Price Volatility, Tariff Structure and the Special Safeguard Mechanism

PRELIMINARY DRAFT: NOT FOR CITATION

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Abstract

Agricultural commodity and food price volatility has been a central focus by policy makers around the globe. Following price spikes in 2008, 2011 and 2012, much attention has been given to price fluctuations as poor households are more negatively affected by extreme variation in prices rather than the increasing levels of prices alone. Two key contentious policy measures within the WTO that affect both the levels and potential variability in commodity prices include specific tariffs and the proposed Special Safeguard Mechanism (SSM). Both policies are shown to be discriminatory in nature towards developing countries (Chowdri, 2012 and Hertel et al. 2010). However, while the SSM is expected to increase agricultural price volatility, the use of specific tariffs may be volatility reducing when compared to an ad valorem tariff structure. This research investigates the potential for reduced commodity price volatility in the presence of the SSM, given the use of specific rather than ad valorem tariffs. Our works implements the SSM in a computable general equilibrium modeling framework and finds evidence of decreased variability of producer prices, import prices, and output in most developed and developing countries when specific tariffs are accounted for.

JEL Classifications: F13, F14, Q17, Q18

Introduction

Two key policy instruments that have been central in the WTO negotiations under the Doha Development Agenda include the Special Safeguard Mechanism and specific tariffs in agriculture (See for example, Alexandraki and Lankes (2005), Beghin (2005), Hertel, Martin and Leister (2010), Hoek-man, Ng and Olarreaga (2002)). The Special Safeguard Mechanism has been a controversial feature that would allow developing countries to safeguard domestic agricultural markets against surges in imports (quantity-based SSM (Q-SSM)) or reductions in import prices (price-based SSM (P-SSM)), while developed countries have been urged to convert specific tariffs to ad valorem equivalents. Hertel et al. (2010) found that implementation of the SSM may reduce imports, raise domestic prices, and boost mean domestic production in SSM regions. Ivanic and Martin conclude that the quantity-based SSM would raise the world poverty headcount by 24 million, while Thennakoon and Anderson find that implementation of the price-based mechanism would only offset a fraction of the potential losses to producers if import prices fall enough to trigger the P-SSM. Furthermore, the SSM is expected increase domestic price volatility in developing countries, rather than insulating countries that use it from price volatility (Hertel et al. 2010). These findings shed light on the potentially damaging effects of widespread use of the SSM. Critical questions regarding the price volatility effects of the SSM remain and merit further exploration, especially given that these studies fail to consider key intricacies in the preexisting tariff structure of agricultural markets. This research extends the literature regarding the potential policy implications of the SSM by considering the economic effects of the SSM in the presence of specific tariffs.

The standard GTAP model (Hertel, 1997), and many GTAP-class CGE models, treat all import tariffs as ad valorem, i.e., as fractions of prices. However, the current tariff structure in global

markets is rather complex, with the prevalent presence of non-ad valorem instruments such as Tariff-Rate-Quotas (TRQs) and specific tariffs. Narayanan and Villoria (2013) extend the standard GTAP model to account for specific tariffs. The data sources for their model include the GTAP 8 Data Base (Narayanan, McDougall and Aguiar, 2012), the MacMAP tariff dataset constructed by ITC and CEPII, as well as the methodology outlined by Guimbard, Jean and Mimouni (2012) to compute Ad Valorem Equivalents (AVEs) of specific tariffs. Agricultural markets have a widespread prevalence of specific tariffs in place, which will affect the economic outcomes of implementing the SSM.

The research question for this paper is motivated based on three different findings in other studies. Firstly, a major finding of Narayanan and Villoria (2013) is that the existence of specific tariffs keeps prices relatively more stable in the presence of external supply shocks. Secondly, Hertel et al. (2010) find that prices in developed countries are more volatile in the presence of the SSM. Thirdly, MacLaren (2011) finds that it is difficult for developing country importers to benefit from the SSM in the presence of ad valorem tariffs, as they increase price volatility. We delve into the question of the behavior of the SSM in the presence of specific tariffs, focusing on changes in price volatility in agricultural markets. Questions relating to the impacts of price volatility across the world have been a central focus of policy discussions since 2007; therefore we begin with the GTAP 8.1 Data Base. Rather than focusing on production and price variability in the wheat sector alone, as done in Hertel et al (2010), we follow Narayanan and Villoria (2013) and apply yield shocks across all agricultural commodities to examine this issue. Yield shocks are estimated as residuals from the regression of yield against linear and quadratic trend

In this work, we divert our attention to the price volatility impacts on developed countries, which are expected to face higher volatility with the implementation of the SSM by developing

countries, rather than focusing on the effects of the SSM on developing countries alone. Furthermore, we analyze the welfare implications of implementation of the SSM in the presence of specific tariffs for different players across the world. For the analysis in this paper, we chose 18 aggregated commodities and 30 aggregated regions in the GTAP database. The choice of these commodities and regions was made based on the prevalence of specific tariffs across sectors and countries. The results of this work shed light on the policy discussion regarding the SSM and its potential impacts on agricultural price volatility.

Prevalence of Specific Tariffs

Specific tariffs are widely used by developed countries and have been found to discriminate against developing country exporters (Gibson et al., 2001; Von Kirchbach and Mondher, 2003; Bouet et al., 2004). Developing countries typically export relatively lower priced goods (Schott, 2004) which causes the ad valorem equivalent (AVE)[1] tariffs to typically be higher for developing country exporters when compared to the AVE for the same level of specific tariff levied on developed country exports (Chowdri, 2012). Also, specific tariffs are predominant in agricultural commodity trade, which comprises a large percentage of developing country exports (Gibson et al., 2001; Hoekman et al., 2002). Accordingly, developing countries are adversely affected by the presence of specific tariffs relative to ad valorem tariff structures when compared to the effects on developed country exporters when measuring the cost of the specific tariff relative to the price of the good traded. However, Narayanan and Villoria (2014) find that specific tariffs may reduce price volatility for both developed and developing countries vis-à-vis ad valorem tariffs. Given the potential for developing country implementation of the SSM, both

[1] The AVE translates the level of the specific tariff to a percentage of the price of the good.

wealthy and poor nations may be better off by having more stable prices if developed countries maintain specific tariffs rather than converting to ad valorem tariffs.

Table 1 describes specific tariff revenue and AVE of specific tariffs by sector; furthermore the maximum AVE of specific tariffs for bilateral trading partners, and the maximum average AVE of specific tariffs faced by exporters and levied by importers for each sector are described as well. For example, the highest AVE in the Vegetable Oil sector is levied by Switzerland (CHE) on Malaysia (MYS), while Turkey (TUR) is the exporter that experiences the highest AVE of specific tariffs in the vegetable oil sector and Switzerland levies the highest AVE of specific tariffs on imports when considering the vegetable oil sector. The share of specific tariff revenue in total tariff revenue is relatively small for a suite of countries; however, six countries[2] have 10-25% of tariff revenue generated by specific tariffs, while five countries obtain more than 25% of total tariff revenue from specific tariffs including Singapore (100%), Norway (56%), Georgia (36%), Switzerland (31%) and Australia (28%). While specific tariffs are imposed largely by developed countries, both developed and developing countries face specific tariffs as exporters. The share of specific tariffs in total tariffs faced by exports from Latin American and African countries is greater than 10%. It is important to note that both developed and developing countries face specific tariffs as exporters, and this tariff structure is predominant in agricultural commodity and food sectors.

Modeling Framework and Scenario Design

This research extends two papers, Hertel et al. (2010) which examines the potential effects of the SSM on the global wheat market, and Narayanan and Villoria (2014) which studies the

[2] Countries with specific tariff revenue comprising 10-25% of total tariff revenue include Japan, Malta, Malaysia, Zimbabwe, Israel and Romania.

relationship between food price volatility and specific tariffs. Similar to both papers, we implement a modified version of the GTAP model that has been designed for applications specific to agricultural production and consumption (Keeney and Hertel, 2005) in tandem with systematic sensitivity analysis (Arndt, 1996) to simulate historical volatility in global agricultural markets (Valanzuela et al. 2007; Narayanan and Villoria, 2014).

Our work focuses on implementation of the quantity based SSM (Q-SSM) which allows developing countries to impose a tariff on imports when import volumes exceed 110% of a three year moving average of imports. The Q-SSM may be equal to 25% of the bound tariff or 25 percentage points, whichever is higher. There is a second tier of the Q-SSM that allows an additional duty of 40% of the bound rate (or 40 percentage points) if imports exceed 115% of baseline imports, and finally a third tier of the Q-SSM allows an additional duty of 50% of the bound rate (or 50 percentage points) if imports exceed 135% of baseline imports. As in Hertel et al. (2010) the Q-SSM is modeled as a non-linear complimentarity problem where T_i is the SSM tariff, and QR_i is the ratio of observed imports to the baseline (trigger) level of imports for the SSM tier *i= 1, 2, 3*, which gives the following complementary slackness condition:

$T_i \geq 0 \perp (1 - QR_i) \geq 0$ which implies that either:

$T_i \geq 0, (1 - QR_i) = 0$ (SSM is binding) or:

$T_i = 0, (1 - QR_i) \geq 0$ (SSM is non-binding)

The implementation of the SSM into a global CGE model by Hertel et al. (2010) furthered the literature and quantitative analysis of the proposed SSM; however, the authors assumed that ad valorem tariffs prevail throughout the trading system and failed to account for the presence of

specific tariffs in their work. Accordingly, we account for the presence of specific tariffs, which are prevalent in agricultural commodity and food markets, and model the specific tariff structure following Narayanan and Villoria (2014). This allows for the estimation of changes in market prices, *pms(i,r,s)* that are inclusive of ad valorem tariffs, specific tariffs as well as SSM tariffs, if the quantity based SSM measure is invoked. Accordingly, market prices in linearized form are defined as:

*pms(i,r,s)=SHRADV(i,r,s)*tms(i,r,s)+SHRSPE(i,r,s)* {spec (i,r,s) – ppriv(s) - pcif(i,r,s) }* + p_TM_QUOTA1(i,s) + p_TM_QUOTA2(i,s)+ *pcif(i,r,s)*

where: (1) SHRADV*(i,r,s)* = {VIWS*(i,r,s)** TMS(i,r,s) } / VIMS(i,r,s)

(2) SHRSPE = SPEC_TAR_REV*(i,r,s)* / VIMS(i,r,s)

We then employ supply shocks for agricultural sectors that are estimated as the standard deviations of the residuals from a simple linear regression of historical yields (using data from 1961-2011 from FAOSTAT). Our scenario design then includes two stages. First we include supply shocks to agricultural sectors with the model that includes the SSM and the presence of an ad valorem tariff structure alone (following Hertel et al. 2010). Second, we employ the same estimated yield shocks in the newly created model (GTAP-SpecSSM) that accounts for both the SSM and the existence of specific tariffs. Our results section focuses on the differences in means and standard deviations of key variables under both scenarios to investigate the effects of varying tariff structures in the presence of the SSM.

The sectors modeled for specific tariffs include wheat, coarse grains, sugar cane & beet and oilseeds. We limit the SSM policy to apply only within the wheat sector for this analysis. We aggregate the GTAPv8 database to 30 regions and 18 sectors, which are chosen based on the

prevalence of specific tariffs as well as the ability of developing countries to implement the SSM policy. As the wheat sector is the focus of the results section, it is critical to note what countries are most affected by policies concerning specific tariffs. Importers that impose the highest specific tariffs on wheat include Japan (96%) and Norway (100%). On the export side, China faces specific tariffs to the extent that 24% of tariff revenue generated by Chinese wheat exports is specific tariff revenue. Accordingly, our results focus on the difference between the simulations using the GTAP-SSM model versus the GTAP-SpecSSM model.

Results and Discussion

Table 2 includes the mean and standard deviation of the power of the SSM tariff (i.e., 1 + the ad valorem tariff rate) for the SSM and SpecSSM scenarios. The columns in Table 2 relate to the tier 1 and tier 2 tariffs applied to imports from all sources. When *cif* prices are unchanged, a one percentage point change in the power of the SSM tariff is equal to a one percentage point change in the domestic price of wheat imports. As indicated, the percentage change in the mean SSM tariff is lower in all but 3 developing countries (China, Argentina, and the Middle East) given the accounting of specific tariffs, and the percentage change in the standard deviation of the SSM tariff is lower in all countries except the Middle East when considering the specific tariff structure. Only the Middle East invokes the tier-2 SSM tariff; the tier-3 tariff is not utilized in our simulations.

Tables 3 and 4 report the changes in mean and standard deviations of key variables in Developed country markets, while Tables 5 and 6 include changes in mean and standard deviations of key variables in Developing Country markets: SpecSSM –SSM values, expressed as a percent of baseline values. The developing country regions in Tables 5 and 6 are the countries that are

allowed to apply the SSM, and for this work, we assume countries will implement the SSM when imports reach 110% of baseline levels. The second tier tariff may be applied if imports reach 115% of baseline levels and the second tier of safeguards is triggered.

Focusing on the changes in volatility in a policy environment that includes the SSM, many developed countries are expected to experience greater stability under the presence of specific tariffs when considering changes in the variability of import prices, producer prices , land rents and output. The changes in variability of wheat imports varies for developed countries in the sample, yet are expected to be lower in both Japan and Norway (the two countries that impose high specific tariffs on wheat imports) under the SpecSSM scenario. On the other hand, developing countries, in general, experience lower variability in both import prices and domestic prices of wheat when specific tariffs are accounted for compared to the SSM scenario that only considers the ad valorem tariff structure. The change in the standard deviation of global wheat trade volumes is higher under SpecSSM, while world price volatility is slightly lower under the SpecSSM.

Conclusion

While the structure of specific tariffs may be discriminatory in nature by imposing higher AVEs on developing country exports, there is potential for decreased price volatility in global commodity markets given the presence of specific rather than ad valorem tariffs. Specifically, we find that the variability in agricultural prices that would be imposed under the presence of the SSM may be mitigated by developed country implementation of specific rather than ad valorem tariffs in some cases. This sheds light on the need to give considerable attention to the policy environment and measures in place when considering moving from specific to ad valorem tariffs.

Developing country welfare may be reduced with specific rather than ad valorem tariff structures in developed countries in a policy environment that does not include the Special Safeguard Mechanism (Chowdri 2012); however, the presence of specific tariffs has the potential to stabilize prices relative to an ad valorem tariff structure if the SSM policy is implemented. This work sheds light on the potentially stabilizing effects of specific tariffs in the presence of the SSM, and future work will include the modeling and implementation of the SSM in multiple commodity markets to more fully explore the global effects of the SSM when both ad valorem and specific tariffs are imposed on imports.

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Table 1. Specific Tariff Revenue and AVE of Specific Tariffs by Sector

Commodities	Specific Tariff Revenue (US$ Million)	Maximum AVE of Specific Tariff (%)			Global Average AVE of Spec. Tar. (%)	Global Trade Flows (US$ Million)
		Bilateral	Importers	Exporters		
Beverages and Tobacco	2430	746 (ARM on XCB)	47(MYS)	10(CHN)	2.42	100,219
Sugar	1697	179 (UKR on XEC)	13(RUS)	12(BRA)	8.99	18,879
Meat (other than cattle)	1415	478 (XEF on BRA)	22(XEF)	5(BRA)	2.49	56,926
Other Food Products	1164	383 (NOR on GEO)	15(NOR)	3(GEO)	0.43	272,027
Wheat	857	150 (NOR on XNF)	19(NOR)	2(FRA)	2.87	29,822
Vegetable Oil	562	111 (CHE on MYS)	18(CHE)	2(TUR)	0.86	65,385
Vegatable and Fruits	500	94 (UKR on CAN)	18(XEF)	1(CHN)	0.56	89,208
Milk Products	372	176 (CHE on CAN)	17(XEF)	7(XSM)	0.61	60,885
Other Crops	318	995 (MYS on RUS)	56(MYS)	8 (MWI)	0.60	53,281
Cattle Meat	106	192 (XEF on NAM)	20 (XEF)	3 (XCB)	0.29	36,939

Table 2. Means and Standard Deviations for quantity-based Safeguards: percent change in power of the tariff

	Percentage Changes in Means						Percentage Changes in Standard Deviation						
	p_TM_Q1			p_TM_Q2				p_TM_Q1			p_TM_Q2		
	SSM	Spec SSM	SpecSSM -SSM	SSM	Spec SSM	SpecSSM-SSM		SSM	Spec SSM	SpecSSM -SSM	SSM	Spec SSM	SpecSS M-SSM
1 CHN	1.29	1.33	0.03	0.00	0.00	0.00	1 CHN	2.11	2.05	-0.06	0.00	0.00	0.00
2 OEASIA	0.00	0.00	0.00	0.00	0.00	0.00	2 OEASIA	0.00	0.00	0.00	0.00	0.00	0.00
3 MYS	0.00	0.00	0.00	0.00	0.00	0.00	3 MYS	0.00	0.00	0.00	0.00	0.00	0.00
4 SEASIA	0.00	0.00	0.00	0.00	0.00	0.00	4 SEASIA	0.00	0.00	0.00	0.00	0.00	0.00
5 STHASIA	0.53	0.52	-0.01	0.00	0.00	0.00	5 STHASIA	1.19	1.22	0.03	0.00	0.00	0.00
6 MEX	0.00	0.00	0.00	0.00	0.00	0.00	6 MEX	0.00	0.00	0.00	0.00	0.00	0.00
7 ARG	0.81	0.89	0.09	0.00	0.00	0.00	7 ARG	1.68	1.51	-0.17	0.00	0.00	0.00
8 BRA	1.43	1.25	-0.18	0.00	0.00	0.00	8 BRA	2.78	2.30	-0.48	0.00	0.00	0.00
9 CentrAmr	0.00	0.00	0.00	0.00	0.00	0.00	9 CentrAmer	0.00	0.00	0.00	0.00	0.00	0.00
10 STHAmr	0.29	0.16	-0.13	0.00	0.00	0.00	10 STHAmer	0.82	0.49	-0.32	0.00	0.00	0.00
11 MIDEAST	8.89	12.37	3.48	2.33	0.49	-1.84	11 MIDEAST	11.20	12.38	1.18	4.47	1.07	-3.39
12 NAfrica	0.52	0.38	-0.14	0.00	0.00	0.00	12 NAfrica	1.22	0.94	-0.29	0.00	0.00	0.00
13 EAfrica	0.45	0.40	-0.05	0.00	0.00	0.00	13 EAfrica	1.26	1.01	-0.26	0.00	0.00	0.00
14 WAfrica	0.00	0.00	0.00	0.00	0.00	0.00	14 WAfrica	0.00	0.00	0.00	0.00	0.00	0.00
15 SAfrica	1.28	1.22	-0.06	0.00	0.00	0.00	15 SAfrica	2.13	1.77	-0.36	0.00	0.00	0.00
16 MidAfrica	0.14	0.06	-0.08	0.00	0.00	0.00	16 MidAfrica	0.50	0.29	-0.21	0.00	0.00	0.00

Table 3. Percentage Changes (SSM minus No-SSM) of mean outcomes for key variables in developed country wheat markets (percentage change from 2007 base)**

Percentage Changes in Means

	pim	pim		qim	qim		ps	ps		pmes	pmes		qo	qo	
	SSM	SpecSSM	SpecSSM-SSM	SSM	SpecSSM	SpecSSM-SSM	SSM	SpecSSM	SpecSSM-SSM	SSM	SpecSSM	SpecSSM-SSM	SSM	SpecSSM	SpecSSM-SSM
1 Oceania	-0.07	-0.06	0.01	5.46	5.30	-0.17	1.52	1.50	-0.02	2.38	2.32	-0.06	1.89	1.87	-0.02
3 JPN	-0.12	-0.07	0.05	0.14	0.10	-0.04	0.09	0.11	0.02	-0.15	-0.04	0.11	-0.20	-0.11	0.09
8 CAN	-0.54	-0.56	-0.02	3.02	3.04	0.02	0.03	0.01	-0.02	-0.62	-0.77	-0.15	-0.38	-0.45	-0.07
9 USA	-0.04	-0.06	-0.02	0.16	0.14	-0.02	-0.10	-0.12	-0.02	-1.08	-1.22	-0.14	-0.60	-0.66	-0.07
15 EU27	-0.09	-0.10	-0.01	0.51	0.53	0.02	0.06	0.06	0.00	-0.41	-0.43	-0.02	-0.28	-0.29	-0.01
16 NOR	-0.03	-0.01	0.02	0.30	0.27	-0.04	0.14	0.16	0.01	-0.28	-0.25	0.03	-0.12	-0.09	0.03
17 CHE	-0.05	-0.06	-0.01	0.49	0.49	0.00	0.17	0.17	0.00	-0.16	-0.18	-0.02	-0.10	-0.10	-0.01
18 OEUR	-0.12	-0.13	-0.02	1.90	1.93	0.03	0.38	0.38	-0.01	0.18	0.16	-0.03	0.11	0.10	-0.01
19 RUS	-0.10	-0.11	-0.01	2.42	2.24	-0.18	0.68	0.63	-0.05	-1.90	-2.01	-0.11	-1.15	-1.19	-0.04
20 UKR	-0.38	-0.39	-0.01	9.86	9.67	-0.19	2.07	2.02	-0.05	1.13	1.00	-0.13	0.14	0.08	-0.06
21 ARM	0.15	-0.13	-0.28	3.59	4.13	0.54	0.98	0.88	-0.10	-0.51	-0.75	-0.23	-0.58	-0.68	-0.10
22 GEO	0.17	0.13	-0.04	0.06	0.73	0.67	0.11	1.70	1.58	0.75	1.31	0.56	0.43	1.81	1.39
23 TUR	-0.04	-0.06	-0.03	1.36	1.43	0.07	0.23	0.22	-0.01	-0.11	-0.14	-0.02	-0.13	-0.14	-0.01
30 ROW	-0.12	-0.14	-0.02	0.34	0.36	0.02	-0.02	-0.03	-0.01	-0.21	-0.30	-0.10	-0.17	-0.23	-0.06

Table 4. Percentage Changes (SSM minus No-SSM) of standard deviations for key variables in developed country wheat markets (percentage change from 2007 base)**

Percentage Changes in Standard Deviation

	pim SSM	pim SpecSSM	SpecSSM-SSM	qim SSM	qim SpecSSM	SpecSSM-SSM	ps SSM	ps SpecSSM	SpecSSM-SSM	pmes SSM	pmes SpecSSM	SpecSSM-SSM	qo SSM	qo SpecSSM	SpecSSM-SSM
1 Oceania	6.58	6.64	0.06	14.41	13.14	-1.27	10.87	10.69	-0.18	11.61	11.69	0.08	17.84	17.88	0.03
3 JPN	2.06	1.24	-0.82	3.45	3.37	-0.09	3.24	3.09	-0.16	17.94	16.52	-1.42	10.08	9.86	-0.22
8 CAN	2.14	2.10	-0.04	11.66	11.72	0.06	3.13	3.16	0.02	19.83	19.59	-0.24	14.67	14.54	-0.13
9 USA	2.75	2.77	0.02	8.93	9.11	0.18	2.28	2.30	0.01	9.01	8.96	-0.05	6.45	6.41	-0.04
15 EU27	2.09	2.09	0.00	2.39	2.39	-0.01	2.57	2.57	0.00	2.89	2.89	0.00	2.69	2.68	-0.01
16 NOR	2.01	0.97	-1.05	4.93	4.76	-0.18	4.01	3.95	-0.06	4.82	3.48	-1.34	6.21	6.00	-0.22
17 CHE	2.18	2.19	0.00	6.87	6.87	0.00	3.26	3.25	0.00	4.65	4.65	0.00	5.41	5.41	0.00
18 OEUR	2.67	2.65	-0.02	11.62	11.53	-0.09	5.01	5.00	-0.01	4.47	4.43	-0.04	7.05	7.03	-0.02
19 RUS	0.90	0.89	-0.01	14.78	14.88	0.10	5.73	5.74	0.00	10.72	10.57	-0.15	11.66	11.55	-0.11
20 UKR	2.15	2.02	-0.13	26.09	25.33	-0.76	8.57	8.54	-0.04	7.13	6.81	-0.32	12.05	11.85	-0.20
21 ARM	4.52	4.58	0.06	21.89	21.89	0.00	7.82	7.78	-0.04	4.05	4.09	0.03	6.92	6.91	-0.01
22 GEO	3.55	3.54	-0.01	2.11	7.08	4.97	1.20	10.89	9.69	6.71	17.84	11.13	4.26	23.99	19.73
23 TUR	2.94	2.93	-0.01	14.08	14.06	-0.01	4.28	4.28	0.00	3.05	3.04	-0.01	3.20	3.19	0.00
30 ROW	1.64	1.64	0.00	2.22	2.23	0.01	0.86	0.86	0.00	5.65	5.64	-0.01	3.46	3.45	-0.01

Table 5. Percentage Changes (SSM minus No-SSM) of mean outcomes for key variables in developing country wheat markets (percentage change from 2007 base)**

	Percentage Changes in Means														
	pim SSM	pim SpecSSM	SpecSSM-SSM	qim SSM	qim SpecSSM	SpecSSM-SSM	ps SSM	ps SpecSSM	SpecSSM-SSM	pmes SSM	pmes SpecSSM	SpecSSM-SSM	qo SSM	qo SpecSSM	SpecSSM-SSM
2 CHN	0.59	0.60	0.01	-1.10	-1.19	-0.09	0.19	0.19	0.00	0.19	0.18	-0.01	0.00	0.00	-0.01
4 OEASIA	-0.54	-0.55	-0.02	0.18	0.18	0.00	0.63	0.62	-0.01	0.13	0.10	-0.03	0.13	0.12	-0.01
5 MYS	-0.53	-0.55	-0.01	0.07	0.07	0.00	0.04	0.04	0.00	0.78	0.61	-0.18	-1.93	-2.05	-0.12
6 SEASIA	-0.49	-0.51	-0.02	0.05	0.05	0.00	0.35	0.33	-0.02	3.20	3.13	-0.07	0.58	0.55	-0.03
7 STHASIA	0.35	0.31	-0.04	-0.49	-0.39	0.11	0.11	0.10	-0.01	0.24	0.19	-0.05	0.05	0.04	-0.02
10 MEX	-0.12	-0.14	-0.02	0.10	0.12	0.02	-0.01	0.01	-0.01	-0.26	-0.29	-0.03	-0.22	-0.23	-0.01
11 ARG	0.02	0.09	0.06	0.41	0.16	-0.25	0.05	0.06	0.00	-0.83	-0.82	0.01	-0.40	-0.40	0.00
12 BRA	1.36	1.16	-0.20	-0.95	-0.73	0.22	1.08	0.99	-0.09	3.09	2.50	-0.58	1.36	1.14	-0.21
13 CentrAmer	-0.10	-0.12	-0.02	0.03	0.03	0.00	0.04	0.02	-0.01	-0.21	-0.28	-0.08	-0.19	-0.22	-0.03
14 STHAmer	0.13	-0.02	-0.15	0.23	0.44	0.21	0.22	0.15	-0.07	0.04	-0.24	-0.28	0.00	-0.11	-0.11
24 MIDEAST	11.35	12.51	1.15	-6.41	-8.54	-2.12	10.18	10.26	0.07	21.63	24.12	2.49	9.14	10.31	1.17
25 NAfrica	0.22	0.05	-0.17	0.08	0.29	0.21	0.26	0.17	-0.09	0.14	-0.20	-0.33	0.06	-0.06	-0.12
26 EAfrica	-0.06	-0.12	-0.07	0.82	0.91	0.10	0.34	0.32	-0.02	-0.91	-1.08	-0.17	-0.53	-0.60	-0.07
27 WAfrica	-0.14	-0.16	-0.02	0.06	0.06	0.00	0.69	0.68	-0.01	2.41	2.34	-0.07	0.39	0.36	-0.04
28 SAfrica	1.07	0.98	-0.09	-1.15	-0.99	0.16	0.69	0.67	-0.02	1.84	1.60	-0.24	0.83	0.75	-0.08
29 MidAfrica	0.0064	-0.085	-0.0914	0.34449	0.42229	0.078	0.3523	0.314	-0.0383	-0.5149	-0.745	-0.2301	-0.1628	-0.26028	-0.1

Table 6. Percentage Changes (SSM minus No-SSM) of standard deviations for key variables in developing country wheat markets (percentage change from 2007 base)**

	Percentage Changes in Standard Deviation														
	pim SSM	pim SpecSSM	SpecSSM-SSM	qim SSM	qim SpecSSM	SpecSSM-SSM	ps SSM	ps SpecSSM	SpecSSM-SSM	pmes SSM	pmes SpecSSM	SpecSSM-SSM	qo SSM	qo SpecSSM	SpecSSM-SSM
2 CHN	2.66	2.54	-0.12	12.24	12.17	-0.07	3.85	3.84	0.00	3.63	3.64	0.00	1.88	1.88	0.00
4 OEASIA	2.76	2.76	-0.01	1.34	1.34	0.00	7.23	7.18	-0.05	14.16	14.06	-0.09	12.48	12.46	-0.02
5 MYS	3.29	3.29	0.01	0.27	0.27	0.00	0.31	0.31	0.00	44.20	44.64	0.44	21.18	21.34	0.16
6 SEASIA	2.94	2.93	-0.01	0.28	0.28	0.00	5.10	5.04	-0.06	44.95	44.93	-0.02	29.73	29.76	0.03
7 STHASIA	2.60	2.58	-0.02	9.15	9.13	-0.02	2.24	2.23	-0.01	3.08	3.04	-0.04	1.44	1.43	0.00
10 MEX	2.06	2.07	0.01	2.09	2.09	0.00	2.12	2.12	0.00	12.76	12.81	0.04	8.10	8.11	0.01
11 ARG	2.44	2.31	-0.13	9.79	9.93	0.15	3.83	3.86	0.04	14.99	14.87	-0.12	11.37	11.30	-0.07
12 BRA	3.61	2.96	-0.65	10.09	10.50	0.41	7.19	6.93	-0.26	12.27	12.61	0.34	12.23	12.61	0.38
13 CentrAmer	2.07	2.08	0.01	0.50	0.50	0.00	2.23	2.23	0.00	11.99	12.01	0.03	7.75	7.76	0.01
14 STHAmer	1.96	1.92	-0.04	7.61	7.90	0.29	3.70	3.61	-0.09	6.08	6.38	0.30	6.23	6.38	0.15
24 MIDEAST	17.51	15.05	-2.46	22.02	21.80	-0.21	28.89	26.72	-2.18	18.85	12.66	-6.19	31.96	31.02	-0.94
25 NAfrica	2.36	2.04	-0.32	8.37	8.64	0.27	4.34	4.15	-0.19	5.87	5.96	0.09	6.49	6.65	0.15
26 EAfrica	2.36	2.25	-0.11	7.37	7.51	0.14	4.38	4.32	-0.06	6.72	6.75	0.03	6.30	6.39	0.08
27 WAfrica	1.78	1.78	0.00	1.47	1.47	0.00	6.13	6.09	-0.04	38.34	38.43	0.09	25.35	25.36	0.01
28 SAfrica	2.72	2.17	-0.55	10.59	11.02	0.43	6.48	6.40	-0.08	6.88	6.64	-0.23	8.70	8.89	0.19
29 MidAfrica	1.8375	1.8128	-0.0247	6.6092	6.7184	0.1092	5.5463	5.4802	-0.0661	11.7725	12.0693	0.2968	11.3854	11.5241	0.1387

Table 7. Changes* (SSM minus No-SSM) of mean outcomes and standard deviations for world wheat trade (percentage change from 2007 base)

Percentage Changes in Means

	qiwcom			piwcom		
	SSM	SpecSSM	SpecSSM-SSM	SSM	SpecSSM	SpecSSM-SSM
1 wht	-0.23	-0.33	-0.09	-0.23	-0.25	-0.02

Percentage Changes in Standard Deviation

	qiwcom			piwcom		
	SSM	SpecSSM	SpecSSM-SSM	SSM	SpecSSM	SpecSSM-SSM
1 wht	2.2426	2.2813	0.0387	1.9724	1.9697	-0.0027