.8	0.0	−0.6
Russian Federation	−3.1	−3.3	42.7	42.9	7.3	7.1	0.5	−0.3	−1.5	−2.0
United States	0.5	0.7	4.1	4.4	1.0	1.2	3.3	4.6	1.5	2.1
Standard deviation										
Australia	8.0	8.3	58.2	63.1	6.4	6.6	41.0	39.1	28.5	27.8
Canada	5.1	5.1	20.8	20.8	4.8	4.8	30.2	30.4	20.7	20.7
European Union	4.6	4.6	3.8	3.8	6.0	6.0	11.5	11.4	11.3	11.3
Japan	4.5	4.5	2.0	2.0	4.5	4.5	34.6	34.9	15.6	15.6
Other Europe	4.6	4.7	68.0	68.7	19.1	19.2	5.6	5.8	16.8	16.3
Russian Federation	15.5	15.6	69.3	69.6	31.1	31.2	14.2	14.9	17.7	17.1
United States	4.4	4.4	22.2	22.2	6.1	6.2	16.0	16.0	13.9	13.8

a. Including the duty.

Source: Authors' calculations based on data described in the text.

TABLE A5. Impacts on World Wheat Trade of Quantity- and Price-Based Safeguards

Trade Measure	Baseline	Quantity-based Safeguard	Price-based Safeguard
Mean			
Quantity	7.3	2.6	6.8
Price	0.1	−0.7	0.1
Standard deviation			
Quantity	7.8	5.7	7.9
Price	4.1	4.2	4.2

Source: Authors' calculations based on data described in the text.

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