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RICE TRADE POLICIES AND THEIR IMPLICATIONS FOR FOOD SECURITY

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JEL classification code: F13, Q17, Q18.

INTRODUCTION

There is a strong linkage between the behavior of the rice market and the state of food security in many regions around the world, particularly in Asia, as made evident in the 2007-08 commodity crisis. Rice is a staple for the majority of the population in Asia, where roughly 60% of the close to one billion undernourished people live (FAO, 2010). As Timmer (2010) states, "it is impossible to improve food security in the short run or long run without providing adequate supplies of rice that are accessible to the poor" (p. 2).

The rice crisis of 2007-08 showed the crucial role of export and import policies on the behavior of the rice market and its consequences for price stability and food security. Market fundamentals could only explain a minimal part of the skyrocketing increase in rice prices observed (Dawe, 2010).

The overarching objective of this study is to assess the impact of international rice trade policies on the patterns of production, consumption, trade, and prices, and analyze the implications of these policies from a food-security point of view. The trade liberalization scenario is implemented by removing the effect of all import policies (e.g., tariffs and tariff-rate-quotas) on rice trade, leaving unaltered domestic support to rice granted primarily by Japan, the EU, and the U.S., as well as export restrictions employed by several exporters during the rice crisis of 2008.

Achieving food security implies guaranteeing access (physical availability and affordability) to safe and nutritious food to the entire population. Improving food security is the key goal of the World Food Summit of 1996 and the first Millennium Development Goal[1]. Food security assessments have traditionally been done either at the macro level (market stability) or micro level (household access). Although the methodology used in this study constrains us to focus on the macro level, it can contribute to an improved understanding of trade policy to regional and global rice supply and, thus, to market stability.

RICE POLICY

Rice is among the most distorted among agricultural markets. According to the OECD's producer support estimate (PSE), rice received the largest level of support among agricultural commodities, estimated at USD 16.5 billion in 2008-09 (see Table 1 below). Support to rice in Japan amounted to USD 12.3 billion or 63.9% of the rice output value, which amounts to 75 percent of total global support to rice. South Korea also grants significant protection to its rice sector both in absolute and relative terms.

Countries differ in the way they support the rice sector. The EU and the U.S., for instance, rely primarily on direct budgetary transfers to producers to support the income of rice producers. Thus, taxpayers rather than consumers are responsible for the welfare transfers to producers. Transfers vary in their degree of coupling with the rice market, and consequently in their

[1] The World Food Summit goal is to halve the number of undernourished people between 1990-92 and 2015. The Millennium Development Goal 1, target 1C, is to halve the proportion of people suffering hunger between 1990 and 2015 (FAO, 2010).

potential impact on global markets. Payments such as the Single Farm Payment in the EU or the Direct Payment Program in the U.S. are considered decoupled and, consequently, assumed to generate minimum market distortions.

Table 1. Level of support to rice among OECD countries (USD million)

COUNTRY	2005	2006	2007	2008	2009
Australia					
PSE	4	1	0	1	1
%PSE	2.0%	2.0%	2.0%	2.0%	2.0%
Japan					
PSE	14,762	12,202	10,981	12,073	12,338
%PSE	81.7%	76.3%	71.2%	68.8%	63.9%
South Korea					
PSE	6,622	6,042	6,494	4,079	3,892
%PSE	72.2%	69.0%	69.3%	45.3%	52.9%
Mexico					
PSE	8	8	10	0	1
%PSE	14.4%	12.0%	13.3%	0.0%	2.1%
U.S.					
PSE	110	18	8	12	36
%PSE	5.9%	0.9%	0.3%	0.4%	1.1%
EU					
PSE	337	247	287	307	255
%PSE	35.6%	24.3%	24.3%	18.7%	17.3%
Grand Total	***21,844***	***18,518***	***17,779***	***16,472***	***16,523***

Source: OECD, 2011.

Market access restrictions are arguably the most common policies to protect/support rice. Among OECD countries, Japan and South Korea rely primarily on tariff-rate-quotas and minimum-market-access quotas, respectively. Fixed and ad-valorem import tariffs are the preferred protectionist policy among developing nations.

The average trade-weighted ad-valorem import tariff on rice in 2008 is estimated at 24%. When disaggregated by type, the trade-weighted ad-valorem tariff is estimated at 21%, 111%, and 9% for long grain, medium grain, and fragrant rice, respectively. The high estimate for medium grain is primarily a function of the extremely high level of protection granted by Japan and South Korea as well as their importance as medium grain importers. There is also evidence of tariff escalation in rice. The estimated ad-valorem equivalent for paddy rice stands at 9%, while for brown and milled rice it stands at 30% and 28%, respectively.

Export restrictions, such as export tariffs, minimum export prices, export quotas, and outright export bans, gained relevance during the rice crisis of 2008. Late in 2007, India, the second largest rice exporter, placed a ban on exports of non-basmati rice as a way to stabilize the domestic supply of cereals, after a lower-than-expected wheat harvest in 2006. Despite the export ban, India reported around 2.5 mmt of non-basmati rice exports in 2008, primarily due to government-to-government commitments (Dawe and Slayton, 2010). Vietnam employs export

quotas set after the main harvest late winter, and usually does not allow exports above it. In 2008, arguing concerns about the harvest in the Red River Delta, Vietnam modified the administration of the export quota, banning exports after the main harvest, a move that generated great concern among traders and added to the volatility in the world rice market. Egypt, Malaysia, and the Philippines are further examples of countries that adopted rice export restrictions.

Estimating the ad-valorem equivalent of the export restrictions used partially during a year is challenging. For instance, India's export ban on non-basmati rice most likely affected exports; trade data from India's Department of Commerce shows that non-basmati exports decreased sharply from an average of 4.2 million metric tons in 2006-2008[2] to 0.9 mmt in 2008-2009 and even further to just above 0.1 mmt in 2009-2010, while the average export price increased sharply from USD 308/mt in 2006-2008, to USD 412/mt in 2008-2009, and even higher to USD 514/mt in 2009-2010. India is a large exporter and the retreat from the market surely explains to a large extent the increase in world prices, but isolating the price effect caused by India's export policy is difficult to assess.

Further work to estimate the ad-valorem equivalent of a number of non ad-valorem export policies is being undertaken; hence, we do not attempt to simulate the impact of their removal in this study, but to update this study when those estimates become available..

METHODOLOGY

The RICEFLOW model (Durand-Morat and Wailes, 2010) is used for the assessment. RICEFLOW is a spatial partial equilibrium model of the global rice economy in which the behavior of producers and consumers are specified according to neoclassical economic theory (profit and utility maximizers, respectively). The technology in the value-added nest is specified as a Leontief for primary paddy production, implying that the derived demand for factors of production changes only due to expansionary effects rather than substitution effects. For processed rice (brown and milled), the technology is specified as Cobb Douglas (elasticity of substitution equal to 1). The demand for value-added composite and intermediate inputs is also specified as a Leontief technology, thus implying no substitution among intermediates and between intermediates and the value added composite.

The supply of factors of production is assumed to be perfectly elastic for capital and labor and inelastic for land. For most regions, land supply is assumed to be highly inelastic.

Domestic production and imports are specified as imperfect substitutes following Armington (1969). The maintained assumption is that substitution in processing, where paddy and brown rice are used as an intermediate inputs, is higher (an Armington elasticity of substitution $\sigma = 10$) than substitution in processed rice ($\sigma = 5$) in all regions except Japan and South Korea, where we assume much lower substitution effects ($\sigma = 0.5$) to account for the marked preference for domestically-produced rice.

The model is calibrated to calendar year 2008, the latest available year for which the RICEFLOW database is available. The 2008 RICEFLOW database is disaggregated into 65 regions, including the largest producers and traders of rice, and 9 rice commodities defined on two dimensions, (1) milling degrees (paddy, brown, and milled), and (2) type (long grain,

[2] Marketing year runs from April to March.

medium & short grain, and fragrant). For this study, the database is aggregated into 27 regions according to the pervasiveness of trade policies (see Appendix Table 1 for the specification of the regional aggregation and the incidence of import policies).

To achieve the goal of this study, the trade liberalization scenario defined entails removing all import barriers to trade in rice (see Appendix Table 1 for a description of the level of import policies in the baseline). Thus, the results must be interpreted as the market conditions that would have prevailed in 2008 if all rice trade policies would have been lifted.

RESULTS AND DISCUSSION

Figures 1 through 8 below present a summary of the results with regard to regional production, consumption, and trade. For the most part, results are expressed as percentage deviations from the baseline, that is, calendar year 2008.

Complete liberalization of rice trade is expected to have a marginal impact on global rice production of less than 1 percent. However, important changes in the regional patterns of production can be expected. Figure 1 below shows the change in rice production by region decomposed according to source of the trade policy being removed[3]. Similarly, Figure 2 shows the percentage change in rice producer prices by region and the same decomposition of the results.

The largest reductions in production are realized in Central America, the Philippines, Eastern Europe, and the EU27, where rice production decreases by around 45 percent, 35 percent, 15 percent, and 10 percent, respectively. The U.S. and MERCOSUR report the largest increases in production, around 20 percent and 10 percent, respectively. The high response by MERCOSUR and the U.S. reflect the ability of these regions to still expand the endowment of rice land in response to market incentives. It is well known that land availability across several Asian countries constrains their supply response; furthermore, yield trends in most Asian countries have flattened over the last several years (Dawe et al, 2010), thus undermining their ability not only to grab the benefits that the market may offer, but also to even cope with the increasing demand led by population growth.

The low import penetration in the South Korean and Japanese rice markets, and the relatively inelastic substitution of domestic for imported rice results in very low reductions in production, despite the fact that the very high ad-valorem equivalents implicit in the database for the minimum market access quota (MMA) maintained by South Korea and the tariff-rate-quota (TRQ) maintained by Japan.

[3] The decomposition of the results into three subtotals, namely, (1) long grain rice policy, (2) medium grain rice policy, and (3) fragrant rice policy, amounts to (a) running three different and recursive scenarios, one for each group of shocks included in each of the three subtotals above, and (2) reporting the change in the endogenous variables from each of these subtotals. Decomposition in GEMPACK is simplified, avoiding breaking the original scenario, in this case complete free trade in rice, into the three groups of shocks that define each subtotal.

Figure 1. Percentage change in rice production decomposed by the source of the trade policy

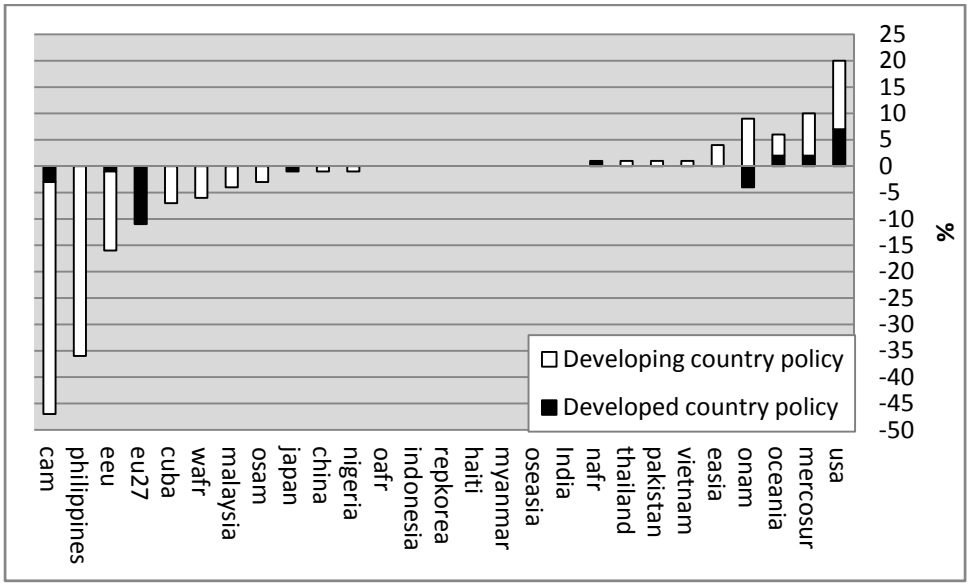
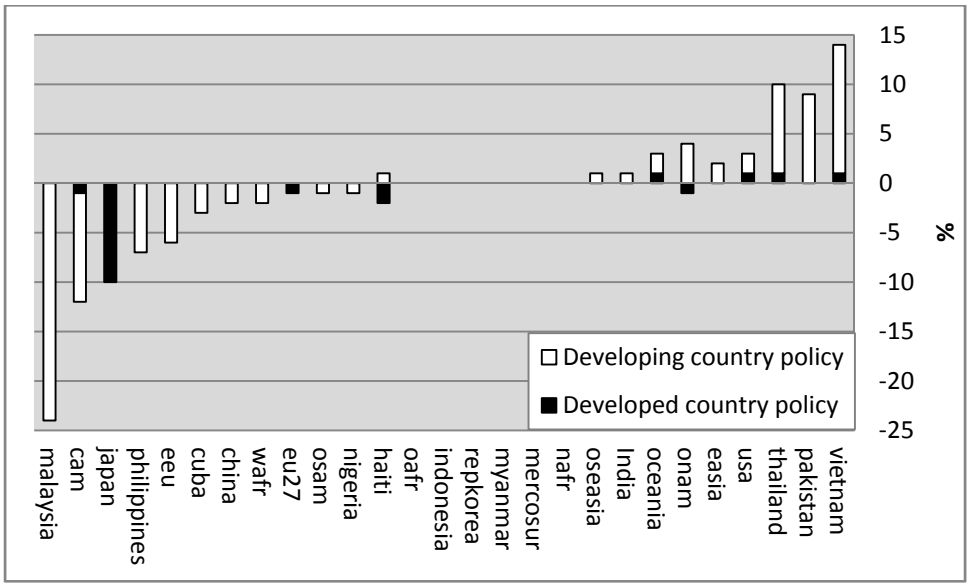


Figure 2. Percentage change in the producer price of rice decomposed by the source of the trade policy



Similar to what has been reported for production, global rice consumption is expected to remain practically unchanged, but significant changes in the regional pattern of consumption are expected. Total rice consumption is estimated to increase in 8 country/regions, including regions with high levels of undernourishment such as Central America, the Philippines, and West Africa (Figure 3). The increases in consumption in Central America and the Philippines are accompanied by significant reductions in consumer prices (Figure 4). Depending on the pattern of trade protection and the characteristics of supply and demand, free trade in rice has the potential to make consumers in exporting countries and in importing countries opened to trade worse off. As shown in Figure 3 below, consumption is expected to decrease in Vietnam and

Pakistan, two of the top 5 exporters of rice, and in Oceania and East Asia, net importers with open rice markets. These decreases in consumption are associated with increases in the consumer price of rice. Despite a significant increase in consumer prices in Thailand, consumption is expected to be only marginally reduced. Consumption volumes and prices in China and India, the two countries with the highest levels of undernourishment in the world, are expected to remain practically unchanged (within 2%) from the baseline, which is explained by the relatively low importance of trade vis-à-vis the domestic market.

Figure 3. Percentage change in rice consumption decomposed by the source of the trade policy

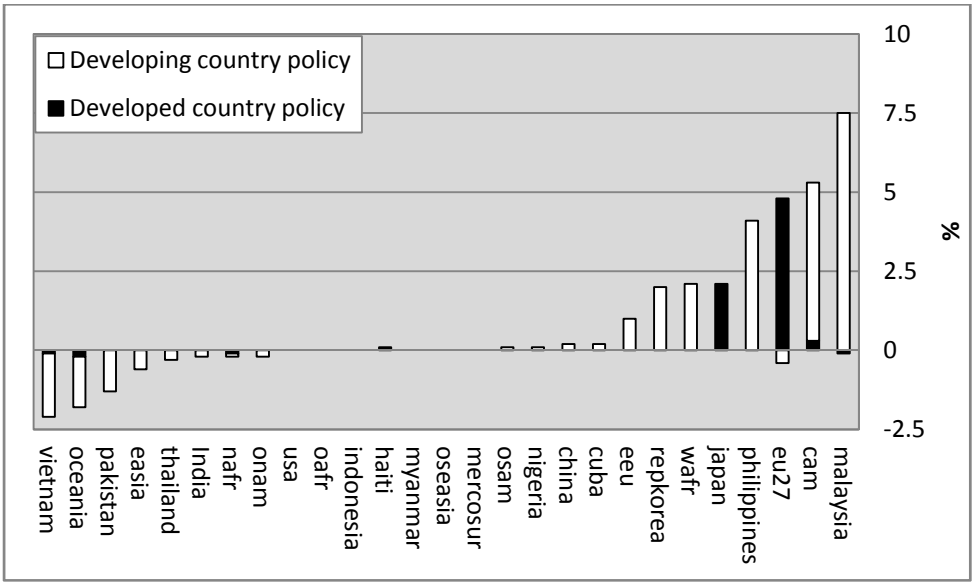
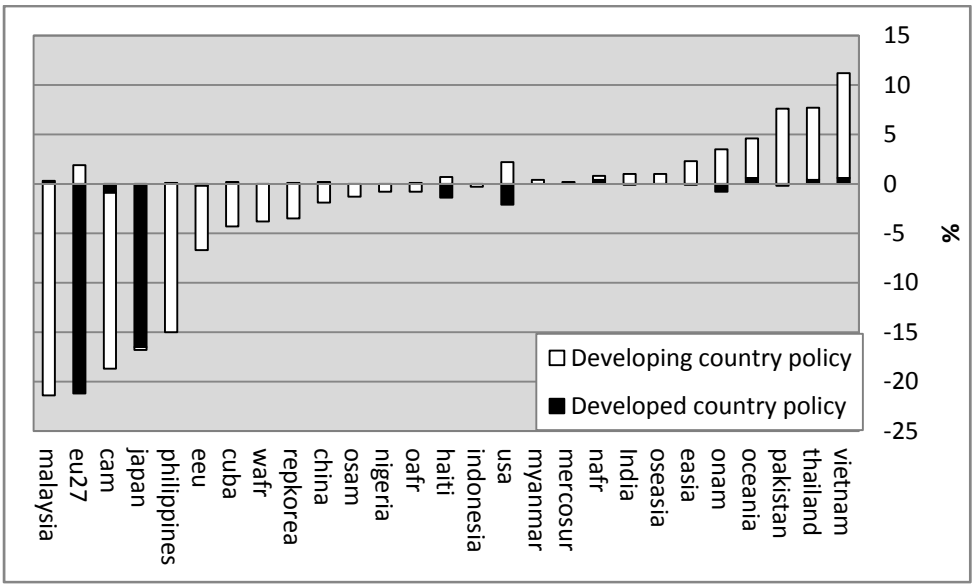


Figure 4. Percentage change in the consumer price of rice decomposed by the source of the trade policy



Despite a significant four-fold increase in the global volume of rice trade since the 1960s, rice continues to be thinly traded, averaging 6.9 percent of global production during the 2000s, compared to 11.8 percent for maize and 18.7 percent for wheat. The limited role of trade is

explained in part by the fact that most consumption coincides regionally with production, and also because of the high level of trade protectionism applied by numerous market members.

Liberalization of the global rice market generates an increase in global rice trade of about 20 percent, led by large increases in medium grain trade (primarily a result of the removal of Japan and South Korea's rice trade policies) and long grain trade. The trade-weighted export price of rice is estimated to increase by 5.4 percent, led by increases in the export price of long grain rice, while the trade-weighted import price is predicted to decrease by 19.2 percent, led by significant reductions in the import price of medium grain rice (Table 2).

Despite differences in terms of model specification and baseline year, the findings of this study with regard to trade are in line with findings from previous studies, which point to increases in global rice trade from complete liberalization between 15.4 percent (Wailes, 2004) and 27 percent (FAPRI, 2002). Regarding prices, the findings of this study suggest relatively similar changes in import prices in aggregate and for long grain rice, but much larger reductions for medium grain imports and much lower reduction for fragrant rice imports than Wailes (2004). On the export price side, our findings are farily similar for long grain and fragrant rice, but much more modest for medium grain than what is reported by Wailes (2004).

Table 2. Impact of complete trade liberalization on the structure of international rice trade

	Aggregate	Long grain rice	Medium grain rice	Fragrant rice
Global volume of trade	19.8%	23.5%	45.8%	0.3%
Trade-weighted export price	5.4%	6.3%	1.3%	1.1%
Trade weighted import price	-19.2%	-14.8%	-62.1%	-1.7%

At the regional level, the Philippines, Japan, and Central America are expected to boost imports significantly, taking advantage of significantly lower import prices (Figure 6). Free trade is expected to reduce imports in already liberalized import markets such as East Asia and Oceania, where the price of imports is actually expected to increase as a result of the liberalization of the rice market.

Figure 5. Percentage change in the volume of imports decomposed by the source of the trade policy

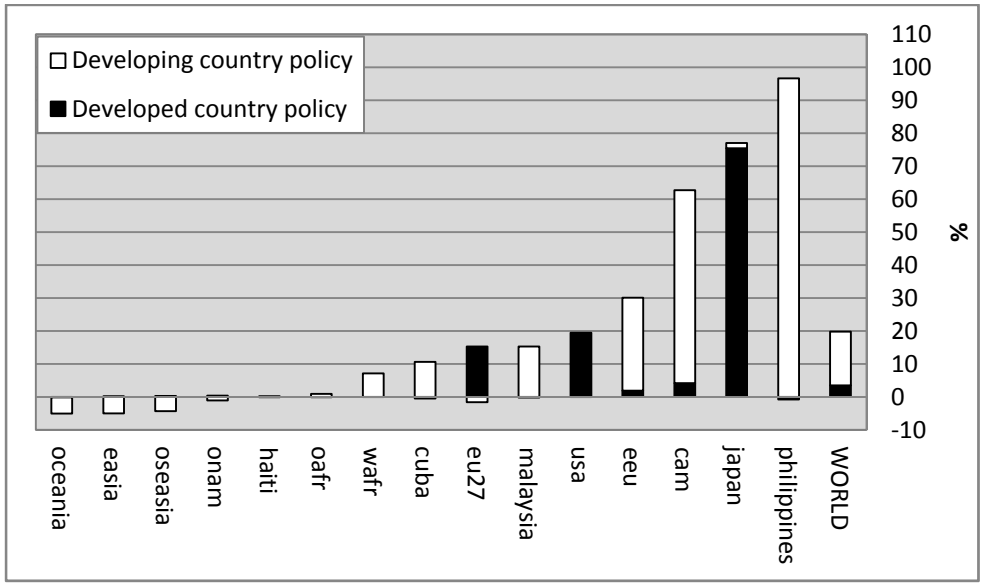
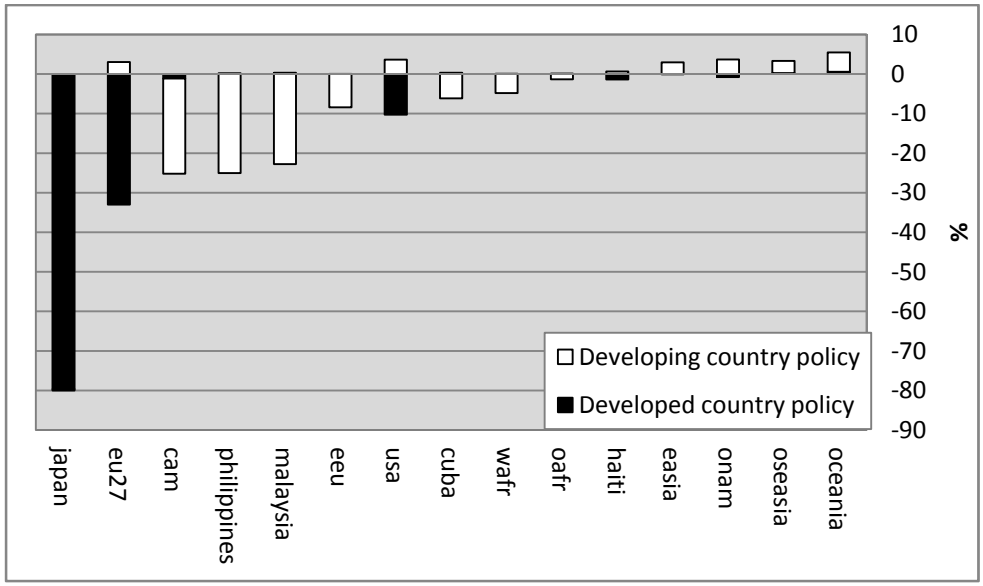


Figure 6. Percentage change in the market price of imports decomposed by the source of the policy change



On the export side, MERCOSUR, China and the U.S. report the largest expansion in trade. China is able to expand exports of medium grain rice significantly maintaining the export price practically unchanged (actually, the export price decreases slightly) primarily because exports represent a very small share of total production (around 1 percent), and because the changes in long grain trade policy yield a reduction in the production cost of medium grain rice through changes in factor markets. MERCOSUR and the U.S., on the other hand, are able to expand exports with relatively minor increases in export prices because they can expand the endowment

of land at relatively lower costs than other exporting regions such as Vietnam, Thailand, and Pakistan.

Figure 7. Percentage change in the volume of exports decomposed by the source of the policy change

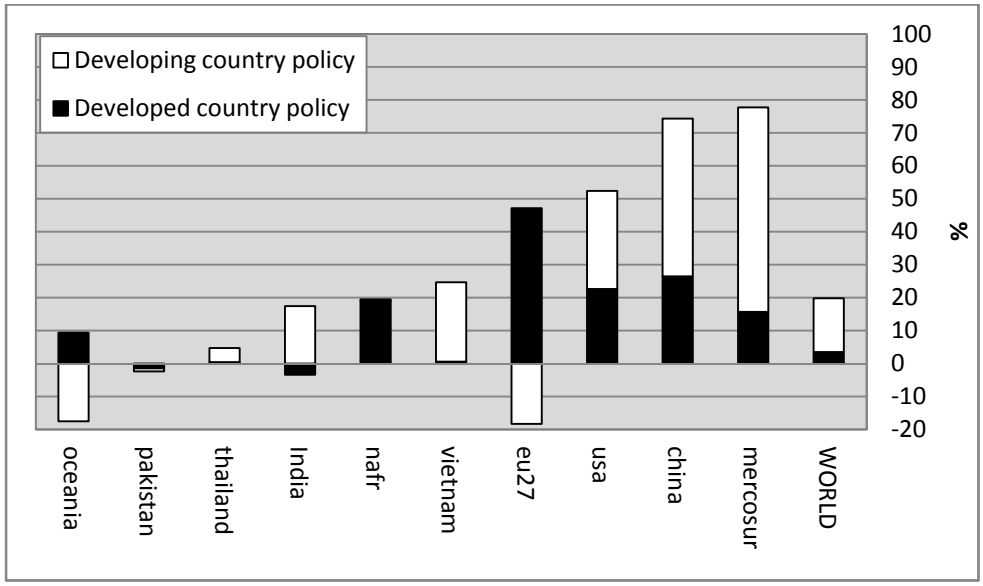
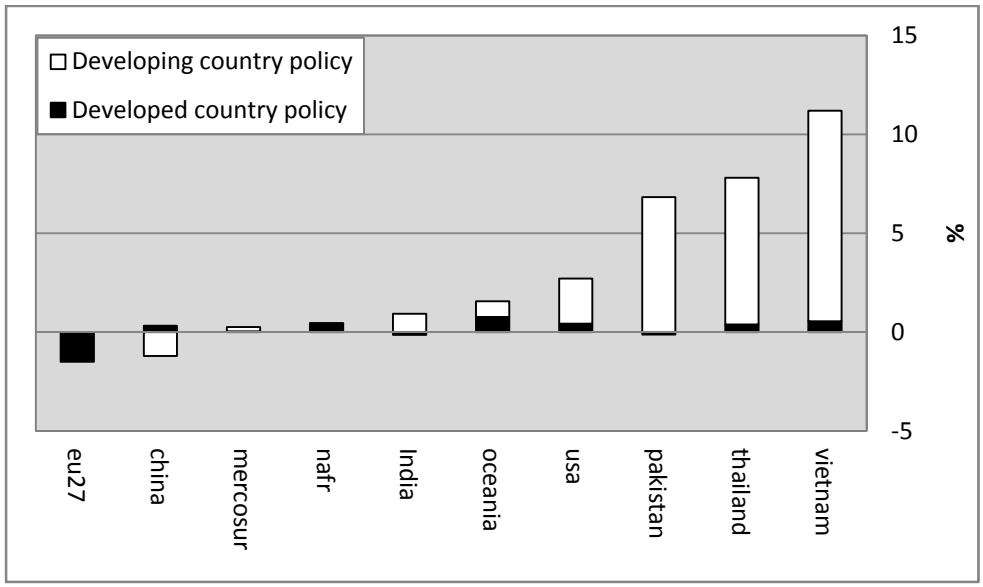


Figure 8. Percentage change in the price of exports decomposed by the source of the policy change



The results presented above can help us shed light on the potential impact of rice trade policies on food security. Table 3 below shows the percentage of undernourished people and two indicators of the relevance of rice in those regions that can help us assess the potential food security impact of rice trade liberalization.

In aggregate, Asian consumers depend more on rice for their dietary caloric intake than consumers in other regions; therefore, affecting food security through changes in rice consumer

prices is more likely in this region. Judging by the potential changes in consumer prices[4], the impact on food security in China and India, where the largest number of undernourished people live, is likely to be marginal as a result of a slight (less than 2 percent) changes in consumer prices. As previously noted, domestic consumption of rice in China and India is primarily covered by domestic production, with rice trade treated as a residual. Negligible effects are also estimated for most Southeast Asian countries including Indonesia, Myanmar and Bangladesh. Trade liberalization has the potential to worsen food security in Pakistan, Thailand, and Vietnam, three of the top-five rice exporters, due to significant increases in consumer prices. The Philippines and Malaysia have the potential to improve food security as a result of rice trade liberalization through significant decreases in consumer prices.

The analysis above applies only to households that are net rice consumers, which are to be found primarily in urban areas. But for households that are net-rice suppliers, the potential effects are the opposite. Hence, net-rice suppliers in Pakistan, Thailand, and Vietnam have the potential to benefit from increasing consumer prices, while net-rice suppliers in the Philippines and Malaysia have the potential to lose from lower market prices. The net effect remains an empirical question that requires more detailed income and expenditure data by household level to be properly addressed.

East, Southern Africa, Sub-Saharan Africa, and The Caribbean show the highest proportions of food-insecure people in the world, estimated at 34 percent, 33 percent, 28 percent, and 24 percent, respectively (FAO, 2010). Despite the lower reliance on rice as a source of caloric intake, changes in the price of rice can contribute to the already fragile situation of poor households in these regions. However, the results suggest negligible changes in consumer prices induced by trade liberalization, and therefore a very limited potential to influence food security through changes in the global rice trade policy environment.

Table 3.Selected indicators on food security and rice consumption reliance for selected countries.

Region/country	Proportion of undernourished people in 2005-07*	Contribution of rice to total dietary energy supply**	Rice self-sufficiency ratio***
China	10%	28%	100%
Haiti	57%	21%	22%
India	21%	32%	107%
Indonesia	13%	50%	104%
Myanmar	16%	56%	111%
Pakistan	26%	7%	198%
Philippines	15%	51%	89%
Thailand	16%	42%	197%
Vietnam	11%	59%	132%
West Africa			
Benin	12%	13%	16%

[4] Assessing food security potential impact through changes in consumer prices is valuable for net consumers of rice, including farmers with a net rice deficit. For farmers that are net suppliers, lower consumer prices may lead to lower producer prices and, thus, lower revenues, thus worsening rather improving food security.

Ivory Coast	14%	22%	27%
Ghana	5%	10%	24%
Guinea	17%	38%	82%
Liberia	33%	34%	48%
Senegal	17%	32%	13%
Sierra Leone	35%	42%	103%
Togo	30%	9%	37%
Other Africa			
Cameroon	21%	10%	9%
Congo	69%	10%	1%
Mozambique	38%	10%	15%
Tanzania	34%	10%	102%
Other Southeast Asia			
Bangladesh	27%	71%	104%
Cambodia	22%	65%	103%
Laos	23%	65%	130%

*. Source: FAO, 2010.
**. Kcal rice / Kcal food. Reference year 2007. Source: FAOSTAT.
***. Production/total domestic supply. Reference year 2007. Source: FAOSTAT.

CONCLUSIONS

The results of this study highlight the potential of affecting food security through improving the workings of the international rice market, eliminating the distortions introduced by import trade policies. They highlight the rather limited scope of rice free trade to improve food security in several countries with high levels of undernourished people like China, India, Africa, and The Caribbean. International trade is a residual of domestic trade for China and India, which explains the high insulation from the changes transmitted from the global market. While the removal of relatively high import barriers in Africa and to a lesser extent The Caribbean are expected to reduce the market price of imports, the removal of all rice import barriers push world prices higher, leading to an almost neutral impact on import prices.

Large net exporters of rice like Pakistan, Thailand, and Vietnam, may actually experience an increase in consumer prices as a result of the liberalization of trade. Food security in The Philippines and Malaysia is expected to improve as a result of significantly lower consumer prices. These results have to be analyzed taking into consideration the limitations of this study. First, by altering the returns on factors of production and output revenues, rice trade liberalization has the potential of inducing significant changes in income levels among factor owners and rice farmers. In the case of exporting countries such as Vietnam, Pakistan, and Thailand, higher producer prices will lead to improvements in income of households that are net rice suppliers. The same reasoning but in opposite direction applies to the Philippines and Malaysia, where the lower producer prices might lead to reductions in income of net-rice suppliers and, thus, a counter effect on food security.

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Appendix Table 1. 2008 import value and ad-valorem equivalent of import tariffs by rice type and region.

	C.I.F. Value Imports (USD million)				Import policy (ad-valorem equivalent)			
Regions*	LG	MG	FR	Total	LG	MG	FR	Total
EASIA	2,930	151	2,401	5,481	10%	12%	6%	8%
WAFR	2,434	27	191	2,652	32%	33%	31%	32%
Philippines	2,098	0	0	2,098	55%	0%	56%	55%
EU27	1,101	31	357	1,489	57%	98%	64%	60%
OAFR	1,282	23	53	1,357	24%	21%	16%	24%
OSEASIA	800	40	305	1,145	7%	9%	6%	7%
Malaysia	636	1	99	736	50%	57%	50%	50%
ONAM	560	52	113	725	8%	4%	10%	8%
USA	160	44	426	630	19%	32%	26%	24%
Cuba	550	0	0	550	32%	0%	0%	32%
Japan	137	324	1	462	632%	425%	403%	485%
EEU	213	159	10	382	30%	12%	10%	22%
OCEANIA	148	55	83	285	14%	0%	0%	7%
Haiti	228	4	0	232	15%	11%	14%	15%
MERCOSUR	216	2	0	218	9%	16%	0%	9%
South Korea	44	173	0	217	16%	236%	0%	191%
China	77	0	128	205	86%	0%	80%	82%
CAM	202	2	0	203	41%	42%	0%	41%
NAFR	162	34	5	201	22%	5%	9%	18%
OSAM	116	0	0	116	25%	0%	0%	25%
Indonesia	104	0	1	105	25%	0%	9%	25%
Nigeria	88	3	3	94	28%	26%	24%	28%
Myanmar	27	0	0	27	18%	0%	0%	18%
Vietnam	16	0	0	16	5%	0%	0%	5%
Thailand	13	3	0	16	25%	39%	8%	28%
Pakistan	5	0	0	5	9%	0%	0%	9%
Vietnam	16	0.0	0	16	5%	0%	0%	5%
Total	14,341	1,128	4,175	19,644	35%	167%	17%	39%

*. Regional aggregations from the original database are as follow:
EASIA: Iran, Iraq, Israel, Oman, Saudi Arabia, Syria, United Arab Emirates, and Yemen.
WAFR: Benin, Ivory Coast, Gambia, Ghana, Guinea, Liberia, Senegal, Sierra Leone, and Togo.
OAFR: Angola, Cameroon, Congo, Gabon, Kenya, Mozambique, South Africa, and Tanzania.
OSEASIA: Bangladesh, Brunei, Cambodia, Hong Kong, Laos, and Singapore.
ONAM: Canada and Mexico.
EEU: Russian Federation, and Turkey.
OCEANIA: Australia, Papua, Timor.
MERCOSUR: Argentina, Brazil, and Uruguay.
CAM: Costa Rica, El Salvador, Honduras, and Panama.
NAFR: Algeria, Egypt, and Libya.
OSAM: Peru.