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# Poverty impacts of the volume-based special safeguard mechanism\*

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The volume-based Special Safeguard Mechanism (Q-SSM) was proposed as essential for small, poor farmers and became the proximate cause of the collapse of the Doha Agenda negotiations in 2008. But is it helpful for these farmers, given that it is likely to be applied when farm output is depressed and many poor farmers in developing countries need to buy food? Stochastic simulations for 31 countries suggest that use of this safeguard in line with the proposed WTO rules would raise the world poverty headcount by an average of 24 million. The adverse poverty impact of the duty is larger when the quantity safeguard is triggered than it would be in other years, because lower farm output reduces the benefits to poor farm households from higher prices.

**Key words:** agricultural yield, poverty, quantity safeguard, special safeguard mechanism, SSM, World Trade Organization.

## 1. Introduction

The logic of the proposed volume-based special safeguard mechanism (SSM) in the Doha Agenda negotiations (WTO 2008) seems quite simple. When imports increase from baseline levels, a duty can be invoked to protect domestic producers against the threat posed by these imports. Such a measure seems appealing from the viewpoint of producers, who might find difficulty competing with imports which have, for some reason, suddenly become more competitive than domestic products. As designed, this policy might seem potentially important for poverty reduction because most of the poor in developing countries live in rural areas, and the majority of the poor depend on agriculture for their livelihoods (World Bank 2008). If all poor farmers in developing countries were net sellers of food – as are almost all commercial producers in industrial countries – then a measure that raised the price of competing imports would likely help to reduce poverty amongst this group.

However, it is important to remember that farm structures in developing countries are very different from those in the industrial countries, for which the original special agricultural safeguard (SSG) was designed, and on which the SSM proposals were based. Many farmers in poor countries remain

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subsistence-oriented, and many poor farmers are actually net buyers of food. Sometimes this reflects the limited resources available to these producers, other times a desire to diversify their output mix to reduce their vulnerability to shocks affecting any one activity. Low-income producers are particularly likely to be net buyers in years when the country faces increased competition from imports, perhaps because of unfavourable seasonal conditions. Low-income non-farm households are likely to be vulnerable to increases in the prices of staple foods, as many spend up to three-quarters of their incomes on staple foods. When many poor farm households are also vulnerable to higher food prices, the risk that higher food prices will raise overall poverty rates, and hence imperil the food security of the poor, seems particularly strong. Whether this is the case is an important question when evaluating the potential impact of such a measure.

As the proposed measures provide a right, but not an obligation, to impose a duty, a key decision for WTO members with the right to use an SSM would be when to impose such a duty. Two approaches might seem attractive: to impose such a duty in line with the very specific WTO rules regarding its use, or to impose such a duty when it seems likely that this would help reduce poverty and vulnerability, particularly among small farmers. The first decision rule is relatively simple, as it requires only information on import levels in the current year relative to imports in a 3-year moving-average baseline. The second would be much more complex because it requires much more difficult-to-obtain information on whether individual households are net buyers or net sellers of the products in question. An important question is therefore how application of the measure in line with the proposed WTO rules would affect poverty in developing countries and globally.

While many studies (e.g. Montemayor 2007; Grant and Meilke 2009; Hertel *et al.* 2010) examine the implications of the SSM proposals for aggregate variables such as market prices and farm incomes, almost no analysis is available at the household level needed to assess the implications of the SSM for its intended objectives of improving food security, livelihood security and rural development. For an excellent overview of related issues of the implementation of SSM policies and a review of many quantitative and qualitative studies on the subject, see Grant and Meilke (2011).

This paper uses data at the household level to assess the implications of the volume-based SSM for household welfare, and particularly for the number of people who fall below the internationally standard poverty line of \$1.25 per day (Ravallion *et al.* 2009), and hence face increased risks to their food and livelihood security. In the following sections of this paper, we develop a methodology to assess the frequency with which the volume-based safeguard might be applied, and how its effects might be assessed. After a short discussion of the data available for the analysis, we present poverty estimates of our simulations for a set of individual developing countries as well as for the world as a whole.

## 2. Methodology

The proposed SSM involves both a price-based and a quantity-based measure. The price-based measure (P-SSM) is much simpler to use than the Q-SSM, as it can be invoked whenever the price of a shipment falls below a trigger level based on a moving average of import prices from all sources (Hertel, Martin and Leister 2010). As noted by Martin and Anderson (2011) and Anderson *et al.* (2013), such price-based measures are likely to be attractive for individual developing countries – and have been widely used in the industrial countries in the past. They can stabilize domestic prices in individual, small countries relative to the situation without such intervention. One concern with the shipment-by-shipment nature of the proposed price-based safeguard is that the strong incentives for false invoicing introduce risks both for the effectiveness of the measure in restraining imports, and for corruption. Another concern is for discrimination against exporters with lower unit values, who are typically from poorer countries.

These problems with the price-based measure could be overcome by using a reference price of imports rather than a price for each individual shipment. However, even with this modification, widespread use of such measures leads to a collective action problem – by substantially increasing the volatility of world prices, these interventions may become collectively ineffective in stabilizing domestic prices (Martin and Anderson 2011). While it is possible that price insulation could reduce poverty by reducing price increases in countries where the poor are the most vulnerable to higher prices, Anderson *et al.* (2013) found that this was not the case during the food price crisis of 2006–8.

The implications of applying quantity- and price-based SSMs on the volatility of world market prices were quantified for the wheat market by Grant and Meilke (2009, p. 11) who estimate a 16-per cent increase in the standard deviation of the world price as a result of the application of whichever measure imposes the higher levy in each case (subject to existing tariff bindings). Such a large increase in price volatility makes it more difficult for countries to refrain from using such measures – a problem akin to the collective action problem when members of a crowd stand up in the stadium to get a better view at a sporting event.

We begin our analysis of the Q-SSM by considering the sources of increases in imports relevant to this measure. For at least three reasons, it seems likely that the price-based safeguard would be applied in most cases where a government wished to use an SSM measure. First, the P-SSM can be applied quickly when the price of a particular shipment is 15 per cent or more below a 3-year moving average price, while the volume-based safeguard requires the authorities to wait until the cumulative exports during a year exceed a 3-year moving average of imports. Second, the duties permitted under the Q-SSM bear no obvious relationship with the size of any adverse shock to producers. Third, the Q-SSM trigger – the percentage change in the volume of imports –

**Table 1** Relative standard deviations of crop yields (median values, range of 25th and 75th percentile in parentheses, sample of 31 countries)

Commodity	Relative to 3-year average	Relative to trend
Maize	0.187 (0.113–0.236)	0.234 (0.149–0.321)
Rice	0.128 (0.078–0.213)	0.175 (0.11–0.24)
Soybeans	0.19 (0.098–0.213)	0.243 (0.155–0.38)
Wheat	0.171 (0.12–0.286)	0.232 (0.141–0.349)

is not directly related to the extent of any damage to producers. If imports are initially small, a large percentage change in imports may have little impact on producers. By contrast, if imports are initially large, a small percentage change in imports may have a sizeable impact on the market. For all these reasons, it seems likely that the Q-SSM would generally be used only when the price of imports has not fallen substantially, and hence the P-SSM has not been triggered. It appears that this type of situation occurs frequently. The South Centre (2009, p. 2) concludes that, in over 85 per cent of import surges,<sup>1</sup> the import price did not fall more than 15 per cent below the preceding 3-year moving average.

As the focus of the volume-based safeguard is on situations where the price of imports does not decline, we need to ask carefully why imports might rise when import prices are not declining. For most agricultural commodities, this is likely to be the case because of weather-induced shocks to output which – in the case of crops – are largely reflected in yield changes (Roberts and Schlenker 2010). We considered following Roberts and Schlenker in using the deviations of yields from trends, but finally decided to use the 3-year average of previous yields as our benchmark against which to compare current yields. To the extent that changes in imports reflect changes in the volume of output, use of this average-yield measure as the base should better reflect the deviations in imports from their 3-year moving average that trigger the volume-based SSM. We compared the deviations from the 3-year moving average with those from a linear trend and found those from the 3-year moving average to be smaller (Table 1).

Our analysis considers the impacts of yield shocks and subsequent application of the Q-SSM in a sample of low and middle-income countries (for the list of countries see Table 2) many of which are, or may become, importers of key commodities, particularly maize, rice and wheat. For all countries included in our sample, we have collected detailed data from household surveys on the sources of income and patterns of expenditure – with special emphasis on the consumption of staple foods whose price is typically very important for the poor, and on income from production of these goods – for a large sample of households. These data are used to

<sup>1</sup> Where an import surge is defined as imports exceeding 110 per cent of the preceding 3-year moving average.

**Table 2** Household surveys used in the study

Country name	Year	Survey name
Albania	2005	Living Standards Measurement Survey
Armenia	2004	Integrated Survey of Living Standards
Bangladesh	2005	Household Income-Expenditure Survey
Belize	2009	Household Income and Expenditure Survey
Cambodia	2003	Household Socio-economic Survey
China	2002	Chinese Household Income Project
Ecuador	2006	Encuesta Condiciones de vida – Quinta Ronda
Guatemala	2006	Encuesta Nacional de Condiciones de Vida
India	2005	India Human Development Survey (IHDS)
Indonesia	2007	Indonesia Family Life Survey
Ivory Coast	2002	Enquete Niveau de Vie des Menages
Malawi	2004	Second Integrated Household Survey
Moldova	2009	Cercetarea Bugetelor de Familie
Mongolia	2002	Household Income and Expenditure Survey
Nepal	2002	Nepal Living Standards Survey II
Nicaragua	2005	Encuesta Nacional de Hogares sobre Medicion de Nivel de Vida
Niger	2007	Enquete National sur Le Budget et la Consommation des Menages
Nigeria	2003	Nigeria Living Standards Survey
Pakistan	2005	Pakistan Social and Living Standards Measurement Survey
Panama	2003	Encuesta de Niveles de Vida
Peru	2007	Encuesta Nacional de Hogares
Rwanda	2005	Integrated Household Living Conditions Survey
Sierra Leone	2011	Sierra Leone Integrated Household Survey
Sri Lanka	2007	Household Income and Expenditure Survey
Tajikistan	2007	Living Standards Measurement Survey
Tanzania	2008	National Panel Survey
Timor-Leste	2007	Poverty Assessment Project
Uganda	2005	Socio-Economic Survey
Vietnam	2010	Household Living Standard Survey
Yemen	2006	Household Budget Survey
Zambia	2010	Living Conditions Monitoring Survey

capture the impacts of production and price shocks on the real incomes of households.

The first step in the analysis is to estimate the distribution of unfavourable shocks to agricultural output – such as might arise from a drought – and evaluate their implications for the national economy and for household welfare. We use historical data on yield shocks, available from the FAO, to estimate the distribution of shocks in productivity relative to the 3-year moving average. We then implement shocks in a CGE model (GTAP) as negative productivity shocks and, through a Monte Carlo exercise, calculate the resulting distribution of prices, household incomes and poverty rates.

Although the quantity-based SSM duty cannot be imposed until imports have exceeded a trigger level, we assume that key market participants know the broad order of magnitude of the output decline – and hence the size of the duty to be imposed when the trigger level of imports is reached during the marketing season – at, or before, the time of the harvest. Given intertemporal arbitrage possibilities, the expectation that a duty will be imposed later in the



season can be expected to raise the price of the commodity from the beginning of the marketing season. Otherwise, market participants could make profits by buying early in the season and selling later. Given the time sequence, availability in the marketing season during which the duty is imposed is unable to respond to the higher prices resulting from the duty.

We consider the impact of the measure only in the marketing season for the affected crop. The fact that the Q-SSM duty may be imposed for up to twelve months means that it may apply also in the first part of the subsequent marketing season. Our estimates miss any impact of the duty in the following season – an omission that we believe unlikely to be severe. As consumption in the first part of the marketing year is likely to be sourced domestically, a duty that will be phased out during the marketing year is likely to have little impact on domestic prices, as long as imports needed in the latter part of the year can be imported after the duty has expired.

At the household level, we assume, for simplicity and transparency, that output in all producing households falls by the same proportion. The direct effect of these shocks on farm households is to reduce their incomes directly, through reductions in the value of agricultural output they produce at any given price. Another potential effect arises from changes in prices following the output change – whether due to changes in market prices or to the imposition of a duty. With lower farm output, farm households are more likely to be adversely affected by (or to gain less from) increases in food prices.

We follow Deaton (1989) in assessing the welfare impact of a price change using only the net buyer or net seller status of the household in a particular commodity. We considered allowing for welfare impacts resulting from food-price-induced changes in wages (see Ivanic and Martin 2008), but the evidence (see, for example, Ravallion 1990) suggests that most of this effect takes several years to emerge in poor countries. The income effect of a yield change was measured simply using the change in producers' output volumes valued at domestic prices. We also ignore the depressing effect of the greater frequency of use of safeguards on average world prices – an effect that may further increase the adverse impact of the measure on poverty (Ivanic and Martin 2014).

The second stage in the analysis is to take into account the effects of introducing the duties permitted under the quantity-based SSM. When negative output shocks cause imports to exceed one of the SSM thresholds, we change the Q-SSM duty in line with SSM proposal (WTO 2008). When the country in question is a net importer, introduction of the duty is assumed to raise import prices by the same percentage and consumer prices by this percentage times the share of imports in total consumption. The increase in consumer prices raises the demand for domestically produced products and hence the price received by producers. Where farmers were, and remain, net sellers of food, the increase in prices will help compensate for any losses resulting from the decline in their output. However, for farmers who were –

or who have become after the adverse output shock – net buyers, the increase in prices resulting from the duty will have an adverse impact on real incomes.

A potentially important consequence of imposing SSM duties is their effect on government revenues. If these increase, they might be used to ameliorate the adverse impacts of higher food prices on the poor. If they decline, then the adverse impact on the government's fiscal position must be addressed in some way such as by reducing transfers or provision of government-supplied goods. While the SSM duties introduce new revenues, these will be offset to some degree by reductions in the volume of imports on which existing tariffs are levied. The higher the initial tariffs and the more elastic the import demand, the greater the probability that total trade tax revenues will be reduced. Given that tariffs on food are frequently relatively high, we allow for the possibility of either higher or lower revenues in the analysis.

There are several mechanisms by which changes in duty revenues may be redistributed to consumers. One would be for the government to absorb the changes, not passing them on to poor consumers at all. At the other extreme, the government might subsidize consumption of the affected commodity while providing higher sales prices for farmers. Alternatively, tariff revenues could be used to compensate farmers for the income losses resulting from lower yields. However, because we are unsure what specific measure would be adopted, we consider a simplified uniform reduction in a general consumption tax which would make the imposition of SSM duties fiscally neutral. To implement this, we use the CGE model to infer the change in the consumption tax needed to redistribute all SSM duty revenues. We then use the resulting prices to assess the poverty impacts of the SSM duties with and without this revenue redistribution.

### 3. Data

We obtained information on the historical distribution of yields for maize, rice and wheat from the FAO's FAOSTAT database which contains information on crop yields for 211 countries and regions for the period 1961–2009. From the WTO's Integrated Database, we obtained tariff-line-level information on bound and applied tariff rates for member countries. Using the reported unit values of cereal imports from the combined FAO database, we expressed all tariffs in their *ad valorem* equivalents.

We used a set of 31 household surveys representing globally distributed low- and middle-income countries (Table 2) collected between 2002 and 2010. All of the surveys contain household-level information on production and consumption of the four crops considered in this study (maize, rice, soybeans and wheat) as well as total household expenditures which allow us to assess the impact of changes in productivity and prices for these commodities on household welfare.



## 4. Methodology

### 4.1. Stochastic modelling of yields

Our analysis of the distribution of yields for our sample of 31 countries shows that the median standard deviation of yields from their average of the previous 3 years is lowest for rice (12.8 per cent) and highest for soybeans (19 per cent). Of course, many countries in our sample – particularly those where crops are grown under dry land conditions – experience much greater-than-average volatility, especially for wheat where a quarter of the countries experience volatility greater than 25 per cent.

The univariate distribution of individual yields is not enough to capture their impacts on the economic variables of interest because crop yields are correlated across regions and commodities in response to correlated shocks such as those resulting from weather. These correlations raise the probability that Q-SSM measures will be introduced on more than one product in the same year, raising the overall impact of the measure in that year and the variance of the overall effects of the Q-SSM on the poor. To capture this important feature of the world, we developed our pseudo-random shocks to crop yields by first estimating the variance–covariance matrix of crop yields ( $C$ ) across regions and crops. Then, we used the Cholesky decomposition to obtain a lower triangular matrix,  $U$ , where  $C = UU^T$ . Pre-multiplying a matrix of independent, standard normally distributed shocks obtained from a random number generator by the lower triangular matrix  $U$  created a new matrix with variance–covariance matrix  $C$ .

Domestic output shocks are only indirectly related to whether the Q-SSM will be triggered because the change in imports resulting from the shock depends on a number of other factors. To translate the changes in domestic productivity into changes in imports and, from there, duties and domestic prices, we use the GTAP model into which we feed the set of simulated productivity changes. The imperfect substitution between imported and domestic goods in this model reduces the magnitude of the import shocks relative to those expected in a model with perfect substitutes, making our results conservative estimates of the measured impacts of the measure.

### 4.2. Macro model

The initial part of the analysis was undertaken using version 8 of the GTAP global CGE model originally described in Hertel (1997). This model allows us to simulate the implications of changes in agricultural yields (productivity) for numerous variables of importance such as domestic prices and wage rates. To facilitate the analysis, we run the Monte Carlo simulations, with the 57 available commodities aggregated into six – maize, wheat, rice, soybeans, other food, and the rest of the economy. We focus on these commodities because they account for a large fraction of global calorie consumption,

because their output is frequently variable, and because it seems likely that they would loom large in the use of the Q-SSM given the sensitivity of these products to policy makers. We aggregate the available 129 countries and regions into 32 blocs used to represent our sample countries and the rest of the world.

In each of our simulations, we assume a short-run closure where the allocation of land, labour and natural resources to each commodity is fixed. The reason for this assumption is that the size of the SSM response will generally become known only when most agricultural input decisions have already been taken and little can be done to adjust output. Once a crop has experienced a poor harvest, the level of the resulting import surge is determined simultaneously with the corresponding duty change.

Within the GTAP framework, we endogenously determine the duty rate consistent with the actual change in imports resulting from the changes in domestic productivity and in the SSM duties. Q-SSM duty changes are modelled with the three-tiered structure in the Q-SSM proposal. Using GEMPACK's complementary slackness feature, we allow duties to be increased to the allowed limit for each level of import surge (110, 115 or 135 per cent of base imports). No duty is imposed unless imports from a particular supplier reach 110 per cent of the previous 3 years' average; if these imports are between 110 and 115 per cent of the 3-year average, a duty which is the greater of 25 per cent or 25 of the existing bound rate is imposed on top of existing tariffs. If imports from a particular supplier exceed 115 per cent of the 3-year average, duties are raised to 40 per cent or 40 per cent of the existing bound rate. Finally, we allow for a duty of 50 per cent, or 50 per cent of the bound rate, when imports reach 135 per cent of the historical average.

#### 4.3. Micro model

For each run of our Monte Carlo simulation, we collect all of the relevant outputs from the macro model and use them as inputs in our household-level model. Specifically, we apply the productivity change as a shock to the output of each crop produced by the household; and changes in domestic producer and consumer prices and wages to the households in our survey sample. Using the resulting impacts on the distribution of income, we calculate changes in national poverty rates following the approach of Ivanic *et al.* (2011), including second-order impacts for household consumption. This method can be simply described as follows: in the first step, we calculate a compensating variation measure of the implications of price and wage changes for household welfare. In the next step, we evaluate the number of households whose new welfare level places them below the poverty line. Finally, we use household weights to calculate an updated poverty rate.

#### 4.4. Global extrapolation

We extrapolate the results from our sample of 31 countries into global estimates of poverty, change expressed in millions of people. We do so by using our sample of 31 countries with their respective population weights following the methodology in Anderson *et al.* (2013). Because our sample is fairly representative of Sub-Saharan Africa and includes almost all the South Asian countries, we are able to extrapolate global poverty estimates with relatively small standard errors.

### 5. Results

Our analysis of the Monte Carlo-simulated distribution of productivity changes suggests that quantity-based SSM measures are likely to be triggered often. As shown in Table 3, the probability of triggering a response appears to be lowest for wheat (21 per cent) and greater (in excess of 40 per cent) for the rest of the commodities, reflecting the relative yield volatility levels and trade shares for these crops. Considering all four commodities together across our sample of 31 countries, at least one SSM duty is triggered in about 98 per cent of the simulated cases.

With regard to the average size of the SSM duty when applied, the 50 per cent duty – impossible as a response to a 35 per cent or greater increase in imports – is the most frequent overall and for wheat and maize. For each run, we calculate price and income changes resulting from the simulated yield changes in three distinct scenarios – no SSM duties as our baseline scenario, SSM duties without redistribution of the resulting revenue changes to the poor, and SSM duties with a general consumption tax change redistributing revenue changes.

The introduction of SSM duties has implications for the domestic prices of the affected commodities, especially maize and soybeans whose consumer prices are found to increase by 14 and 13 per cent on average, with their standard deviation increasing by 23 and 68 per cent. The increase in the consumer price of rice is smaller at 12 per cent with the standard deviation higher by 70 per cent. In the case of wheat, we observe a relatively small increase in average consumer price at about 8 per cent, while its standard

**Table 3** Relative frequency of triggered SSM responses, per cent

Commodity	No response	25% duty	40% duty	50% duty
Average	0.626	0.135	0.059	0.180
Maize	0.566	0.102	0.077	0.256
Rice	0.560	0.190	0.068	0.182
Soybeans	0.586	0.195	0.050	0.169
Wheat	0.791	0.053	0.042	0.115

Note: The actual duty imposed is the greater of the specified percentage and that percentage of the bound tariff.

deviation increases by 111 per cent. Average output prices weighted by the level of output increase less than consumer prices because the highest prices occur at the times of the lowest output – the output price of maize only increases by 10 per cent, followed by the price of soybeans, rice and wheat with price increases of 8, 7 and 6 per cent. The volatility of output prices also rise substantially, although by less than for consumer prices, which are impacted more directly; for example, in the case of wheat, rice and soybeans the standard deviations of output prices rise by 67, 22 and 47 per cent. Only in the case of maize, does the volatility of output prices increase more than for consumer prices, by 52 per cent. While the Q-SSMs are found to increase average domestic prices and their volatility in the countries that apply them, we find that world prices are generally lowered and made marginally more stable for the rest of the world because the countries affected with the greatest weather shocks reduce the extent to which they transmit their domestic shocks to the global market by curtailing their imports with the imposition of Q-SSMs. The precise magnitude of the global price decline depends on the share of the countries that adopt Q-SSMs.

The country-level poverty results of our Monte Carlo simulation are shown in the first column of Table 4 for net poverty changes and in the second column for gross poverty increases. Both of these are measured relative to a stochastic benchmark with volatile yields but no Q-SSM response. As shown in the table, using the Q-SSM generally increases average poverty rates and the inter-temporal volatility of poverty rates as people enter and leave absolute poverty. In only a few cases (Cambodia, Tajikistan, Timor Leste and Yemen) do we observe a reduction in poverty as a result of the Q-SSM. The second column of the table shows the change in the number of people in households that have fallen into poverty (gross change in poverty) as a consequence of the Q-SSM. This table shows that, even in some of those countries where the Q-SSM tariffs reduce poverty on average (Cambodia), there are frequently larger numbers of people who are forced below the poverty line as a consequence of the Q-SSM. Unlike social safety nets, trade measures like the Q-SSM are not no-regrets policy measures and invariably cause harm to some people. In this case, the people adversely affected are net buyers of food.

The global poverty results for the three Monte Carlo simulations are shown in Table 5. Focusing on the first column which shows the average changes in global poverty, we can see that the introduction of the Q-SSM results in an increase in average global poverty of 0.42 per cent over the benchmark scenario. With about 5.5 billion people living in the sampled region of low- and middle-income countries, this translates into an average increase in poverty of about 24.2 million people.

The estimated standard deviations of the global poverty results, also shown in Table 5, provide an additional useful indication of the relative frequency with which the use of the Q-SSM increases global poverty. Assessing the results of the Monte Carlo simulation, we estimate that the use of this

**Table 4** Changes in poverty rates by country relative to the baseline (average change with the corresponding standard deviation in parentheses)

Country name	Net poverty change	Gross poverty increase
Albania	0.1% (0.1%)	0.1% (0.1%)
Armenia	0.3% (0.3%)	0.3% (0.3%)
Bangladesh	2.3% (3.7%)	3.1% (4.8%)
Belize	0.2% (0.3%)	0.3% (0.3%)
Cambodia	−0.8% (1.3%)	0.6% (0.6%)
China	0% (0.3%)	0.1% (0.2%)
Cote d'Ivoire	0.6% (1.4%)	0.8% (1.4%)
Ecuador	0.4% (0.7%)	0.4% (0.7%)
Guatemala	0.8% (1.1%)	0.8% (1.2%)
India	0.7% (1.1%)	0.7% (1.1%)
Indonesia	0.3% (0.5%)	0.6% (0.8%)
Malawi	0.4% (0.6%)	0.3% (0.6%)
Moldova	0.3% (0.6%)	0.2% (0.6%)
Mongolia	1.2% (1.7%)	1.1% (1.6%)
Nepal	1.3% (1.4%)	1.4% (1.5%)
Nicaragua	0.3% (0.5%)	0.3% (0.5%)
Niger	0.6% (0.8%)	0.6% (0.8%)
Nigeria	0.5% (1.1%)	0.8% (1%)
Pakistan	0.9% (1.7%)	0.9% (1.7%)
Panama	0% (0.1%)	0% (0.1%)
Peru	0.3% (0.3%)	0.3% (0.3%)
Rwanda	0.4% (0.4%)	0.5% (0.5%)
Sierra Leone	0.9% (1.7%)	0.7% (1.5%)
Sri Lanka	0.6% (0.9%)	0.6% (0.9%)
Tajikistan	−0% (0%)	−0% (0%)
Tanzania	0.1% (0.3%)	0% (0.2%)
Timor-Leste	−0.1% (0.2%)	−0.1% (0.2%)
Uganda	0.3% (0.4%)	0.3% (0.4%)
Vietnam	0.1% (0.3%)	0% (0.3%)
Yemen	−0.1% (0.1%)	−0.1% (0.1%)
Zambia	0.6% (0.9%)	0.8% (0.8%)

**Table 5** Estimates of global poverty changes as a result of three SSM simulations (average changes with the corresponding standard deviation in parentheses where available)

Simulation	Net change in poverty (%)	Net change in poverty (millions)	Gross increase in poverty (%)	Gross increase in poverty (millions)
Q-SSM	0.44 (0.47)	24.2 (26)	0.55 (0.5)	30.1 (27.4)
Q-SSM with duty redistribution	0.4 (0.45)	22.1 (25)	0.52 (0.48)	28.6 (26.5)
Hypothetical Q-SSM	0.4 (0.59)	21.7 (32.4)	N/A	N/A

measure would result in a net poverty increase in about 90 per cent of the time.

The introduction of a uniform subsidy used to redistribute any duty revenue gains to households appears to lower the poverty implication slightly

(a change of 2.1 million from 24.2 to 22.1 million shown in the first row of Table 5) in the outcome of the Q-SSM scenario. The minor importance of revenue redistribution for poverty can be attributed to at least two factors. Most importantly, we model duty revenue redistribution through a uniform consumption tax which means that higher duties imposed on food – an important consumption item for the poor – are compensated with a much smaller subsidy on everything – primarily non-food items, which are less important for the poor and result in a very muted favourable impact of the duty revenue redistribution. Second, in some countries, the initial tariffs on the commodities considered are very high (e.g. 100 per cent on wheat in India, 62 per cent on rice in China, 45 per cent on soybeans in India and 25 per cent on maize in Uganda), which means that the new revenues obtained from the Q-SSM duty are offset by revenue reductions resulting from declines in the volume of imports on which these tariffs are collected. We estimate that duty revenue redistribution barely affects the probability of the Q-SSM raising global poverty, leaving it at about 87 per cent.

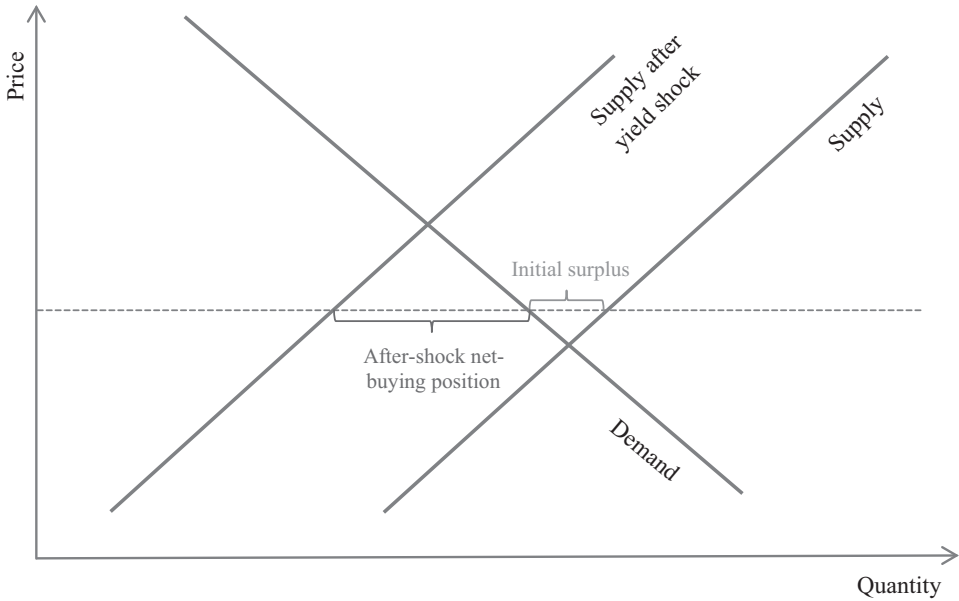
Our global results suggest that application of the Q-SSM is likely to raise global poverty. However, from the results we have presented so far, it is unclear how much of this increase in poverty headcount is due to the short-run increases in prices as a direct consequence of SSM duties and how much to the fact that SSM duties are applied when crop yields are depressed and the net selling position of farmers is reduced (Figure 1); either by reducing their net sales; converting them from net sellers into net buyers; or making them bigger than usual net buyers. To understand this issue better, we run a hypothetical simulation in which we apply the same yield shocks with the SSM duties exactly as in the first scenario but do not change the households' net selling position. This removes the adverse effect of the negative correlation between yields and prices introduced by the SSM.

In the third row of Table 5, we show the extrapolated global poverty change of this modified simulation. As the global estimates presented in the table suggest, the effect of rising prices when household yields are depressed is responsible for about 2.5 million of additional poor globally (change from 21.7 to 24.2 million). The negative sign of this impact is the result of the negative correlation between the changes in yields and SSM-driven price increases which have the tendency to doubly punish poor farming households whose incomes have declined because of lower yields and whose cost of living has increased as well.

## 6. Conclusions

In this study, we considered the implications of the proposed quantity-based special safeguard mechanism (Q-SSM), which would allow developing countries to impose safeguard duties when imports of agricultural commodities rise above defined threshold levels even though import prices are not falling. Identifying domestic yield variations as the most likely causes of these





**Figure 1** The change in net-selling position due to an adverse yield shock.

import surges, we analyse the likely impact of these policy responses on poverty in the imposing countries.

Using the historically observed variances and covariances for yields of key crops (maize, rice, soybeans and wheat) to generate pseudo-random data on yield variations, we performed Monte Carlo simulations with 500 runs to assess the poverty impacts of the SSM policy in a representative sample of 31 developing countries. The consequences for the incomes of each household were then assessed, taking into account the adverse impact of the decline in output on the farm incomes of households producing these goods, and the impacts on the welfare of each household from the change in prices resulting from the Q-SSM duty.

Our analysis suggests that yield volatility of output for the main staples (maize, rice, soybeans and wheat) is sufficient for SSM tariffs to be triggered quite often – between 44 per cent of the time for rice and 21 per cent for wheat. The results from this analysis suggest that use of the volume-based duty raises poverty in most countries because of the importance of food in the expenditure patterns of the poor, and the tendency for low income farmers to be net buyers of food. We estimate that use of the proposed Q-SSM measure would increase global poverty about 90 per cent of the time, with an average net increase in poverty of 24 million people.

The adverse impact of the duty on poverty is worse than it would be in a normal year because – at the time of an adverse yield shock – producers have less output on which to benefit from higher prices and fewer producers are net sellers of food. Typical poor producers who are or become net buyers of food are doubly disadvantaged in the situation – first by the adverse yield shock

that directly reduces their incomes and secondly by the duty-induced rise in prices that increases the cost of their food purchases. We calculate that about 2.5 million people would be thrown into poverty precisely due to the inappropriate timing of the SSM duties, which raise food prices at precisely the time that producers' incomes have fallen.

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