

Do national trade policy changes increase global food price volatility?

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Abstract

Price volatility in global agricultural markets has gained increasing prominence since the world food price crises of the years 2007-08 and 2010-11. While the public and media awareness focused on rising food price levels, the political response concentrated on food price volatility. This political priority is reflected in a dedicated target on food price volatility in the 2030 Agenda for Sustainable Development. National governments have frequently resorted to agricultural trade policy interventions as a means to stabilize domestic food prices with the aim of averting adverse effects on poor consumers and agricultural producers. However, there is a widespread concern that trade policy interventions result in even more volatile global market prices. Yet, the empirical evidence behind this concern is thin. If national trade policy interventions indeed increase global price volatility, their effects most likely appear on the day that trade policy changes are announced. This paper presents the first analysis on the effects of the announcement of national trade policy changes on global food price volatility. We develop an original dataset on announcements of national trade policy changes covering the main global staple crops, namely wheat, maize, and rice, and the time period from 2005 to 2017. Our results show that the announcement of national trade policy changes, specifically restrictive export and liberal import policies, can result in increases of global food price volatility on their announcement day and a few days thereafter, yet the persistence of these trade-policy related volatility effects is short. Moreover, the results show that adequate stock levels can minimize the observed short-term effects. Our results hence provide little empirical support to the concern that national agricultural trade policies exacerbate global food price volatility.

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1 Introduction

Price volatility in global agricultural markets has gained increasing prominence in the past decade. Much of this renewed attention can be attributed to the food price crises of the years 2007-08 and 2010-11 (Tadesse, Algieri, Kalkuhl, & Braun, 2014). Between 2006 and 2008 the Food and Agriculture Organization (FAO) of the United Nations' food price index rose by 38%, and between 2009 and 2011, again by 27% (Bellemare & Lee, 2016). While the ensuing public and media debate focused on these rising food price levels, the political response quickly concentrated on food price volatility (Bellemare, Barrett, & Just, 2013), that is fluctuations of food prices around their short-term trend. Policy makers around the world pushed for measures to limit food price volatility and stabilize prices (Bellemare & Lee, 2016). This shared political priority was consequentially also reflected in a dedicated target to "limit extreme food price volatility" in the 2030 Agenda for Sustainable Development, adopted in 2015 (Transforming our world: the 2030 Agenda for Sustainable Development, 2015).

The political focus on food price volatility can be explained by a shared consensus among countries that volatility is undesirable. In contrast, countries do not have such a shared consensus on the issue of high food prices as they affect countries unevenly. Food price volatility is widely seen as detrimental for producers and consumers alike, while high food prices have negative repercussions for consumers but benefit agricultural producers (HLPE, 2011). The welfare effect of high food prices hence depends on the sectoral composition of national economies. Where positive effects on agricultural producers outweigh adverse effects on food buyers, high food prices may overall have positive welfare and economic effects. The literature documents that the impact of high food prices on poverty and food security has indeed been uneven among and within countries (e.g. Headey, 2013; Headey & Martin, 2016; Ivanic, Martin, & Zaman, 2012; Ivanic & Martin, 2014; Anríquez, Daidone, & Mane, 2013).¹ In contrast, food price volatility induces price risk and uncertainty, which challenge both consumers and producer's ability to make decisions optimal for their welfare (e.g., Wossen, Berger, Haile, & Troost, 2018; Pieters & Swinnen, 2016; Dawe & Peter Timmer, 2012; Gouel, 2013). These effects are particularly detrimental in the developing world, where consumers and producers have limited options to hedge against price uncertainty (e.g. Magrini, Balié, & Morales-Opazo, 2017; Bellemare et al., 2013; Clapp, 2009; Naylor & Falcon, 2010; Gilbert & Morgan, 2010). In poor countries, volatile staple food prices can induce risks for poor farmers and consumers for falling into poverty traps, limit investment in agriculture and throughout the economy, and result in reduced income and food security (e.g. Wossen et al., 2018; Bellemare et al., 2013; Dawe & Peter Timmer, 2012;). The social relevance of limiting food price volatility is illustrated in Ethiopia, where Bellemare et al. (2013) show that the average household would be willing to pay 18% of their income to fully stabilize commodity prices. Given the value of stable food prices for consumers and producers, contrasted with

¹ For example, Headey and Martin (2016) show that sustained increases in food prices have often benefited the poor and likely contributed to faster global poverty reduction from the mid-2000s onward, and Headey (2013) finds that during the global food crises (2007-08), food security remained the same or even improved.

diverging effects of high food prices, it comes with no surprise that policy-makers emphasized measures to limit price volatility.

National governments have frequently resorted to trade policy interventions as a means to stabilize domestic food prices in the face of volatile global market prices (Gilbert & Morgan, 2010). However, there is a widespread concern that the result of these interventions are even more volatile global market prices, which in turn transmit back to domestic markets (Gilbert & Morgan, 2010). This concern is exemplified in the declaration of a summit convened at the FAO in 2008, which had reaffirmed “the need to minimise the use of restrictive measures that could increase volatility of international prices” (Food and Agriculture Organization of the United Nations, 2008, Para. 6e). These consequences for international price volatility could imply beggar-your-neighbour effects and limit the effectiveness of trade policies to create more stable domestic prices. To the extent that price volatility transmits from global markets to domestic markets, this concern is well founded. Ceballos, Hernandez, Minot, and Robles (2017) show statistically significant volatility transmission from global markets to domestic markets for wheat, rice and maize, with strongest effects for wheat. Yet, very little is known on the effects of national trade policy interventions on global price volatility in the first place.

The limited literature on the effects of trade policy interventions on global price volatility has thus far argued that restrictive trade policies have stronger effects on global food price volatility as compared to liberal trade policies, and that these effects are again more pronounced if restrictions concern exports rather than imports (e.g. Rude and An, 2015). Based on this argument, Rude and An (2015) focus on restrictive export policies and show that export taxes and quantitative export restrictions increased global price volatility of wheat, export taxes increase price volatility of rice, but neither increases price volatility of maize and soybean. Similar results for protectionist trade policies in general, without a distinction into import and export restrictions, are shown in a simulation study for the period 1970-2010 (Ivanic & Martin, 2014). Yet, we are not aware of any study that has empirically analyzed the postulated diverging effects of different types of trade policies. This is especially surprising as a frequent policy of importing countries in times of high and volatile global food prices are liberal import policies. For example, for the year 2008, Demeke, Pangrazio, and Maetz (2009) find that out of 81 countries in their sample, there were more countries that reduced tariffs or import custom fees (43) than countries that restricted or banned exports of agricultural commodities (25). There is a priori no reason why import policies, specifically liberal import policies, should have no effect on price volatility.

If national trade policy interventions indeed increase global price volatility, their effects most likely appear on the day that trade policy changes are announced. This paper presents the first analysis on the comparative effects of the announcement of trade policy measures on global grain price volatility. We focus on the announcement, rather than the implementation of trade policy measures, as market participants learn about a policy change on the announcement day. In an efficient market, this information should be immediately reflected in market participants’ expectations, and hence prices and volatility, while the actual implementation of changes, which is rarely on the same date, does not provide new information. Specifically, we analyse the volatility effects following the announcement of different types of national trade

policy changes, including the thus far neglected effects of liberal import policies. Moreover, our analysis is based on daily data, in contrast to monthly or annual data typically used in the existing literature. To do so, we develop an original dataset of announcements of national trade policy changes for the main global staple crops, namely wheat, maize, and rice, for the period 2005-2017. Our data captures the characteristics of policies announced, coded based on an extensive and replicable media search. We estimate daily price volatility from the daily range of futures prices, i.e. the difference between the highest and the lowest price observed on a given day, at the Chicago Board of Trade (CBOT). Our daily data further permits to estimate the persistence of volatility effects by the extent to which announcements of trade policy changes continue to affect price volatility after the event day. Persistent shocks have more important policy implications as they are more likely to transmit to domestic markets where food price volatility can cause adverse effects on producers and consumers.

2 Implications of Trade Policy for Global Food Price Volatility

The extent to which trade policies translate into price volatility depends on supply and demand elasticities (Gilbert & Morgan, 2010). For a global market of staple foods, these elasticities are generally assumed to be inelastic in the short term. On the production side, supply is inelastic in the short term due to the inherently lagged response of seasonal agricultural production, and demand is inelastic due to slow changes of dietary habits and, in developing countries, the dependence on staples for basic food security (Gilbert & Morgan, 2010). Our argument hence is that import policies (demand shocks) and export policies (supply shocks) can both affect world market price volatility.

Other factors may, however, moderate the effects of trade policies on price volatility. In particular, stockholding can affect the extent to which supply and demand shocks affect price volatility, which reflects the conceptual framework of the model of competitive storage (Gustafson, States, & Agriculture, 1958; Samuelson, 1971; Newbery & Stiglitz, 1981; Deaton & Laroque, 1992, Deaton & Laroque, 1996; Cafiero, E. S.A Bobenrieth H., J. R.A. Bobenrieth H., & Wright, 2011). Stocks dampen the effects of a given consumption or production shock on price volatility. In the presence of sufficient stocks, a given shock induces less uncertainty on future price developments, which translates into more limited price volatility effects.

Yet, stocks are more effective in reducing price volatility effects of positive supply and negative demand shocks, i.e. increases in supply or reductions of demand, than of negative supply or positive demand shocks, i.e. reductions of supply or increases of demand (Wright, 2011). In the event of positive supply and negative demand shocks, stockholders respond by building up stocks, and the resulting price effect on the world market is dampened through additional stock demand. In contrast, when a negative supply or positive demand shock affects world markets, the extent to which prices are moderated is limited by stock levels, i.e. carry-overs from past seasons that can be released. Restrictive export policies and liberal import policies represent such negative supply and positive demand shocks, and we hence expect accentuated price volatility effects for these two trade policy types.

Taken together, we hypothesize most pronounced effects of restrictive export policies and of liberal import policies on global food price volatility, particularly when stocks are low.

3 Methods

We put our arguments to an empirical test based on an original dataset on trade policy events from 2005 to 2017 for the world's most important staple crops and by estimating the storage-dependent effects of different types of trade policies on daily futures price ranges using a Conditional Autoregressive Range (CARR) model.

3.1 Conceptual Framework

We adopt a simple definition of agricultural trade policy. International trade refers to exchanges of commodities, such as goods and services, across national boundaries, whereas trade policies comprise the standards, goals, rules and regulations that govern such exchanges (Mitchell, 2008). Based on this general concept, agricultural trade policy is defined here as 1) an actual or potential decision by a national government or an institution controlled by the national government, that concerns 2) transboundary exchange in one or more agricultural commodities. The first component puts the focus on national trade policies. Trade policies by the European Union are included, as they can be understood as decisions pertaining to a group of sovereign countries. Multilateral trade agreements, such as those of the World Trade Organization (WTO), are not considered. The definition further excludes decisions of private sector traders but includes decisions by state-owned enterprises.

3.2 Case Selection

To study the influence of trade policy interventions on price volatility, we focus on wheat, maize and rice. This choice is motivated by their importance in global agricultural production, consumption and commodity trade. Maize, rice and wheat are the most important element in the human diet as they supply 42.5% of the world's food calories (Food and Agriculture Organization of the United Nations, 2016). In most developing countries, these grains provide more protein than fish or livestock products combined (Food and Agriculture Organization of the United Nations, 2016). All three crops have in the past been subject to trade policy interventions, which results in an adequate level of variation in the data and is sufficient for distinguishing the relative influence of different directions and types of trade policy interventions. We focus on a 12-year time period, from 2005 until mid 2017, which encompasses peaks in food prices observed for the years 2007 and 2008, as well as 2011, and periods of relatively stable or decreasing world market prices for grains since 2012. Currently available, comparable datasets only cover the time after 2008, for example the Global Trade Alert database (Evenett, 2009).

3.3 Empirical Estimation

Since we are interested in the announcement effects of trade policy changes (also referred to as “events” for the remainder of this paper) on food price volatility, we use an event study approach. Our empirical setting requires times series of daily volatilities. However, volatility (i.e., the second moment of the return distribution) is generally unobservable and has to be estimated from observed prices. We estimate daily volatility for the three crops of interest from the range-based approach suggested by Parkinson (1980). Let P_τ be the price of an asset at time τ . The price range over an interval $[t-1, t]$, defined as

$$R_t = \max\{\ln(P_\tau)\} - \min\{\ln(P_\tau)\},$$

$$\text{where } \tau \in [t - 1, t], \quad (1)$$

is an unbiased estimator of volatility. Compared to standard return-based measures, which are based on the difference of close-to-close prices, the range-based estimator incorporates more information, as it also captures the intra-period (i.e., within day) price movements that return-based volatility measures ignore.

For our empirical design, we use the Conditional Autoregressive Range (CARR) model, initially proposed by Chou (2005). The model is a variant of the ARCH/GARCH family of models developed by Engle (1982) and Bollerslev (1986), which are widely used for modelling time series of (conditional) volatilities. The CARR model, however, is based on ranges, rather than returns, which makes the model more informationally efficient, as shown by Alizadeh, Brandt, and Diebold (2002) and Brandt and Jones (2006).

Although initially formulated as an autoregressive model, the CARR model can be extended to take additional explanatory variables into account (then termed CARRX). A CARRX model of order (p, q, l) is given by:

$$R_t = \lambda_t \varepsilon_t,$$

$$\lambda_t = \omega + \sum_{i=1}^p \alpha_i R_{t-i} + \sum_{j=1}^q \beta_j \lambda_{t-j} + \sum_{k=1}^l \gamma_k X_{t,k}, \quad (2)$$

where λ_t denotes the conditional mean of the range, based on all information up to time t , and ε_t is the shock to the range. The parameter ω characterizes the inherent uncertainty in the range, α describes the short-term impact of a prior shock, and β describe the long-term effect of past shocks to the range.

Exogenous variables are denoted by $X_{t,k}$. The main explanatory variable used in this paper is trade policy changes, which we code as dummy variables that take on the value 1 on the announcement day of a trade policy event, and are zero otherwise. We construct one vector of dummy variables for each type of policy events. The parameter γ measures the impact of trade policy changes on conditional volatility. Similar approaches have been used by Auer (2016) and Haase and Huss (2018), among others. Based on our argument, a strong positive coefficient is expected for restrictive export and liberal import policies.

3.4 Data on Trade Policy

The maize, rice and wheat trade policy changes are identified through a media search and hand-coded in terms of their type and the direction of change. The coding procedure and indicators were developed by experts within our research consortium (see Appendix A.2).

The media search was done on the “Factiva” database and restricted to English-language articles on the “Reuters Newsfeed”, published between January 2005 and July 2017. As we seek to assess the effects of trade policy on global food prices, measured at the Chicago Mercantile Exchange (CME), there is little reason to assume that trade policies reported in non-English media would have effects on global markets. Search terms include keywords for classes of trade policy measures and all synonyms and singular/plural forms, and where applicable, verb forms, e.g. quota and limit, duty and duties, suspension and suspend*. The full search string is available in the code book in Appendix A.2.

The media search resulted in 27’507 articles. The date and time of publication as well as the standard reference number were automatically extracted from these articles, using an own text mining algorithm. Apart from date and time, all indicators were hand-coded by a dedicated team at the Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD), after a coding training workshop. Relevance of the article was assessed as the first step. As to be expected, the media search yielded a much smaller number of relevant articles; 1’165 articles were identified as relevant. As some of these relevant articles concerned several trade policy changes or affected more than one commodity, the total number of identified trade policy events is 1’737.

For the purpose of this analysis, the authors did additional hand-coding for all identified trade policy events to flag articles that present new information as compared to previous articles on the same trade policy change. Out of 1737 articles, 812 presented new information, which form the data used in this paper (see also Table A-1 in Appendix A.1, which shows the number of trade policy events by country).

3.5 Types of Trade Policy

For each article, the type of trade policy was coded, i.e. whether it is a tariff measure or a non-tariff measure, and what kind of. Tariffs are defined as “customs duties on merchandise import” (World Trade Organization, 2018). Non-tariff measures are defined as “policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both” (United Nations Conference on Trade and Development, 2015, p. 1). We use the International Classification of Non-Tariff Measures developed by the Multi-Agency Support Team (MAST) group to classify different types of non-tariff measures (United Nations Conference on Trade and Development, 2015). We summarize some very specific sub-classifications developed by the MAST group in their higher-level groupings, thereby reducing the level of detail while maintaining the overall (aggregate) categories. The groupings, codings, and respective descriptions are available in a separate codebook for trade policy measures (see Appendix A.3).

3.6 Direction of Change

We seek to assess the effects of trade policy changes contingent on whether they are expected to increase or decrease world market demand or supply. For the purpose of a simplified coding instruction, the direction of the reported change was coded. For example, if an export tax on maize is changed from 5% to 10%, the new policy is coded as “higher” (H). On the other hand, if an import quota on rice is changed from 1 Million tonnes down to 0.5 Million tonnes, the new policy is coded as “lower” (L). Based on these coded indicators, we developed a ruleset which shows for each type of trade policy and for each direction, whether the trade policy change leads to higher or lower world market supply, or higher or lower world market demand. For example, a higher export tax is expected to lower world market supply, while a lower import quota is anticipated to lower world market demand. The rules for classification of world market effects are shown in Appendix A.4. Table 1 presents an overview of trade policy events in our dataset according to their direction and the affected crop.

Table 1: **Counts of Types of Trade Policy Events by Commodity in our Dataset.** Numbers show counts of total trade policy events recorded for the observation period.

	Liberal Import <i>(Higher World Market Demand)</i>	Restrictive Export <i>(Lower World Market Supply)</i>	Restrictive Import <i>(Lower World Market Demand)</i>	Liberal Export <i>(Higher World Market Supply)</i>	Total
Wheat	95	94	47	108	344
Maize	53	69	21	69	212
Rice	44	90	38	84	256
Total	192	253	106	261	812

3.7 Grain Price Data

To proxy for global grain prices, and their volatilities, respectively, we use the prices of nearby futures contracts (i.e., contracts with the shortest time to maturity) traded at the Chicago Board of Trade (CBOT), which is part of the CME. This choice reflects the assumption that the analysis of food price volatility, as done in this paper, requires daily price observations. Such data is not available for (the generally unobservable) spot markets, in particular at the global level. The contracts traded at the CBOT are characterised by high trading volumes, and usually provide the highest liquidity compared to other exchanges, in particular for wheat and maize (termed “corn” at the CBOT). They are therefore typically the preferred contracts for global actors, even outside the US, for the purpose of hedging against future price risks. These characteristics make them a suitable estimate for global grain prices, which are the basis for our estimates on daily price volatility.

The futures price data was obtained from the Thomson Reuters Datastream. To calculate our volatility measure, we gather the highest and lowest price recorded by the exchange for each trading day. The sample period starts in January 2005, which coincides with the start of the data collected on trade policy announcements. The end of the sample period is March 2018

for each commodity. This enables us to analyse the volatility dynamics in the time following the last trade policy announcement in our dataset (June 2017).

3.8 Stocks Data

We identify periods of high and low stocks from the stock-to-use ratio, which is measured as the end of period stock level, divided by the period consumption. Specifically, we classify a month as a low stock period if the stocks-to-use level is below the first quintile during the observation period (2005-2017). We use stocks-to-use data for the United States, which is compiled by the United States Department for Agriculture (USDA) and available at monthly frequency from their World Supply and Demand Estimates report (USDA FAS, 2018). Data for global stock-to-use estimates are only available on an annual frequency. However, United States stocks data may be a more relevant indicator for our analysis, given that price volatility is measured here as the daily range of futures prices at the Chicago Mercantile Exchange.

4 Results

4.1 Grain Trade Policy Events 2005-2017

In the observation period, the global trade of maize, rice and wheat was subject to frequent trade policy events as well as changing patterns in price volatility. Figure 1 summarizes the number of trade policy events in each month during the observation period, and shows the daily price ranges for each commodity.

Compared to maize and rice, wheat was subject to a higher number of trade policy changes (see also Table 1). Although announcements of trade policy events occur over the entire observation period, the number of announcements is particularly clustered in the years 2007 and 2011 for the three grains. The figure also indicates that price volatility is highly time varying and reaches a peak during the years 2008 and 2009, the time of the global food price crisis, suggesting that increases in volatility were preceded by more frequent trade policy events in the months before.

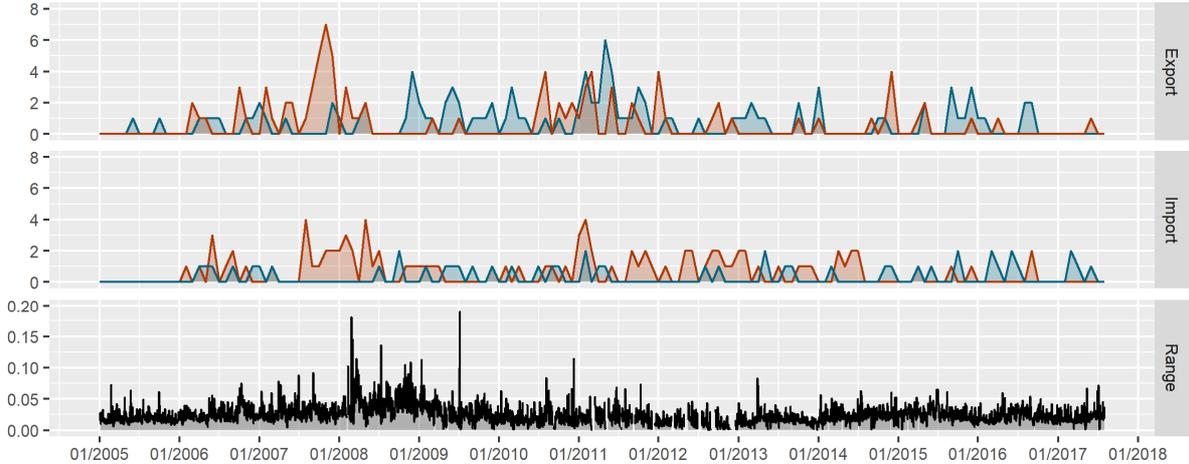
The figure further discriminates between export-related (upper panel) and import-related trade policy events (middle panel), as well as the direction of trade policy events in terms of their expected effect on world market supply and demand. Trade policies that represent a negative supply or a positive demand shock, for which we expect pronounced volatility effects, are shown with red lines. For example, a higher number of events that imply a negative supply or a positive demand shock (red lines) is observed for the year 2007, whereas more events that imply a positive supply or a negative demand shock (blue lines) occurred in 2009.

The results obtained from the CARR model mirror the impressions from the visual inspection of our data on price volatility. For all three commodities, price volatility was slightly higher in spike years (2007/08), although the increase is only statistically significant for maize (see Table 2, last Column). Overall, the impact of a prior shock to next day's volatility is similar for wheat and maize, but higher for rice, as indicated by a higher alpha value. Correspondingly, the long-

term effect of shocks is smaller for rice, as compared to wheat and maize, which is indicated by a lower beta value. The omega, alpha and beta coefficients reported in Table 2 remain almost identical in all augmented model specifications (i.e., augmented with policy dummy variables) presented in this paper. For the sake of brevity, we only report the coefficients for the exogenous variables added to the model. The complete results are available upon request from the authors.

Figure 1: Frequency and Direction of Trade Policy Events from 2005-2017

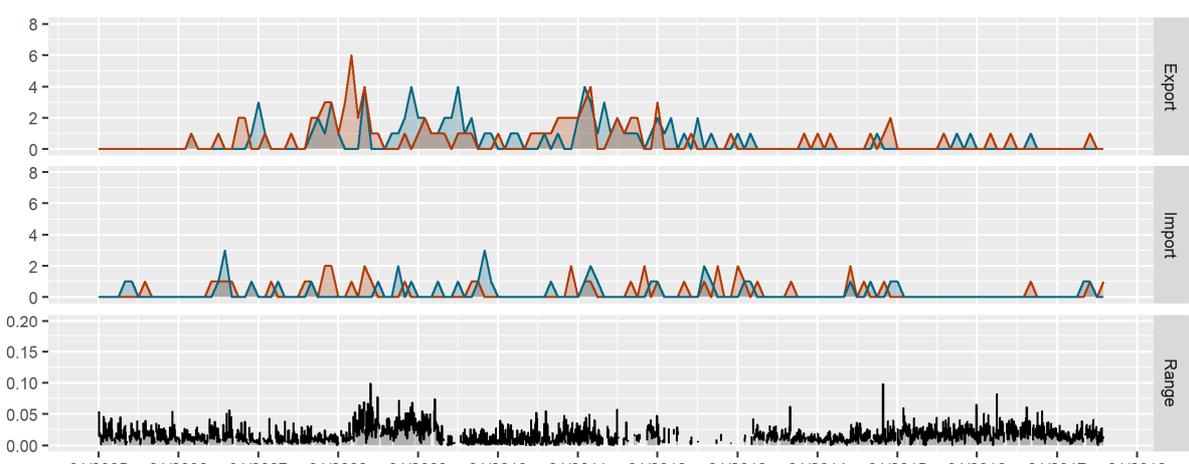
a) Wheat



b) Maize



c) Rice



Note: Trade policy events and price ranges (volatility) for a) wheat, b) maize, and c) rice. For each commodity, the upper and middle panels show counts of monthly trade policy events affecting exports (upper) and imports (middle), and the lower panel shows daily futures price range. For upper and middle panels, red lines show trade policy events that represent a negative supply or a positive demand shock, and blue lines show events that imply positive supply or negative demand shocks.

Table 2: **CARR model estimates for the observation period and effects of years 2007/2008.** Table shows CARR model estimates with effect of spike year 2007 and 2008 as exogenous dummy variable. First row for each crop shows coefficients, second row shows p-values. Significance levels: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

		omega	alpha	beta	2007/2008
Wheat	Coefficient	0.0003**	0.1348***	0.8626***	0.0002
	p-value	0.0106	0.0000	0.0000	0.2870
Maize	Coefficient	0.0003***	0.1459***	0.8382***	0.0002*
	p-value	0.0001	0.0000	0.0000	0.0813
Rice	Coefficient	0.0007***	0.2461***	0.7331***	0.0001
	p-value	0.0014	0.0000	0.0000	0.6382

4.2 Announcement Day Effects

We hypothesize that the announcement of restrictive export and of liberal import policies leads to pronounced increases in global grain price volatility, particularly when stocks are low. These effects should be highest on the announcement day, which is the day when the trade policy event was announced. If no futures contracts were traded that day, the announcement day reflects the next date when futures contracts were traded again.

Columns 1 and 2 of Table 3 present the effects of the announcement of restrictive export policies and liberal import policies. Announcement effects of policies where we expect more limited effects, i.e. liberal export policies and restrictive import policies, are displayed in Columns 3 and 4. Consistent with our expectation, our results suggest that the announcements of different types of trade policy changes have distinct effects on price volatility. We further find heterogenous effects for the different crops.

While the announcement of restrictive export policies significantly increases the price volatility of wheat on the announcement day, the coefficient for the announcement of liberal import policies is not statistically significant. In contrast, for maize, announcements of liberal import policies significantly increase price volatility, whereas no statistically significant effects are observed for restrictive export policies. Announcements effects of other types of trade policies for these two crops are insignificant on the announcement day. These results are consistent with our hypothesis that import and export policies can both affect price volatility, and that their effects are more pronounced when they induce negative supply shocks or positive demand shocks.

The opposite effect is observed for rice. Restrictive export policies and liberal import policies do not appear to affect price volatility. However, announcements of liberal export policies and of restrictive import policies show statistically significant reductions of price volatility on the announcement day. Though we had expected less pronounced effects for these trade policies that can cause positive supply and negative demand shocks, a reduction of volatility is surprising.

We further augment the analysis to consider effects of trade policy events conditional on the prevailing stock level (see Table 4). We identify periods of high and low stocks from the stock-to-use ratio, and classify a month as a low stock period if the stocks-to-use level is below the first quintile during the observation period (see Chapter 3.8). The results are robust to an alternative stock-to-use threshold (see Table A-2, Appendix A.1).

The results show, as expected, that stocks moderate the effects of announcements of trade policies for wheat and rice, but stocks do not appear to substantially moderate effects for maize (see Table 4). For wheat, the results indicate that announcements of protectionist export policies and of liberal import policies only significantly increase price volatility on the announcement day if they fall into periods of low stocks, which is consistent with our hypothesis. In the case of announcements of liberal import policies when stocks are high, the results show a statistically significant reduction of announcement day price volatility. The results for rice suggest that the reported surprising effects of the announcements of liberal export and protectionist import policies, are concentrated on periods of high stocks. For maize, the coefficients for the respective effects for announcements concerning trade policies on maize are similar for low and high stocks.

To summarize, our results show that the announcement of restrictive export policies leads to statistically significant increases in volatility for wheat, whereas the announcement of liberal import policies increases price volatility for both maize and wheat, though the latter only when stocks are low. Surprisingly, for rice, we do not find statistically significant effects for these policies, though we find that liberal export policies and restrictive import policies lead to a statistically significant reduction in price volatility, albeit only so when stocks are high. These results lend support to our argument that both import and export policies can have effects on global food price volatility on the announcement day.

Table 3: Effects of Import and Export Policy Announcements on Price Volatility. The table reports CARRX model coefficients of the exogenous variables (i.e., policy dummies) by type of trade policy (positive export and import, as well as negative export and import trade policy shocks), crop, and the prevailing stock level at the time of the announcement. Coefficients show effect on global food price volatility by commodity. Significance levels: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

		Liberal Import (1)	Restrictive Export (2)	Restrictive Import (3)	Liberal Export (4)
Wheat	Coefficient	-0.0007	0.0013**	-0.0004	-0.0005
	p-value	0.1948	0.0377	0.6405	0.3346
Maize	Coefficient	0.0012*	0.0007	0.0010	0.0003
	p-value	0.0886	0.2331	0.3470	0.6499
Rice	Coefficient	0.0004	-0.0003	-0.0017**	-0.0016***
	p-value	0.6591	0.6596	0.0316	0.0022

Table 4: **Comparison of the Effect of Trade Policy Events in Low and High Stock Periods.** The table reports CARRX model coefficients of the exogenous variables (i.e., policy dummies) by type of trade policy, crop, and the prevailing stock level at the time of the announcement. First row for each crop shows coefficients, second row shows p-values. Coefficients show effect on global food price volatility by commodity. Threshold for low stocks set at the 0.2 percentile. Significance levels: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	Liberal Import		Restrictive Export		Restrictive Import		Liberal Export	
	(1)		(2)		(3)		(4)	
	Low Stocks	High Stocks	Low Stocks	High Stocks	Low Stocks	High Stocks	Low Stocks	High Stocks
Wheat	0.0021*	-0.0014**	0.0019**	0.0007	0.0009	-0.0005	-0.0003	-0.0005
	0.0761	0.0113	0.0429	0.3734	0.8199	0.5913	0.8493	0.3571
Maize	0.0011	0.0011	0.0005	0.0011	0.0017	0.0007	0.0010	-0.0005
	0.3189	0.1829	0.3837	0.1107	0.4473	0.5213	0.1888	0.4588
Rice	0.0006	0.0003	-0.0004	-0.0008	0.0016	-0.0022***	-0.0005	-0.0022***
	0.7768	0.7267	0.5684	0.2562	0.5561	0.0068	0.7017	0.0006

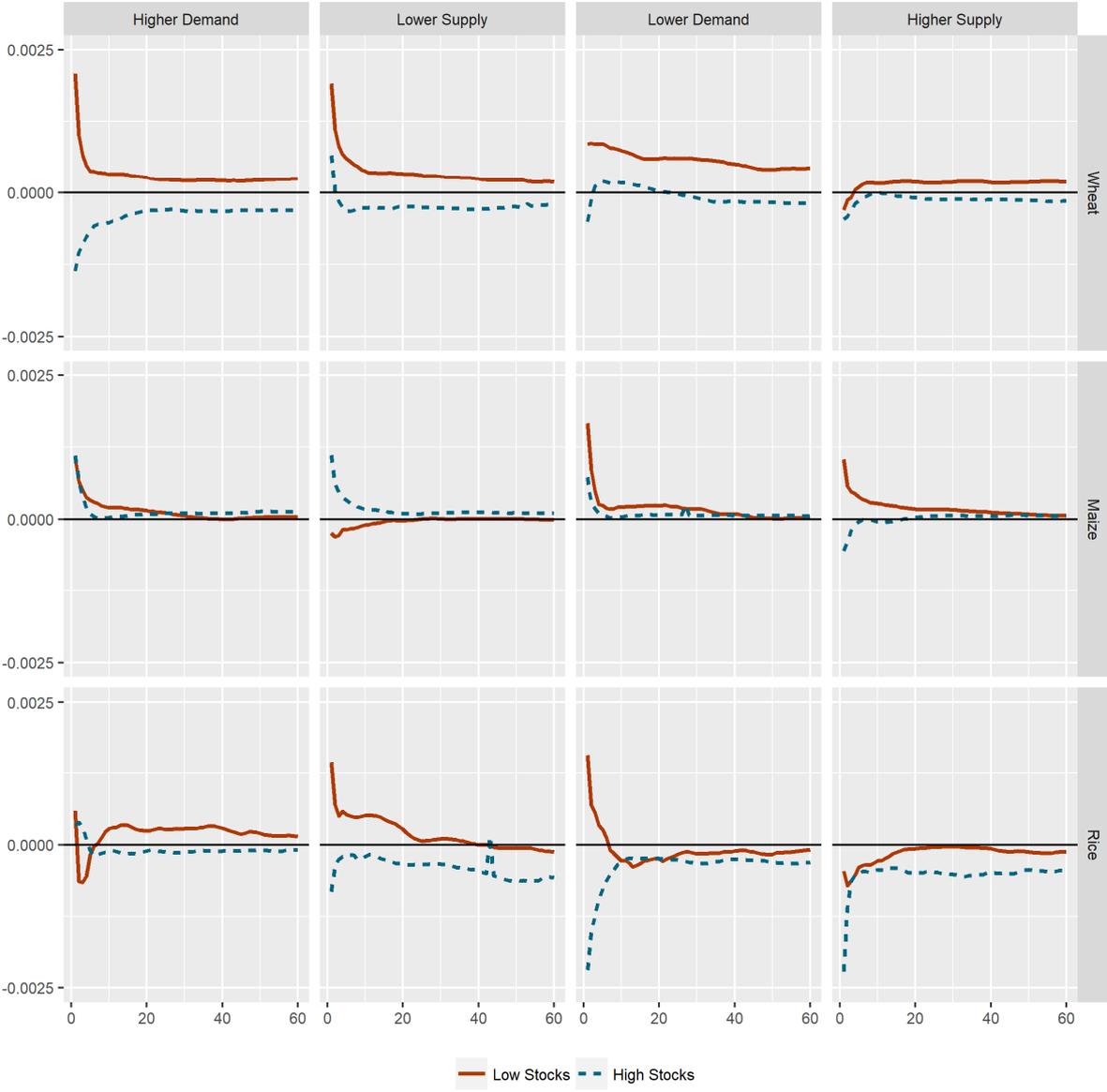
4.3 Persistence of Event Effects

From a policy perspective, the persistence of price volatility effects are of particular importance as longer-term shocks are more likely to cause adverse effects on producers and consumers. To analyze the persistence of effects, we gradually extend the event window beyond the announcement day. Specifically, we consecutively add one or more days to the corresponding dummy variable in the CARR model and re-estimate the model for each extended window.

Figure 2 shows results for the persistence of price volatility shocks induced by announcements of different types of trade policies, dependent on levels of stocks. Visual inspection shows that the induced shocks persist only for a few days after the announcement day. The effects quickly tend to zero as the event window is extended. In almost all combinations of types of trade policies announced and crops studied, the increase in event window price volatility is negligible after 10 days. The shocks tend to persist slightly longer if stocks are low (red, solid line) compared to high stocks (blue, dashed line).

Effect estimates for selected event windows are shown in Table 5. They mirror the insight from visual inspection. Coefficients decrease quickly with extension of the event window, and shocks are slightly more persistent for wheat and rice, as compared to maize. The results remain robust when using an alternative threshold for the distinction in low and high stock periods (see Table A-4, Appendix A.1).

Figure 2: Persistence of Abnormal Price Volatility Across Different Types of Trade Policies and Crops



Note: Model coefficients by type of trade policy and crop. Each sub-panel shows estimates by trade policy type (vertical), and by crop (horizontal). For each sub-panel, the red line shows effects in periods of low stocks, the blue, dashed line shows effects when stocks are high, x-axis shows the number of days for the event window estimated, and y-axis are effects on price volatility, expressed as the coefficients from model estimates.

Table 5: **Persistence of Trade Policy Induced Price Volatility.** The table reports CARRX model coefficients of the exogenous variables (i.e., policy dummies) by type of trade policy, crop, and the prevailing stock level at the time of the announcement. The variable “d” denotes the number of consecutive days after the policy announcement included in the dummy variable of the respective model specification. “W” denotes wheat, “M” denotes maize, and “R” denotes rice. The threshold for low stocks is set at the 0.2 percentile. Significance levels: *** p < 0.01; ** p < 0.05; * p < 0.1. For easier readability, p-values are not reported, but are available from the authors upon request.

		Liberal Import		Restrictive Export		Restrictive Import		Liberal Export	
		(1)		(2)		(3)		(4)	
	d	Low Stocks	High Stocks	Low Stocks	High Stocks	Low Stocks	High Stocks	Low Stocks	High Stocks
W	1	0.0021*	-0.0014**	0.0019**	0.0007	0.0009	-0.0005	-0.0003	-0.0005
	3	0.0007	-0.0009***	0.0008**	-0.0002	0.0009	0.0001	-0.0001	-0.0003
	5	0.0004	-0.0007***	0.0006**	-0.0003*	0.0009	0.0002	0.0001	-0.0001
	10	0.0003*	-0.0005***	0.0004*	-0.0003***	0.0007	0.0002	0.0002	-0.0000
	20	0.0003**	-0.0003***	0.0003**	-0.0002***	0.0006**	0.0000	0.0002	-0.0001
	60	0.0002**	-0.0003***	0.0002*	-0.0002***	0.0004**	-0.0002***	0.0002*	-0.0001
M	1	0.0011	0.0011	-0.0002	0.0011	0.0017	0.0007	0.0010	-0.0005
	3	0.0005	0.0004	-0.0003	0.0005	0.0005	0.0002	0.0005	-0.0002
	5	0.0003	0.0001	-0.0002	0.0003*	0.0002	0.0001	0.0004*	-0.0000
	10	0.0002	0.0000	-0.0001	0.0002	0.0002	0.0000	0.0003**	-0.0000
	20	0.0001	0.0001	-0.0000	0.0001	0.0002	0.0001	0.0002*	0.0000
	60	0.0000	0.0001**	-0.0000	0.0001*	0.0000	0.0001	0.0001	0.0001
R	1	0.0006	0.0003	0.0014	-0.0008	0.0016	-0.0022***	-0.0005	-0.0022***
	3	-0.0007	0.0003	0.0005	-0.0003	0.0006	-0.0012***	-0.0006	-0.0006**
	5	-0.0002	-0.0001	0.0005	-0.0002	0.0003	-0.0008***	-0.0004	-0.0005**
	10	0.0003	-0.0001	0.0005	-0.0002	-0.0003	-0.0003	-0.0003	-0.0004***
	20	0.0002	-0.0001	0.0003	-0.0003***	-0.0002	-0.0002*	-0.0001	-0.0005***
	60	0.0001	-0.0001	-0.0001	-0.0006***	-0.0001	-0.0003**	-0.0001	-0.0005***

5 Discussion and Conclusion

In the past decade, national governments have frequently used trade policy interventions with the intention to stabilize domestic food prices and avert negative welfare effects of volatile global food prices. These policies were argued to exacerbate global price volatility, and blamed as beggar-your-neighbour policies, although the existing empirical evidence is scarce on this topic. Our results do not lend support to this argument. Although we find that the announcement of trade policy changes can affect price volatility on the announcement day, consistent with our expectations, these effects are short-term and have very limited persistence.

Our results show that the announcement of trade policy changes can increase global food price volatility on the announcement day and a few days thereafter, however, only in time periods of low stocks. When stocks are low, restrictive export policies increase global price volatility of wheat, but not for rice and maize, and liberal import policies increase global price volatility of wheat and maize, but again not for rice. We do not find any statistically significant increases of price volatility for either wheat, maize or rice in times of high stocks. This result is consistent with our argument that stocks can dampen the effects of a given trade policy shock on price volatility.

An important contribution of this paper is the finding that liberal import policies can increase short-term price volatility. This stands in stark contrast to the existing literature, which had argued, but not empirically tested, that liberal import policies “likely had little effect on world price volatility” (Rude & An, 2015, p. 84). The finding has potential implications for the broader literature on the effects of trade policies on price levels. Studies in this strand of research, likewise, either analyze effects of export restrictions or protectionist measures in general, often concluding that trade policy interventions have strong effects on rice and wheat price increases, but only small effects on high maize price levels (e.g. Yu, Tokgoz, Wailes, & Chavez, 2011; Anderson & Nelgen, 2012; Martin & Anderson, 2012; Jensen & Anderson, 2015). Clearly, using our newly established dataset to study effects on food price levels is an opportunity for further research. The dataset used here provides ample opportunities in this direction.

Our empirical setup has important implications for the findings on rice price volatility, where we do not find statistically significant effects following the announcements of restrictive export and liberal import policies, even when stocks are low. This is surprising as it is frequently argued that both global rice demand and supply are the most inelastic of the staple crops studied here, and we consequentially would anticipate that the announcements of restrictive export policies and liberal import policies lead to pronounced effects on price volatility. However, results from an earlier study by Rude and An (2015) had also pointed to mixed-effects for rice as they show that while export taxes increase rice price volatility, quantitative export restrictions do not have effects. Moreover, our results even show statistically significant reductions in rice price volatility for liberal export and restrictive import policies, though only when stocks are high. A possible explanation lies in the structure of the rice market, which is distinctly different to wheat and maize markets. Only a small fraction of rice is traded internationally “as rice is mostly consumed where it is produced” (Timmer, 2010, p. 3). This

implies that trade policies may only affect a relatively small quantity of total global rice consumption and production, and its effects on inducing price uncertainty may hence also be small. At the same time, the limited international trade gives rise to an important caveat concerning our results on rice. As rice is only thinly traded in futures markets (Timmer, 2010), CBOT futures prices may be less representative as proxy for spot market prices for rice as compared to maize or wheat.

While our study analyses the effects of trade policy changes on global food price volatility, it does not empirically address the mechanisms that cause national trade policy changes. Trade policy changes may be announced as a response to past global price volatility, but could also be due to other factors, such as direct national food security concerns. This points out that trade policy may be endogenous to price volatility. However, our methodological approach with its focus on daily events makes such endogeneity unlikely. It is reasonable to assume that trade policy changes on a given day are not the result of same day price volatility. Furthermore, this study does not consider whether excess speculation in futures markets may reduce the effects of trade policy events on global food price volatility (e.g., Haase and Huss, 2018).

These limitations notwithstanding, our results suggest that while trade policy changes, specifically restrictive export and liberal import policies, can indeed result in increases of global food price volatility on their announcement day and a few days thereafter, the persistence of these trade-policy related volatility effects is short. Such short-term effects are unlikely to be a major concern for food security and livelihoods of agricultural producers and poor consumers in developing countries. Our results hence do not provide empirical evidence that underpins the widespread political concern that agricultural trade policies exacerbate global food price volatility. The results further highlight that adequate stock levels can minimize such short-term effects, and further reduce their persistence. For policy-makers aiming to reduce food price volatility, for example as part of the 2030 Agenda for Sustainable Development, our results imply that adequate stock levels can buffer short-term volatility effects of trade policy events.

A. Appendix

A.1 Supplementary Tables

Table A-1: **Counts of Trade Policy Events by Country in our Dataset.** Numbers show counts of total trade policy events recorded for the observation period.

	Country Name	Event Count
1	Russian Federation	131
2	Ukraine	111
3	India	94
4	Argentina	62
5	European Union	49
6	China	41
7	Viet Nam	32
8	Indonesia	27
9	Morocco	27
10	Egypt	25
11	Bangladesh	21
12	Pakistan	18
13	Philippines	16
14	Brazil	15
15	Kazakhstan	12
16	Korea, Republic of	12
17	Tanzania, United Republic of	10
18	Serbia	8
19	Taiwan, Province of China	8
20	Zambia	8
21	Canada	6
22	Iran, Islamic Republic of	6
23	Algeria	5
24	Turkey	5
25	Croatia	4

Table A-1 - Continued

	Country Name	Event Count
26	Kenya	4
27	Mexico	4
28	Nigeria	4
29	Paraguay	4
30	Burundi	3
31	Cameroon	3
32	Guatemala	3
33	Malawi	3
34	Zimbabwe	3
35	Australia	2
36	Colombia	2
37	Japan	2
38	Myanmar	2
39	Nepal	2
40	Peru	2
41	Romania	2
42	Saudi Arabia	2
43	South Africa	2
44	Syrian Arab Republic	2
45	Bulgaria	1
46	Cambodia	1
47	Chile	1
48	Ecuador	1
49	Iraq	1
50	Lebanon	1
51	Sri Lanka	1
52	Thailand	1

Table A-2: Effects of Import and Export Policy Announcements on Price Volatility - Alternative Stock Threshold.
The table reports CARRX model coefficients of the exogenous variables (i.e., policy dummies) by type of trade policy (positive export and import, as well as negative export and import trade policy shocks), crop, and the prevailing stock level at the time of the announcement. Coefficients show effect on global food price volatility by commodity. Significance levels: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	Liberal Import		Restrictive Export		Restrictive Import		Liberal Export	
	(1)		(2)		(3)		(4)	
	Low Stocks	High Stocks	Low Stocks	High Stocks	Low Stocks	High Stocks	Low Stocks	High Stocks
Wheat	0.0024**	-0.0017***	0.0021**	0.0005	0.0016	-0.0008	0.0006	-0.0006
	0.0263	0.0020	0.0233	0.5453	0.5050	0.4277	0.6741	0.2545
Maize	0.0005	0.0015*	-0.0002	0.0012*	0.0021	0.0005	0.0008	-0.0005
	0.6345	0.0821	0.8093	0.0932	0.2838	0.6878	0.2815	0.5431
Rice	-0.0012	0.0013	0.0006	-0.0008	0.0011	-0.0022***	-0.0001	-0.0025***
	0.3589	0.2882	0.6040	0.3276	0.6397	0.0058	0.9011	0.0002

Table A-3: **Effects of Import and Export Policy Announcements on Price Volatility Conditional on Trade Importance of Countries.** The table reports CARRX model coefficients of the exogenous variables (i.e., policy dummies) by type of trade policy (positive export and import, as well as negative export and import trade policy shocks), commodity, and the trade importance of a country in the year preceding the announcement. High importance means that a country has a share of $\geq 1\%$ of total world market imports (Columns 1,3) or world market exports (Columns 2,4) for each given commodity. Coefficients show effect on global food price volatility by commodity. Significance levels: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	Liberal Import		Restrictive Export		Restrictive Import		Liberal Export	
	(1)		(2)		(3)		(4)	
	High Import	Low Import	High Export	Low Export	High Import	Low Import	High Export	Low Export
Wheat	-0,0017***	0,0021*	0,0016**	-0,0025	-0,0007	0,0000	-0,0004	-0,0022
	0,0035	0,0672	0,0151	0,1848	0,5463	0,9933	0,3937	0,4513
Maize	0,0012	0,0008	0,0009	-0,0004	0,0028*	-0,0014	0,0001	0,0008
	0,1123	0,4864	0,1576	0,8082	0,0533	0,3536	0,8130	0,5664
Rice	0,0014	-0,0006	-0,0000	-0,0009	-0,0023**	-0,0004	-0,0021***	-0,0001
	0,2760	0,5911	0,9621	0,4521	0,0130	0,8181	0,0005	0,8993

Table A-4: **Persistence of Trade Policy Induced Price Volatility - Alternative Stock Threshold.** The table reports CARRX model coefficients of the exogenous variables (i.e., policy dummies) by type of trade policy, crop, and the prevailing stock level at the time of the announcement (threshold for low stocks set at the 0.3 percentile). The variable “d” denotes the number of consecutive days after the policy announcement included in the dummy variable of the respective model specification. “W” denotes wheat, “M” denotes maize, and “R” denotes rice. The threshold for low stocks is set at the 0.2 percentile. Significance levels: *** p < 0.01; ** p < 0.05; * p < 0.1. For easier readability, p-values are not reported, but are available from the authors upon request.

		Liberal Import		Restrictive Export		Restrictive Import		Liberal Export	
		(1)		(2)		(3)		(4)	
	d	Low Stocks	High Stocks	Low Stocks	High Stocks	Low Stocks	High Stocks	Low Stocks	High Stocks
W	1	0.0024**	-0.0017***	0.0021**	0.0005	0.0016	-0.0008	0.0006*	-0.0006
	3	0.0008**	-0.0010***	0.0009**	-0.0002	0.0011	0.0000	0.0002	-0.0004*
	5	0.0005*	-0.0008***	0.0006**	-0.0004**	0.0009	0.0001	0.0003	-0.0002
	10	0.0004**	-0.0006***	0.0004*	-0.0003***	0.0006**	0.0001	0.0002	0.0000
	20	0.0003***	-0.0004***	0.0003**	-0.0003***	0.0005*	0.0000	0.0002*	-0.0001*
	60	0.0003***	-0.0004***	0.0002**	-0.0002***	0.0003**	-0.0002***	0.0003***	-0.0002***
M	1	0.0005	0.0015*	-0.0002	0.0012*	0.0021	0.0005	0.0008	-0.0005
	3	0.0002	0.0006*	-0.0002	0.0005*	0.0005	0.0002	0.0004	-0.0002
	5	0.0002	0.0002	-0.0001	0.0003*	0.0002	0.0001	0.0003	0.0000
	10	0.0001	0.0001	-0.0001	0.0002	0.0001	0.0001	0.0002	0.0000
	20	0.0001	0.0001	0.0000	0.0001	0.0000	0.0001	0.0001	0.0001
	60	0.0000	0.0001*	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
R	1	-0.0012	0.0013	0.0006	-0.0008	0.0011	-0.0022***	-0.0001	-0.0025***
	3	-0.0007	0.0006	0.0003	-0.0003	0.0006	-0.0013***	-0.0005	-0.0007**
	5	-0.0003	0.0001	0.0003	-0.0002	0.0003	-0.0008***	-0.0003	-0.0006***
	10	0.0001	-0.0001	0.0002	-0.0002	0.0000	-0.0004*	-0.0002	-0.0005***
	20	0.0000	-0.0001	0.0001	-0.0003**	-0.0001	-0.0003*	0.0000	-0.0005***
	60	0.0001	-0.0001	-0.0001	-0.0005***	0.0001	-0.0003***	0.0000	-0.0005***

A.2 Codebook

The media search was done on the “Factiva” database and restricted to English-language articles on the “Reuters Newsfeed”, published between January 2005 and July 2017 (see Chapter 3.4). The following search string was used:

(non-tariff or pre-shipment inspection* or trade-protective or antidumping or countervailing or licencing or licence* or quota* or prohibition* or ban or bans or banned or suspend* or restraint* or price-control* or tax or taxes or customs charge* or custom* or minimum price* or reference price* or export-price restraint* or variable charge* or customs surcharge* or duty or duties or internal tax or internal taxes or internal charge* or trade finance or trade financing or affecting competition or local content* or localisation or trade-balancing or distribution restriction* or post-sales service* or subsidies or subsidy or loan* or grant* or procurement* or rules of origin or rule of origin or quantitative restriction* or permit* or registration* or state-trading* or state trad* or re-export* or re-import*) and (import or imports or export or exports) and (wheat or maize or corn or rice)*

The following presents the coding guidance used by the research team, which can also serve to replicate the data collection and measurement.

General Rule:

- Type HELP if you don’t know how to fill-out a specific cell and require assistance

a) Information Reference Number

Explanation: The variable contains the unique reference number assigned to each article. The number can be found at the very end of each media article, and looks for example like this “LBA0000020061009e2a90018a”. Copy-paste the full string.

Coding:

- Copy-paste the information reference number, e.g. LBA0000020061009e2a90018a

b) Relevance of the Article:

Explanation: This variable pertains to whether the media article actually deals with agricultural trade policy. To be relevant, the article needs to deal with a) an actual or potential decision by a national government or an institution controlled by the national government, AND b) the decision affects the policy regime governing the transboundary exchange in rice, wheat or maize. For example, an article may describe ongoing negotiations in the World Trade Organization (WTO) on global trade liberalization. While that article may affect trade between countries, possible WTO decisions are not decisions by a national government or institution controlled by the national government. Hence, the article is considered irrelevant, and you would code: 0. If a media article is a duplication of a previous one coded, meaning that no new information is reported, code 0 and move on to the next article.

Note that government to government sales or tenders are only to be considered relevant if they mean a change in the national policy regime. For example, if Vietnam agrees to sell rice to Indonesia despite an export ban in place, it is relevant (code 1). However, if Vietnam announces a tender for rice exports, it is not considered a trade policy change and hence irrelevant (code 0).

Coding:

- Type 1 if the article deals with an agricultural trade policy
- Type 0 if the article does NOT deal with agricultural trade policy

Logic:

If you code 0, i.e. article is not relevant, move on to the next media article!

c) Originating jurisdiction

Explanation: This variable contains the information in which country or jurisdiction a decision affecting trade policy was made. For example, an article may inform that the Government of Russia has decided to stop all exports of wheat. In this case, you would code Russia by typing its shortcode: RU. In the event, that a trade policy change is specific to a small number of countries, type all their shortcodes separated by comma (,). For example, if Cambodia, Lao and Vietnam agree on a regional trade deal to decrease import tariffs for each other, code KH,LA,VN.

Required information: List of country/jurisdiction shortcodes available at: <http://www.unece.org/cefact/locode/service/location>

Coding:

- Type the two-character country/jurisdiction shortcode
- Type N/A if the information is not available in the media article

Logic:

If you code N/A, i.e. the article doesn't say which country is the originator of a policy, then go to next media article

d) Date of the media article

Explanation: This variable pertains to the date of publication of the article as indicated on the article itself. You will have to fill-out three distinct cells, the first cell (column) captures the day of the month, the second cell captures the month, and the third cell the year. Coding example below applies to a possible date of a media article: 6th February 2013.

Coding:

- For the day of the month, specify the day in format dd (e.g. the 6th day of a month, type 06)
- For the month, type in format mm (e.g. if its February, type 02)
- For the year, type year in format yyyy (e.g. if its 2013, type 2013)

e) Goods affected

Explanation: This variable contains the information what products or goods are affected by the agricultural trade policy dealt with in the article. Affected products are those on which the transboundary exchange will have a potential influence. If more than one product is affected, yet not all of them are affected equally, you have to create separate entries. For example, if an article mentions that rice will be subject to a full export ban, and wheat will be subject to increased export tax, then create separate row entries for rice and maize.

Coding:

- Type W for wheat, if the trade policy affects wheat
- Type M for maize, if the trade policy affects maize/corn
- Type R for rice, if the trade policy affects rice
- If the agricultural trade policy concerns more than one product in the same way (e.g. maize and wheat), type all letters, e.g. MW or WMR (the order doesn't matter)
- If the agricultural trade policy concerns more than one product, but not all products are affected equally, copy-paste one additional row for each commodity the agricultural trade policy is related to, type the respective product code in the new fields, and continue coding for each.
- Type N/A if the information is not available in the media article

f) Tariff Measure

Explanation: This variable is a factor variable informing whether the trade policy measure is a form of import tariff or not. Import tariffs are “customs duties on merchandise imports”. We distinguish between a) import tariffs on ad valorem basis (percentage of value), and b) import tariffs on a specific basis (e.g. \$7 per 100 kgs.). For example, a news article may mention that the Government of Kenya is considering to increase its tariff on import of maize from 15% to 20%. In this case, you would code for an ad valorem import tariff and type 1.

Coding:

- If the trade policy is not an import tariff, code: 0
- If the trade policy is an import tariff at ad valorem basis, code: 1
- If the trade policy is an import tariff on specific basis, code: 2
- If the trade policy is an import tariff, but it is not specified if the tariff is ad valorem or specific, code: 3
- Type N/A if the information is not available in the media article

Logic:

If you code 1,2 or 3, skip the next indicator (only the next indicator, NOT going to the next article)

g) Non-Tariff Measure

Explanation: This variable pertains to the codes according to the International Classification of Non-Tariff Measures. All measures other than import tariffs, are classified according to this classification. The document contains definitions and examples for each of the possible trade policy measures. If you are uncertain, you can ask for assistance from the research team. For example, if a country decides to fully ban all exports for maize, that is classified as “Export prohibition”. Hence the correct code is: P11

Required information: Own summary document “Summary: International Classification of Non-Tariff Measures – Codebook.docx”

Coding:

- Type the 3 to 4 character-digit combination according to the International Classification of Non-Tariff Measures, e.g. P11
- Type HELP in case you are uncertain and would like support from the research team
- Type N/A if the information is not available in the media article
- If more than one measure is concerned, create separate rows for each measure and continue with the next indicators for each measure.

h) Direction of Change

Explanation: This variable specifies the direction in which a trade policy is being changed. For example, if an export tax on maize is changed from 5% to 10%, the new policy is coded as “higher” (H). On the other hand, if an import quota on rice is changed from 1 Million tonnes down to 0.5 Million tonnes, the new policy is coded as “lower” (L). If a country decides to lift its export ban or import ban on rice, type lower (L). On the other hand, if a country introduces an export or import ban, type higher (H). If a country decides on stricter administrative procedures, like licensing requirements, type higher.

Coding:

- H: Type H for “Higher” if the direction is an increase
- L: Type L for “Lower” if the direction is a decrease
- HELP: Type HELP if some information is available, but you don’t know how to code it
- N/A: Type N/A if the information is not given in the media article

i) Implementation Status

Explanation: The implementation status variable shows where a specific policy stands in the policy process. Three categories are distinguished: 1) Measure is under consideration, but not yet decided, 2) Measure is decided, but not yet in force, 3) Measure is in force.

Coding:

- 1: Type 1 if the measure is under consideration, but not yet decided
- 2: Type 2 if the Measure is decided, but not yet in force
- 3: Type 3 if Measure is in force
- N/A: Type N/A if the article doesn’t include information on the status of implementation

j) Date of implementation

Explanation: The date of implementation is a variable pertaining to the date the trade policy change is enforced. You will have to fill-out three distinct cells, the first cell (column) captures the day of the month, the second cell captures the month, and the third cell the year. Coding example below applies to a possible date of implementation: 6th February 2013.

For example, if a media article mentions that an increase of import tariffs of the Government of Tanzania will be valid from 15th of April 2013, type 15 in the day cell, 04 in the month cell, and 2013 in the year cell. If a government announces that a partial export ban will be in place starting May 2013, type 5 in the month cell and 2013 in the year cell. In case a government decides upon altered export licensing requirements, and indicates they are effective immediately, type the date of the media article according to coding instructions.

If no day, month or year is given, but any other time indication (like “in autumn”), type OTHER.

Coding:

- For the day of the month, specify the day in format dd (e.g. the 6th day of a month, type 06)
- For the month, type in format mm (e.g. if its February, type 02)
- For the year, type year in format yyyy (e.g. if its 2013, type 2013)
- OTHER: If no specific day, month or year is given (e.g. “in autumn”), type OTHER
- type N/A if no information is given

k) End date

Explanation: For temporary trade policy changes, the end date is the date the documented change will be either withdrawn or fully replaced by a further change. For permanent measures, the measure needs to be coded as “permanent” without end date. For example, if a media article mentions that an increase of import tariffs of the Government of Tanzania will be valid until 31st of December 2013, type 31 in the day field, 12 in the month field, and 2013 in the year field. If a government announces that a partial export ban will be in place until December 2013, type 12 in the month field, and 2013 in the year field. In case a government decides upon altered export licensing requirements, which are meant to be permanent, type “P” in all three date fields.

All measures that do not explicitly specify that they are temporary, have to be coded as permanent.

Coding:

- For the day of the month, specify the day in format dd (e.g. the 6th day of a month, type 06)
- For the month, type in format mm (e.g. if its February, type 02)
- For the year, type year in format yyyy (e.g. if its 2013, type 2013)
- type P if the policy is implemented permanently
- type N/A if no information is given

l) Duration

Explanation: This variable captures the amount of time that a trade policy change is announced to remain in force. This variable has to be filled out if either the implementation date or the end date is missing. It hence has only to be coded in cases where implementation date or end date lack a specific day in their dates. Accordingly, for permanent measures, the field doesn't have to be filled out.

Coding:

- If number of months is mentioned, type the number followed by M, e.g. 1M
- If number of weeks is mentioned, type the number followed by W, e.g. 4W

- If number of days is mentioned, type the number of days followed by D, e.g. 20D
- type N/A if no duration is provided

m) Information Source

Explanation: This variable identifies the source of the information reported in each media article. Two main categories of sources and their combinations are distinguished. A named source means that the source of information reported in a media article is attributed to an identified person or to an official communication from an institution (i.e. there is a name of a person, or a name of an institution). A government source means that the source is mentioned to be associated with the government. Example, a media article may state that China is will revise its import tariff on rice, according to government sources familiar with policy developments (without giving names), yet no named official confirms the information. In this case, the source is an unnamed government source, and you would type 3. If the source for the information is another newspaper or another media article, code 4 (unnamed non-government source).

Coding

- 1: Type 1 if Named Government Source: the source of the information is an identified government official or a named government institution
- 2: Type 2 if Named NON Government Source: Source of the information is an identified person or identified institution outside the government
- 3: Type 3 if Unnamed Government Source: Source of the information is an unnamed/anonymous government official or institution
- 4: Type 4 if Unnamed NON Government source: Source of the information is an unnamed/anonymous person or institution outside the government
- If more than one of the above source categories are given in an article, type each source that applies, separated by comma (,), for example: 1,3,4
- type N/A if no source information is given

A.3 Classification of Non-Tariff Measures (Summary used for Coding)

The following shows our own summary of the International Classification of Non-Tariff Measures from the MAST Group (Multi-Agency Support Team) as used for coding of the type of non-tariff measures in our dataset.

IMPORT NON-TARIFF MEASURES

A SANITARY AND PHYTOSANITARY MEASURES (SPS)

Measures that are applied to protect human or animal life from risks arising from additives, contaminants, toxins or disease-causing organisms in their food; to protect human life from plant- or animal-carried diseases; to protect animal or plant life from pests, diseases, or disease-causing organisms; to prevent or limit other damage to a country from the entry, establishment or spread of pests; and to protect biodiversity. These include measures taken to protect the health of fish and wild fauna, as well as of forests and wild flora. Note that measures for environmental protection (other than as defined above), to protect consumer interests, or for the welfare of animals are not covered by SPS.

B TECHNICAL BARRIERS TO TRADE (TBT)

Measures referring to technical regulations, and procedures for assessment of conformity with technical regulations and standards, excluding measures covered by the SPS Agreement. A technical regulation is a document which lays down product characteristics or their related processes and production methods, including the applicable administrative provisions, with which compliance is mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method. A conformity assessment procedure is any procedure used, directly or indirectly, to determine that relevant requirements in technical regulations or standards are fulfilled; it may include, inter alia, procedures for sampling, testing and inspection; evaluation, verification and assurance of conformity; registration, accreditation and approval as well as their combinations.

C PRE-SHIPMENT INSPECTION AND OTHER FORMALITIES

C1 Pre-shipment inspection Compulsory quality, quantity and price control of goods prior to shipment from the exporting country, conducted by an independent inspecting agency mandated by the authorities of the importing country.

Example: A pre-shipment inspection of textile imports by a third party for verification of colours and types of materials is required.

D CONTINGENT TRADE-PROTECTIVE MEASURES

Measures implemented to counteract particular adverse effects of imports in the market of the importing country, including measures aimed at unfair foreign trade practices, contingent upon the fulfilment of certain procedural and substantive requirements.

D1 Antidumping measure

A border measure applied to imports of a product from an exporter. These imports are dumped and are causing injury to the domestic industry producing a like product, or to third countries' exporters of that product. Dumping takes place when a product is introduced into the commerce of an importing country at less than its normal value, generally where the export price of the product is less than the comparable price, in the ordinary course of trade, for the like product when destined for consumption in the exporting country. Antidumping measures may take the form of antidumping duties, or of price undertakings by the exporting firms.

Example: An antidumping duty of between 8.5 to 36.2% has been imposed on imports of biodiesel products from country A.

D2 Countervailing measure

A border measure applied to imports of a product to offset any direct or indirect subsidy granted by authorities in an exporting country where subsidized imports of that product from that country are causing injury to the domestic industry producing the like product in the importing country. Countervailing measures may take the form of countervailing duties, or of undertakings by the exporting firms or by authorities of the subsidizing country.

Example: A countervailing duty of 44.71% has been imposed by Mexico on imports of dynamic random access memory (DRAM) semiconductors from country A.

D3 Safeguard measures

A temporary border measure imposed on imports of a product to prevent or remedy serious injury caused by increased imports of that product and to facilitate adjustment. A country may take a safeguard action (i.e., temporarily suspend multilateral concessions) in respect of imports of a product from all sources where an investigation has established that increased imports of the product are causing or threatening to cause serious injury to the domestic industry that produces like or directly competitive products. Safeguard measures can take various forms, including increased duties, quantitative restrictions, and others (e.g. tariff-rate quotas, price-based measures, special levies, etc.).

E NON-AUTOMATIC LICENSING, QUOTAS, PROHIBITIONS AND QUANTITY-CONTROL MEASURES OTHER THAN FOR SPS OR TBT REASONS

Control measures generally aimed at restraining the quantity of goods that can be imported, regardless of whether they come from different sources or one specific supplier. These measures can take the form of non-automatic licensing, fixing of a predetermined quota, or through prohibitions. All measures introduced for SPS and TBT reasons are classified in chapters A and B above.

E1 Non-automatic import-licensing procedures other than authorizations for SPS or TBT reasons

An import-licensing procedure introduced, for reasons other than SPS or TBT reasons, where approval is not granted in all cases. The approval may either be granted on a discretionary

basis or may require specific criteria to be met before it is granted. Example: Imports of textile products are subject to a discretionary licence.

E2 Quotas

Restriction of importation of specified products through the setting of a maximum quantity or value that is authorized for import: No imports are allowed beyond those maximums. Example: A quota of 100 tons of fish where the importation can take place any time of the year and there is no restriction on the country of origin of the product.

E3 Prohibitions other than for SPS and TBT reasons

Prohibition on the importation of specific products for reasons other than SPS (A1) or TBT (B1) reasons.

E311 Full prohibition (import ban)

Prohibition without any additional condition or qualification Example: Imports of motor vehicle with cylinder under 1500cc are not allowed, to encourage domestic production.

E312 Seasonal prohibition

Prohibition of imports during a given period of the year: This is usually applied to certain agricultural products while the domestic harvest is in abundance. Example: Imports of strawberries are not allowed from March to June each year.

E313 Temporary prohibition, including suspension of issuance of licences

Prohibition set for a given fixed period of time unrelated to a specific season: usually for urgent matters not covered under the safeguard measures above. Example: Imports of certain fish are prohibited with immediate effect until the end of the current season.

E314 Prohibition of importation in bulk

Prohibition of importation in a large-volume container: Importation is only authorized if the product is packed in a small retail container, which increases per unit cost of imports. Example: Import of wine is allowed only in a bottle of 750 ml or less.

E315 Prohibition of products infringing patents or other intellectual property rights

Prohibition of copies or imitations of patented or trademarked products. Example: Import of imitation brand handbags is prohibited.

E5 Export-restraint arrangement

An arrangement by which an exporter agrees to limit exports in order to avoid imposition of restrictions by the importing country, such as quotas, raised tariffs or any other import controls. The arrangement may be concluded at either the government or industry level. Includes Voluntary export-restraint arrangements (VERs).

Example: A bilateral quota on export of motor vehicles from country A to country B was established to avoid sanction by the latter.

E6 Tariff-rate quotas (TRQ)

A system of multiple tariff rates applicable to a same product: The lower rates apply up to a certain value or volume of imports, and the higher rates are charged on imports which exceed this amount. Example: Rice may be imported free of duty up to the first 100,000 tons, after which it is subject to a tariff rate of \$1.5 per kg.

F PRICE-CONTROL MEASURES, INCLUDING ADDITIONAL TAXES AND CHARGES

Measures implemented to control or affect the prices of imported goods in order to, inter alia, support the domestic price of certain products when the import prices of these goods are lower; establish the domestic price of certain products because of price fluctuation in domestic markets, or price instability in a foreign market; or to increase or preserve tax revenue. This category also includes measures other than tariffs measures that increase the cost of imports in a similar manner, i.e. by fixed percentage or by a fixed amount. They are also known as para-tariff measures.

F1 Administrative measures affecting customs value

Setting of import prices by the authorities of the importing country by taking into account the domestic prices of the producer or consumer. It could take the form of establishing floor- and ceiling-price limits; or reverting to determined international market values. There may be different price setting, such as minimum import prices or prices set according to a reference.

F11 Minimum import prices

Pre-established import price below which imports cannot take place. Example: A minimum import price is established for fabric and apparel.

F12 Reference prices

Pre-established import price which authorities of the importing country use as reference to verify the price of imports. Example: Reference prices for agricultural products are based on the farm-gate price, which is the net value of the product when it leaves the farm, after marketing costs have been subtracted.

F2 Voluntary export-price restraints (VEPRs)

An arrangement in which the exporter agrees to keep the price of the goods above a certain level: A VEPR process is initiated by the importing country and is thus considered as an import measure. Example: The export price of video cassette tapes is set higher in order to defuse trade friction with major importing countries.

F3 Variable charges

Taxes or levies aimed at bringing the market prices of imported products in line with the prices of corresponding domestic products: Primary commodities may be charged per total weight, while charges on processed foodstuffs can be levied in proportion to the primary product contents in the final product. Example: The target price for a seed is \$700 per ton; since the world price is \$500, there is a levy for \$200. If the world price changed to \$600, the levy would change to \$100.

F4 Customs surcharges

An ad hoc tax levied solely on imported products in addition to customs tariff to raise fiscal revenues or to protect domestic industries. Example: Customs surcharge, surtax or additional duty.

F5 Seasonal duties

Duties applicable at certain times of the year, usually in connection with agricultural products. Example: Imports of fresh perry pears, in bulk from 1 August to 31 December may enter free of duty, while in other months, seasonal duties applied.

F6 Additional taxes and charges levied in connection to services provided by the government

Additional charges, which are levied on imported goods in addition to customs duties and surcharges and which have no internal equivalents.⁷ They include: Custom-inspection, -processing and -servicing fees, merchandise-handling or -storing fees, tax on foreign exchange transactions, stamp tax, import licence fee, consular invoice fee, statistical tax, tax on transport facilities, additional charges.

F7 Internal taxes and charges levied on imports

Taxes levied on imports that have domestic equivalents. For example, a tax on sales of products which are generally applied to all or most products.

G FINANCE MEASURES

Finance measures are intended to regulate the access to and cost of foreign exchange for imports and define the terms of payment. They may increase import costs in the same manner as tariff measures. Example: Payment of 100% of the estimated customs duty is required three months before the expected arrival of the goods to the port of entry.

H MEASURES AFFECTING COMPETITION

Measures to grant exclusive or special preferences or privileges to one or more limited group of economic operators. Example: A statutory marketing board with exclusive rights to control imports of certain grains, a canalizing agency with an exclusive right to distribute petroleum, a sole importing agency or importation reserved for specific importers regarding certain categories of goods.

I TRADE-RELATED INVESTMENT MEASURES

I1 Local content measures

Requirements to purchase or use certain minimum levels or types of domestically produced or sourced products, or restrictions on the purchase or use of imported products based on the volume or value of exports of local products. Example: In the production of automobiles, locally produced components must account for at least 50% of the value of the components used.

I2 Trade-balancing measures

Restrictions on the importation of products used in or related to local production, including in relation to the amount of local products exported; or limitations on access to foreign exchange

used for such importation based on the foreign exchange inflows attributable to the enterprise in question. Example: A company may import materials and other

J DISTRIBUTION RESTRICTIONS

Distribution of goods inside the importing country may be restricted. It may be controlled through additional license or certification requirements. For Example, restriction to limit the sales of goods to certain areas within the importing country.

K RESTRICTIONS ON POST-SALES SERVICES

Measures restricting producers of exported goods to provide post-sales service in the importing country. Example: After-sales servicing on exported TV sets must be provided by a local service company of the importing country.

L SUBSIDIES (excluding export subsidies under P7)

Financial contribution by a government or public body, or via government entrustment or direction of a private body (direct or potential direct transfer of funds: e.g. grant, loan, equity infusion, guarantee; government revenue foregone; provision of goods or services or purchase of goods; payments to a funding mechanism), or income or price support, which confers a benefit and is specific (to an enterprise or industry or group thereof, or limited to a designated geographical region). Example: The government provides producers of chemicals a one-time cash grant to replace antiquated production equipment.

M GOVERNMENT PROCUREMENT RESTRICTIONS

Measures controlling the purchase of goods by government agencies, generally by preferring national providers. Example: A government office has a traditional supplier of its office equipment requirement, in spite of higher prices than similar foreign suppliers.

N INTELLECTUAL PROPERTY

Measures related to intellectual property rights in trade: Intellectual property legislation covers patents, trademarks, industrial designs, layout designs of integrated circuits, copyright, geographical indications and trade secrets. Example: Clothing with unauthorized use of trademark is sold at much lower price than the authentic products.

O RULES OF ORIGIN

Rules of origin cover laws, regulations and administrative determinations of general application applied by government of importing countries to determine the country of origin of goods. Rules of origin are important in implementing trade policy instruments such as antidumping and countervailing duties, origin marking and safeguard measures. Example: Machinery products produced in a country are difficult to fulfil the rules of origin to qualify for the reduced tariff rate of the importing country, as the parts and materials originate in different countries.

EXPORT NON-TARIFF MEASURES

P EXPORT-RELATED MEASURES

Export-related measures are measures applied by the government of the exporting country on exported goods.

P1 Export-license, -quota, -prohibition and other quantitative restrictions

Restrictions to the quantity of goods exported to a specific country or countries by the government of the exporting country for reasons such as a shortage of goods in the domestic market, regulating domestic prices, avoiding antidumping measures or for political reasons.

P11 Export prohibition

Prohibition of exports of certain products. Example: Export of corn is prohibited because of a shortage in domestic consumption.

P12 Export quotas

Quotas that limit value or volume of exports. Example: An export quota of beef is established to guarantee adequate supply in the domestic market.

P13 Licensing- or permit requirements to export

A requirement to obtain a licence or a permit by the government of the exporting country to export products. Example: Exports of diamond ores are subject to licensing by the Ministry.

P14 Export registration requirements

A requirement to register products before being exported (for monitoring purposes). Example: Pharmaceutical products need to be registered before being exported.

P19 Export quantitative restrictions (others)

P2 State-trading enterprises, for exporting; other selective export channels

P21 State-trading enterprises, for exporting Enterprises (whether or not State-owned or -controlled) with special rights and privileges not available to other entities, which influence through their purchases and sales the level or direction of exports of particular products (See also H1). Example: An export monopoly board, to take advantage of terms of sale abroad; a marketing board, to promote for export on behalf of a large number of small farmers.

P3 Export price-control measures

Measures implemented to control the prices of exported products. Example: Different prices for exports are applied from the same product sold in the domestic market (dual pricing schemes).

P4 Measures on re-export

Measures applied by the government of the exporting country on exported goods which have originally been imported from abroad. Example: Re-export of wines and spirits back to the producing country is prohibited. The practice is common in cross-border trade to avoid imposition of domestic excise tax in the producing country.

P5 Export taxes and charges

Taxes collected on exported goods by the government of the exporting country: they can be set either on a specific or an ad valorem basis. Example: An export duty on crude petroleum is levied for revenue purposes.

P6 Export technical measures

Export regulations referring to the technical specification of products and conformity assessment systems thereof: Control over the quality or other characteristics of products for export. Example: Exports of processed food products must be inspected for sanitary conditions; or certification required by the exporting country

P7 Export subsidies

Financial contribution by a government or public body, or via government entrustment or direction of a private body (direct or potential direct transfer of funds: e.g. grant, loan, equity infusion, guarantee; government revenue foregone; provision of goods or services or purchase of goods; payments to a funding mechanism), or income or price support, which confers a benefit and is contingent in law or in fact upon export performance (whether solely or as one of several conditions), including measures illustrated in annex I of the Agreement on Subsidies and Countervailing Measures and measures described in the Agreement on Agriculture. Example: All manufacturers in country A are exempt from income tax on their export profits.

A.4 Operationalization of World Market Supply and Demand Effect Variable

Table A-1: **Operationalization of World Market Effects.** This table shows the operationalization of the expected world market supply and demand effects, depending on the direction of change coded. “Dir. Lower” means that the direction of change coded was “lower”, for example, an import quota was decreased. “Dir. Higher” means that a measure was increased. HD=Higher Demand, LD=Lower Demand, HS=Higher Supply, LS=Lower Supply. For some event categories, no world market supply and demand effect is known, for example, if the measure does not provide sufficient details (e.g. if only main category E is coded). In such case, NA is assigned.

Non-Tariff Measure Type		Market Effect	
Code	Name	Dir. Lower	Dir. High.
A	SANITARY AND PHYTOSANITARY MEASURES (SPS)	HD	LD
B	TECHNICAL BARRIERS TO TRADE (TBT)	HD	LD
C	PRE-SHIPMENT INSPECTION AND OTHER FORMALITIES	HD	LD
D	CONTINGENT TRADE-PROTECTIVE MEASURES	HD	LD
D1	Antidumping measure	HD	LD
D2	Countervailing measure	HD	LD
E	NON-AUTOMATIC LICENSING, QUOTAS, PROHIBITIONS AND QUANTITY-CONTROL MEASURES OTHER THAN FOR SPS OR TBT REASONS	NA	NA
E1	Non-automatic import-licensing procedures other than authorizations for SPS or TBT reasons	HD	LD
E2	Quotas	LD	HD
E3	Prohibitions other than for SPS and TBT reasons ⁴	HD	LD
E311	Full prohibition (import ban)	HD	LD

Non-Tariff Measure Type		Market Effect	
Code	Name	Dir. Lower	Dir. High.
E312	Seasonal prohibition	HD	LD
E313	Temporary prohibition, including suspension of issuance of licences	HD	LD
E314	Prohibition of importation in bulk	HD	LD
E315	Prohibition of products infringing patents or other intellectual property rights	HD	LD
E5	Export-restraint arrangement	HD	LD
E6	Tariff-rate quotas (TRQ)	LD	HD
F	PRICE-CONTROL MEASURES, INCLUDING ADDITIONAL TAXES AND CHARGES	HD	LD
F1	Administrative measures affecting customs value	HD	LD
F11	Minimum import prices	HD	LD
F12	Reference prices	HD	LD
F2	Voluntary export-price restraints (VEPRs)	HD	LD
F3	Variable charges	HD	LD
F4	Customs surcharges	HD	LD
F5	Seasonal duties	HD	LD
F6	Additional taxes and charges levied in connection to services provided by the government	HD	LD
F7	Internal taxes and charges levied on imports	HD	LD
G	FINANCE MEASURES	NA	NA
H	MEASURES AFFECTING COMPETITION	NA	NA
I	TRADE-RELATED INVESTMENT MEASURES	NA	NA
I1	Local content measures	HD	LD
I2	Trade-balancing measures	HD	LD
J	DISTRIBUTION RESTRICTIONS	HD	LD
K	RESTRICTIONS ON POST-SALES SERVICES	HD	LD
L	SUBSIDIES (excluding export subsidies under P7)	LD	HD

Non-Tariff Measure Type		Market Effect	
Code	Name	Dir. Lower	Dir. High.
M	GOVERNMENT PROCUREMENT RESTRICTIONS	HD	LD
N	INTELLECTUAL PROPERTY	HD	LD
O	RULES OF ORIGIN	HD	LD
P	EXPORT-RELATED MEASURES	NA	NA
P1	Export-license, -quota, -prohibition and other quantitative restrictions	NA	NA
P11	Export prohibition	HS	LS
P12	Export quotas	LS	HS
P13	Licensing- or permit requirements to export	HS	LS
P14	Export registration requirements	HS	LS
P19	Export quantitative restrictions (others)	HS	LS
P2	State-trading enterprises for exporting; other selective export channels	NA	NA
P3	Export price-control measures	HS	LS
P4	Measures on re-export	HS	LS
P5	Export taxes and charges	HS	LS
P6	Export technical measures	HS	LS
P7	Export subsidies	LS	HS

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