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No. 368 | September 2013

Asian Development Bank

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Asian Development Bank

Asian Development Bank
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org

September 2013
ISSN 1655-5252
Publication Stock No. WPS135996

Note: In this publication, "$" refers to US dollars.

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ABSTRACT

This paper highlights the thinness of rice trade relative to wheat and maize, and the contrasting price volatility and tradability relations for wheat and maize, which display a positive correlation, and for rice, which show an inverse relation. The paper focuses on Southeast Asia, which hosts the world's biggest rice exporters and rice importers. Using the Granger causality tests to determine correlation, the analysis concludes that very low global trading activity in rice that tends to self-perpetuate its dampening effect on trade does not cause extreme rice price volatility in the region, but the other way around. Rice-importing countries appear to resort to self-sufficiency measures as insurance to compensate for the high risks of unreliable rice supply and unaffordable rice prices. What would it take for countries to regain their confidence in external rice trade? The Association of Southeast Asian Nations Integrated Food Security Program provides a menu of policies for reducing and managing the chances of excessive rice price volatility.

Keywords: ASEAN cereal trade, ASEAN food security, ASEAN rice trade, rice price volatility, rice self-sufficiency programs, rice trade

JEL Classification**:** Q17, Q18, F13, F14

I. INTRODUCTION

Rice is a food staple for about half of the world's 7 billion people. Around 90% of the rice produced is consumed in Asia, which is also home to more than two-thirds of the world's poor and hungry. With 2 billion more people projected to increase the world population by 2050, and per capita and global consumption of rice still projected to rise despite increasing incomes and changing diets, there is a need to examine the importance of global rice trade in ensuring food security.

During the 2007–2008 rice crisis when prices spiked to as high as 150% in 4 months,[1] governments blamed trade as the culprit. As a consequence, rice-importing countries intensified their self-sufficiency programs while rice-exporting countries enforced a variety of export restriction measures to shield their domestic economy from global price surges.

Since 2007–2008, world rice prices have remained high but stable. However, prices of maize and wheat—two equally important global cereals—have experienced volatile trends, in the case of maize, even surpassing the 2008 price level in 2011 (World Bank 2013). High and volatile prices are currently described as the "new normal," which does not augur well for both cereal consumers and cereal farmers. Poor consumers get most of their caloric requirements from cereals, while cereal farmers find it difficult to plan their production due to volatile prices and increasing climate variability.

Both the prospects of expanded global rice trade and more stable prices remain uncertain in the near future. Increasingly, rice exports and rice imports hinge on political decisions, as the impact of new variants of export bans unfold (e.g., Thailand's paddy mortgage scheme and India's Food Security Bill) along with the intensified self-sufficiency programs of net rice-importing countries (i.e., Indonesia, Malaysia, and the Philippines). While the global supply stocks of rice are ample, these are not easily accessible via the trade route. Climate change will further impact rice production output. Rice prices will thus most likely remain high and more volatile especially when one factors in the economic problems of Europe and the United States.

This paper revisits the 2007–2008 rice price surge in the context of long-term price trends in rice and the extent of its tradability relative to maize and wheat. The paper asks: Was it trade that caused extreme price volatility? If not, what measures will be needed to rebuild confidence in trade?

The paper focuses on Southeast Asia, which hosts the world's major rice exporters and rice importers, and which also introduced the Association of Southeast Asian Nations (ASEAN) Integrated Food Security Program as a novel response to the 2007–2008 rice crisis. Section II provides an overview of the production and trade trends for the three major food staple crops in the world and in Southeast Asia—maize, rice, and wheat. Section III compares the price and tradability trends for these commodities. Section IV tackles the question: Does trade cause price volatility for rice? The paper then looks at several measures that would help ASEAN countries regain their confidence in external rice trade, and examines the ASEAN Integrated Food Security Program as a regional public good that may provide the key to reducing excessive price volatility. The paper concludes that the program may provide good lessons for other countries to emulate.

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[1] The nominal price of Thai 5% broken rice in December 2007 was $360.67 per ton, which jumped to $907 per ton in April 2008 (World Bank Commodity Price Data [Pink Sheet]).

II. PROFILE OF OUTPUT AND TRADE IN SELECTED CEREALS

A. Production Trends

Of maize, rice, and wheat, maize has the largest amount of global output, with its production level in 2011 about 4 times larger than in 1961 (Table 1). Its expanding output over the past 50 years is largely explained by a significant increase in yields, particularly over the last 2 decades. In 2011, the average yield of maize in the world was estimated to be about 5.18 tons, up by 41% from the 1990 yield.

Table 1: Output, Area Harvested, and Yields of Three Cereals Selected Years, 1961–2011

Cereal/Item/Region	1961	1970	1980	1990	2000	2010	2011
Maize							
Output (in million tons)							
World	205.03	265.83	396.62	483.37	592.48	840.31	883.46
% ASEAN of world	2.30	2.74	2.74	3.40	3.62	4.40	4.23
Area harvested (in million has.)							
World	105.56	113.08	125.78	131.32	137.00	161.77	170.4
% ASEAN of world	4.95	5.78	6.39	7.04	6.10	6.08	5.60
Yield (in tons per ha.)							
World	1.94	2.35	3.15	3.68	4.32	5.19	5.18
ASEAN	0.90	1.11	1.35	1.78	2.57	3.76	3.91
Rice (Paddy)							
Output (in million tons)							
World	215.65	316.35	396.87	518.57	599.36	696.32	722.76
% ASEAN of world	21.34	20.08	21.29	21.48	25.43	28.87	28.61
Area harvested (in million has.)							
World	115.37	132.87	144.41	146.96	154.06	159.42	164.12
% ASEAN of world	24.69	23.70	24.22	24.92	27.93	30.43	30.17
Yield (in tons per ha.)							
World	1.87	2.38	2.75	3.53	3.89	4.37	4.40
ASEAN	1.62	2.02	2.42	3.04	3.54	4.14	4.18
Wheat							
Output (in million tons)							
World	222.36	310.74	440.19	592.31	585.69	653.65	704.08
% ASEAN of world	0.00	0.01	0.02	0.02	0.02	0.03	0.03
Area harvested (in million has.)							
World	204.21	207.98	237.25	231.26	215.44	217.22	220.39
% ASEAN of world	0.01	0.03	0.03	0.06	0.04	0.04	0.05
Yield (in tons per ha.)							
World	1.09	1.49	1.86	2.56	2.72	3.01	3.19
ASEAN	0.31	0.56	1.11	0.95	1.15	1.90	1.80

ASEAN = Association of Southeast Asian Nations, ha = hectare.

Sources: Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT) (1990−2010); Trade Map (2011).

Southeast Asia accounted for only 4.4% of the world's maize output in 2010, growing the crop in only 6.08% of the world's total maize area. Indonesia and the Philippines account for nearly two-thirds of the region's production. The top producer of maize in the world is the American continent, followed by Asia. The People's Republic of China (PRC) has the largest corn output in Asia.

Southeast Asia produces corn primarily to be used as feeds for swine and poultry, and secondarily as food. In the Philippines, white corn is grown and milled as corn grits, which are consumed in the southern provinces of the country. For the Philippines and throughout the region, rice is still the top staple food.

The world's rice output[2] was slightly over 722 million tons in 2011, more than three times its size nearly half a century ago (Table 1). Southeast Asia accounted for 28.61% of this output, up by a multiple of 1.35 from its level in 1961. As in maize, the expansion of rice output in the world is largely driven by increases in yields rather than in area harvested.

Two of the world's largest rice exporters, Thailand and Viet Nam, are in the region, although Indonesia has a larger output than either one. Another important rice producer is Myanmar, which may have untapped potential for increasing its output and export of rice. The region likewise has three of the world's largest importers of rice: Indonesia, Malaysia, and the Philippines. Indonesia and the Philippines view trade as a last resort, making each of them an off-and-on rice importer, depending upon their local production levels.

In 2011, the total world output of wheat was about 704 million tons, almost threefold in size from 1961. The area harvested for wheat declined over the period from 1990, in contrast to those for rice and maize. However, a 25% increase of farm yields pulled up the world's wheat output in the same period. Of the three cereals, wheat is the least grown in Southeast Asia, with only 0.03% share in world production.

B. Trends in Cereal Trade

Over the past 50 years, cereal trade, particularly in wheat, has expanded by at least a multiple of 3.67 (Table 2). In 2011, wheat imports reached 147 million tons and wheat exports, 148 million tons, both up from about 39.53 million tons in 1961. The largest expansion of trade was in maize, which ranked second after wheat. Maize imports and exports grew by nearly 400%, reaching over 107 million tons for each category in 2010. Rice was the least traded among the three cereals. In 2011, the world's total rice imports were only about 34 million tons, and total rice exports, about 35 million tons. These levels are roughly 30% of that of maize and a fifth of the import figures for wheat in 2011.

The decade from 1970 to 1980 appears to have had the largest expansion of cereal trade over the past 50 years. Maize imports and exports expanded the most in 1980, more than doubling their respective levels in 1970. The pattern likewise applies to wheat—from about 50 million tons in 1970 to 90 million tons in 1980. Rice trade also expanded in the same decade, although it ranked only third to maize and wheat.

[2] In this paper, rice generally refers to milled rice, except in the discussion on production, which refers to paddy rice. Milled rice is roughly 67% of paddy rice. Global milled rice production was 466 million tons in 2010.

Trade volumes fell in 1990 for maize and slightly for rice. Maize exports declined by about 8 million tons while rice imports and exports fell by about half a million tons. The relatively low decline in rice trade could be attributed to Viet Nam's entry into the circle of the world's largest rice exporters. From 1980 to 1990, Viet Nam's rice exports rose from 0.26% to 13.04%.

Table 2 also shows the share of Southeast Asia in the total global imports and exports of the three cereals. The region's share in world rice trade exceeded its corresponding shares in maize and wheat. In 2011, the region's rice exports accounted for 45.10% of global rice exports, making it a major player in the world rice market. The rice imports of the region were only 14.55%, indicating that it is a net rice exporter in the world. The figures also imply significant local production in the key major rice-deficit countries such as Indonesia and the Philippines.

Table 2: Trends in Trade of Selected Cereals in the World and Southeast Asia Selected Years, 1961–2011

Cereal/Item/Region	1961	1970	1980	1990	2000	2010	2011
Maize[a]							
Imports (in million tons)							
World	14.25	28.98	79.84	73.51	82.10	107.23	
% Southeast Asia to world	1.21	1.64	1.86	2.75	5.55	6.33	
Exports (in million tons)							
World	14.00	29.68	80.30	72.04	82.35	107.86	
% Southeast Asia to world	5.22	6.00	2.91	2.12	0.28	0.75	
Rice							
Imports (in million tons)							
World	6.57	8.81	12.77	12.27	22.84	31.19	34.11
% Southeast Asia to world	32.69	33.80	21.52	10.38	13.60	14.33	14.53
Exports (in million tons)							
World	6.31	8.40	12.94	12.46	23.55	32.77	34.95
% Southeast Asia to world	59.44	23.21	29.23	47.03	41.97	48.97	45.10
Wheat							
Imports (in million tons)							
World	39.53	50.15	90.18	98.60	117.19	145.16	147.39
% Southeast Asia to world	0.71	2.51	4.02	4.69	7.49	8.24	13.61
Exports (in million tons)							
World	39.53	50.15	90.18	98.60	117.19	145.16	148.84
% Southeast Asia to world	0.00	0.04	0.01	0.03	0.00	0.03	0.01

[a] Data for maize are only available until 2010.

Sources: Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT) (1990−2010); Trade Map (2011).

On the other hand, Southeast Asia has become a net importer of maize and wheat. However, Table 2 shows that in the 3 decades from 1960 to 1980, the region was a net exporter of maize. The significant plunge in the region's marketable surplus of maize may be due to the increased use of maize as feeds for the region's livestock industries, which have been exhibiting vibrant growth, producing hogs, chicken broilers, and layers. From the 1990s to the present, the region has become a net maize importer. In the case of wheat, the region's share in total world imports rose from 0.71% to 13.61% in 2011.

Maize trade. Table 3 shows that in 2010,[3] the top importers of maize in Southeast Asia were Malaysia (45.31%), Viet Nam (24.43%), Indonesia (22.49%), and Thailand (6.14%). The region's total maize imports in 2010 amounted to 6.79 million tons, or about 6.33% of the world's total maize imports (Table 2). While Malaysia is a consistent maize importer, the pattern of maize imports of the other countries in the region has changed over the past 50 years. Indonesia and Thailand have recently been importing significantly, compared to before 2000. The Philippines has the reverse pattern, importing relatively less from 2000 onward, due likely to the substitution of yellow corn for wheat feeds. Viet Nam was a significant maize importer before the 1980s, then had hardly any maize imports in the 1980s and 1990s, but imports picked up again after 2000.

Table 3: Maize Trade of Selected Countries in ASEAN: Selected Years, 1961–2010

Item/Region/Countries	1961	1970	1980	1990	2000	2010
Imports (in million tons)						
Southeast Asia (SEA)	0.17	0.47	1.48	2.02	4.55	6.79
% Cambodia–SEA	0.00	0.00	0.00	0.00	0.00	0.01
% Indonesia–SEA	0.00	0.00	2.28	0.45	27.77	22.49
% Lao PDR–SEA	0.00	0.00	0.00	0.00	0.01	0.01
% Malaysia–SEA	31.12	45.95	44.66	73.12	49.39	45.31
% Myanmar–SEA	0.00	0.00	0.00	0.00	0.05	0.00
% Philippines–SEA	0.05	0.21	16.85	16.94	9.84	1.30
% Singapore–SEA	58.21	29.21	35.83	8.95	0.77	0.24
% Thailand–SEA	0.00	0.02	0.01	0.04	7.48	6.14
% Viet Nam–SEA	10.15	24.55	0.00	0.10	4.34	24.43
Exports (in million tons)						
Southeast Asia (SEA)	0.73	1.78	2.34	1.53	0.23	0.81
% Cambodia–-SEA	14.17	1.88	0.00	0.36	0.03	3.85
% Indonesia–SEA	0.41	16.06	0.64	9.28	12.07	5.18
% Lao PDR–SEA	0.00	0.00	0.00	0.00	0.39	27.82
% Malaysia–SEA	0.17	0.01	0.02	0.23	8.04	0.26
% Myanmar–SEA	3.46	0.58	0.82	1.31	63.60	3.83
% Philippines–SEA	0.85	0.00	0.00	0.01	0.15	0.00
% Singapore–SEA	2.74	4.38	5.49	5.59	1.43	0.00
% Thailand–SEA	77.58	77.08	93.04	80.85	10.51	59.04
% Viet Nam–SEA	0.62	0.00	0.00	2.36	3.79	0.01

ASEAN = Association of Southeast Asian Nations, Lao PDR = Lao People's Democratic Republic.

Source: Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT) (1960−2010).

As shown in Table 3, the region is a net importer of maize. Its maize exports in 2010 amounted to 810,000 tons, or roughly three-fourths of a percent of the world's total exports of the crop. The region had exported significantly more in the 1980s and 1990s. However, the rising demand for corn for animal feeds has cut down the export performance of the region since 2000. The largest exporter of maize in the region is Thailand followed by the Lao People's Democratic Republic (Lao PDR).

Rice trade. Southeast Asia has increasingly become the world's top exporter of rice in the last half century. In 2010, the region exported 16.05 million tons of rice, which comprised nearly

[3] The data available for maize go as far as only 2010.

49% of the world's total rice exports. This is attributed to Thailand and Viet Nam, which expanded their joint share of global rice exports from 46.83% in 1961 to 97.73% in 2010 (Table 4). Thailand topped the list of rice exporters not only in the region but also in the world, accounting for 30.63% of total world rice exports in 2011.

Table 4: Rice Trade of Selected Countries in ASEAN: Selected Years, 1961–2010

Item/Region/Countries	1961	1970	1980	1990	2000	2010	2011
Imports (in million tons)							
Southeast Asia (SEA)	2.15	2.98	2.75	1.27	3.11	4.47	4.95
% Cambodia–SEA	0.00	0.04	5.04	2.03	2.05	1.50	0.20
% Indonesia–SEA	49.50	32.1	73.22	3.89	43.64	15.35	5.55
% Lao PDR–SEA	4.10	2.33	0.04	0.33	0.44	0.96	0.50
% Malaysia–SEA	19.71	11.93	6.10	25.95	19.18	20.83	20.80
% Myanmar–SEA	0.00	0.00	0.00	0.00	0.33	0.04	0.10
% Philippines–SEA	8.74	0.00	0.00	46.56	20.68	53.19	14.30
% Singapore–SEA	15.61	9.85	6.86	17.32	11.44	6.95	7.30
% Thailand–SEA	0.00	0.00	0.00	0.00	0.02	0.12	0.20
% Viet Nam–SEA	0.86	42.30	7.33	0.15	0.00	0.02	0.40
% Brunei Darussalam–SEA							0.70
Exports (in million tons)							
Southeast Asia (SEA)	3.75	1.95	3.78	5.86	9.88	16.06	15.76
% Cambodia–SEA	6.38	9.12	0.00	0.00	0.06	0.32	1.11
% Indonesia–SEA	0.00	0.00	0.26	0.03	0.01	0.00	0.00
% Malaysia–SEA	0.55	0.01	0.01	0.00	0.00	0.00	0.00
% Myanmar–SEA	42.44	32.88	17.27	3.65	2.54	0.76	1.75
% Philippines–SEA	0.00	0.06	6.90	0.00	0.00	0.00	0.00
% Singapore–SEA	3.80	2.40	0.71	0.03	0.04	0.28	0.55
% Thailand–SEA	41.97	54.57	73.96	68.57	62.15	55.71	67.92
% Viet Nam–SEA	4.86	0.95	0.88	27.72	35.19	42.92	0.00

ASEAN = Association of Southeast Asian Nations, Lao PDR = Lao People's Democratic Republic.

Sources: Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT) (1960−2010); Trade Map (2011).

Viet Nam accounted for 12.89% of global rice exports in 2011. The country's performance picked up significantly in 1990 when it delivered 27.72% of ASEAN rice exports, from only 4.86% in 1960. Interestingly, another potential large exporter of rice is Myanmar, which had been a significant rice exporter in the 1960s through the 1980s. However, the country's exports declined substantially in 1990, the reverse of Viet Nam's export performance. While Myanmar's share of the region's rice exports in 2011 was insignificant at 1.75%, analysts project the country to be the next major rice exporter. Cambodia also appears to reflect a pattern of performance similar to Myanmar. Lately, there have been significant investments toward modernizing Cambodia's rice mills, with a huge build-up of energy and transportation infrastructure.

The region remains a significant net rice exporter although it hosts three of the world's largest rice importers for 2011—Indonesia, Malaysia, and the Philippines, in that order. The region imported 4.95 million tons of rice in 2011, or 14.52% of the world's total rice imports. The region's rice imports have shown a very flat growth trend over the past 50 years. An off-and-on pattern of rice imports can be observed from the data. The region's rice imports slightly grew to

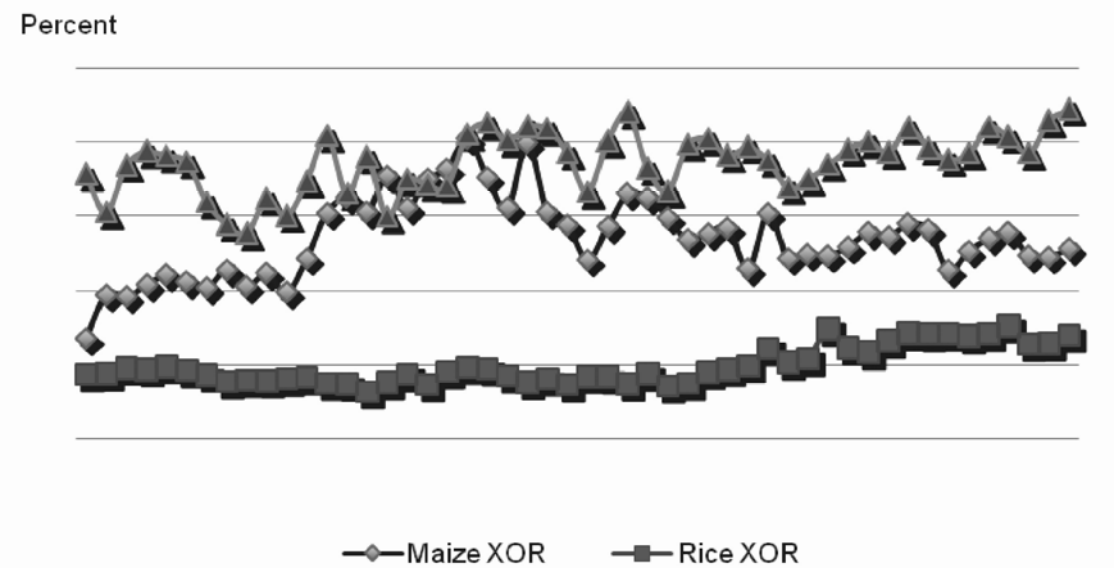
2.98 million tons in 1970, dropped to a low of 1.27 million tons in 1990, and recovered to 4.95 million tons in 2011. Indonesia accounted for 73.22% of rice imports in 1980, 3.89% in 1990, 43.64% in 2000, and 55.5% in 2011. In the case of the Philippines, its rice importation accounted for about half of the ASEAN members' total in 1990 and 2010, but its share dropped significantly to 14.3% in 2011, while the Aquino government intensified its rice self-sufficiency program. The figure for the Philippines' rice imports in 2011 is even lower than its rice import volume in 2000, about 20% of ASEAN rice imports.

III. TRADABILITY AND PRICE VOLATILITY OF CEREALS

As used in this paper, tradability is defined as the extent by which goods are exported or imported. It is measured in terms of export-to-output ratio (XOR) and import-to-output ratio (MOR), and is expressed in percentage.

Figure 1 shows the XOR of rice, maize, and wheat from 1961 to 2009. Wheat is the most tradable, with an average XOR of 18.63%, followed by maize, with an average XOR of 13.57%. Rice has the lowest average XOR, equal to 4.98%.

Figure 1: World Export-to-Output Ratios of Cereals



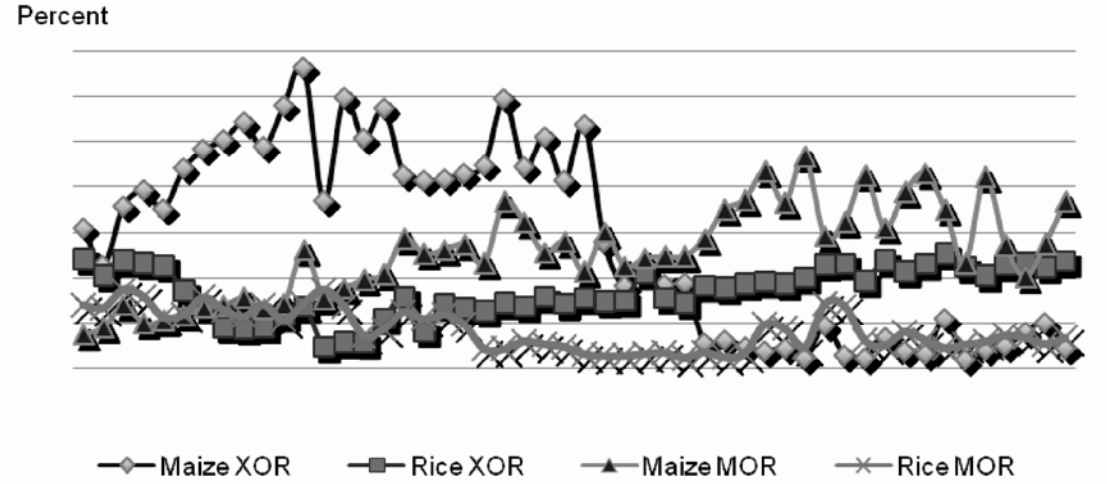
MOR = import-to-output ratio, XOR = export-to-output ratio.

Source: Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT).

Rice and wheat exports as a percentage of their respective output levels have steadily increased through the years, while the tradability of maize has declined since it peaked in the 1970s. In the 1960s and 1970s, the average XOR for rice was 4.22% while for wheat, the XOR was 17.19%. The XOR for rice increased to 5.49% and for wheat to 19.58% in the 1980s and 1990s, and expanded further from 2000 onwards to 6.96% for rice and 20.19% for wheat. The corresponding ratios for maize slightly fluctuated in the same period. In the 1960s and 1970s, maize was being exported increasingly. However, starting in the 1980s, the maize XOR declined and stabilized at about its average.

Until the 1990s, ASEAN was a net exporter of maize, as shown in Figure 2. After the 1990s, the pattern was reversed. The XOR for maize fell significantly after the mid-1980s because of the increasing use of maize in the region and the expansion of the region's output. In contrast, the region's XOR for rice steadily increased after reaching bottom levels in the middle of the 1970s, which likely reflected the decline of rice exports from Myanmar. The MOR for rice had steadily declined since the 1960s to the middle of the 1990s, before gradually rising to its present level. Figure 2 clearly shows that the region has increasingly become a net rice exporter.

Figure 2: ASEAN Export-to-Output Ratios and Import-to-Output Ratios for Maize and Rice



ASEAN = Association of Southeast Asian Nations, MOR = import-to-output ratio, XOR = export-to- output ratio.

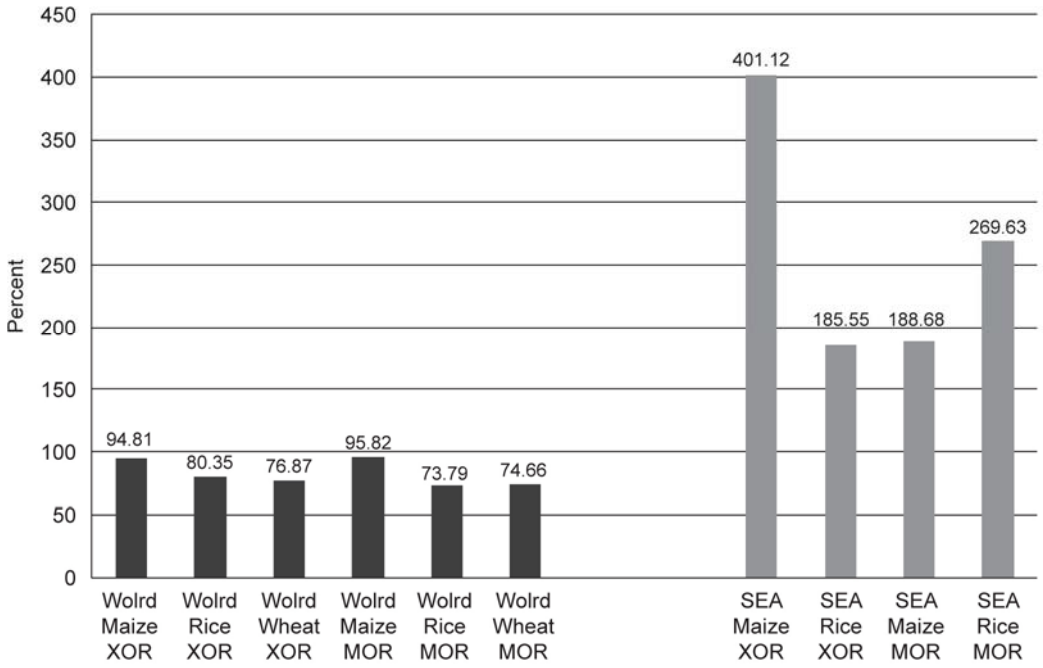
Source: Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT).

The off-and-on patterns of the MOR for maize, and to some extent, the MOR for rice, are worth noting. Although the rice MORs were at their lowest in the 1980s, they nonetheless exhibited a stable pattern unlike that in the 1990s. It may be observed that the XOR for maize was unstable in earlier years, and in the more recent period as well. When the maize MOR fell, its XOR rose, which apparently indicates that the source of this instability was the fluctuation of the region's rice output. Furthermore, this indicates that trade is clearly a last resort at least for maize and perhaps also for rice. If there is a marketable surplus because of a good harvest, the XOR rises and the MOR falls. The reverse occurs when harvests turn out to be lower than expected.

The MOR follows a pattern similar to that for the XOR as an indicator of tradability for the same period. Rice had an average MOR of 4.89%; wheat, 18.47%; and maize, 13.46%. In the second half of the 1970s, maize imports reached the levels of the MOR for wheat. Since 1990, maize importability gradually declined and settled at 13%, still exceeding that of rice at 6.75%. In ASEAN, which does not have any significant export potential in maize, the difference in importability between rice and maize is more pronounced compared to the case of exports, in which rice exports have surpassed maize.

Figure 3 shows the volume volatility indices of the XOR and MOR from 1961 to 2009 for the world for the three cereals, and those for Southeast Asia for rice and maize.[4] The world XOR and MOR tended to be more stable compared to those of ASEAN. The volume volatility indices of the world XOR are 94.81% for maize, 80.35% for rice, and 76.87% for wheat. On the other hand, the corresponding estimates for world MOR are 95.82% for maize, 73.79% for rice, and 74.66% for wheat. The ASEAN members exhibit more instability in their respective tradability indices. It is interesting to note that the ASEAN's MOR for rice has exceeded that for maize.

Figure 3: Volatility of Export-to-Output Ratios and Import-to-Output Ratios of Selected Cereals



MOR = import-to-output ratio, SEA = Southeast Asia, XOR = export-to-output ratio,

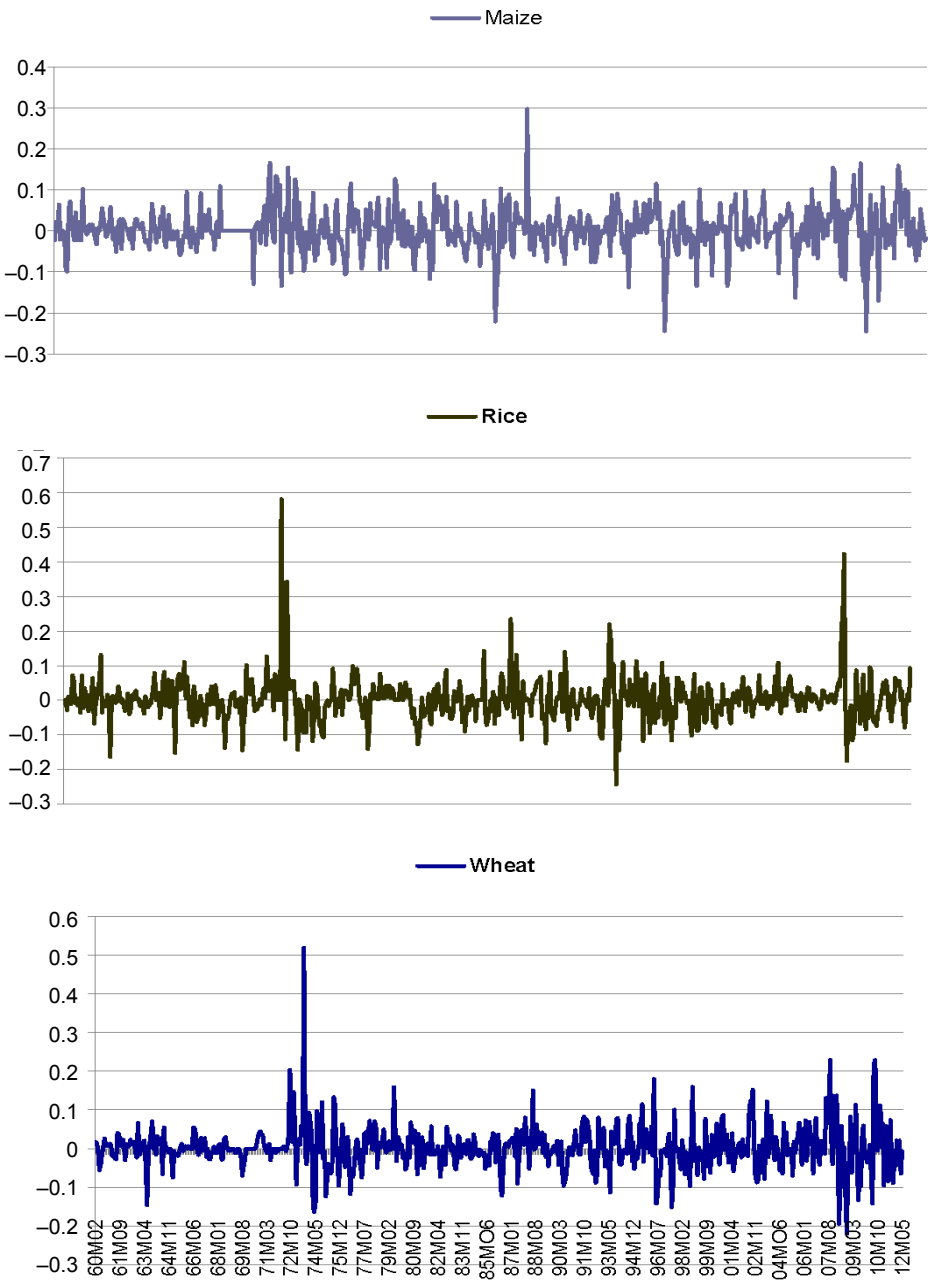
Source: Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT).

A. Price Volatility

Price volatility is measured as the standard deviation of the natural logarithm of monthly changes in prices, multiplied by the square root of the total number of observations.

[4] The index is the standard deviation of the annual percentage changes of the tradability indices multiplied by the square root of the total number of observations.

Figure 4: Volatility of Monthly Prices of Maize, Rice, and Wheat, 1960–2012



Source: World Bank Commodity Price Data (Pink Sheet).

Figure 4 shows how the monthly prices of the three cereals fluctuated from February 1960 to May 2012. The range of price fluctuations for maize is from -0.25 to +0.3, the narrowest and the lowest among the three cereals. In contrast, rice and wheat had price spikes exceeding +0.3, as in the first half of the 1970s. Rice had another spike in the first half of 2008. Maize, however, had sharper price slumps compared to rice and wheat. There were 2 months when its price declined sharply from the immediately preceding month at the rate of at least 0.20%.

As shown in Table 5, at least 95% of these price fluctuations are roughly between -0.1 and +0.2. In the case of maize, 95.38% of the observations are in this range, while for rice it is 96.50%, and for wheat, 96.02%. Rice has the highest number of observations of price changes exceeding +0.3, having registered 1.11% compared to 0.16% for maize and 0.80% for wheat. It would appear from these numbers that rice prices have tended to be the most prone to spikes.

Table 5: Frequency Distribution of Monthly Cereal Prices, February 1961–May 2012
(%)

Categories of rates of monthly price changes	Maize	Rice	Wheat
Equal to or less than minus 20%	–	–	–
Equal to or less than minus 10% and more than minus 20%	0.48	0.16	0.16
Equal to or less than 0% and more than minus 10%	3.34	3.50	2.55
Equal to or less than 10% and more than 0%	48.09	45.70	49.84
Equal to or less than 20% and more than 10%	43.95	47.29	43.63
Equal to or less than 30% and more than 20%	3.98	2.23	3.03
Equal to or less than 40% and more than 30%	0.16	0.64	0.64
Equal to or less than 50% and more than 40%	–	0.16	–
Equal to or less than 60% and more than 50%	–	0.16	–
Equal to or less than 70% and more than 60%	–	0.16	0.16
More than 70%	–	–	–
Total	**100.00**	**100.00**	**100.00**

– = no data.

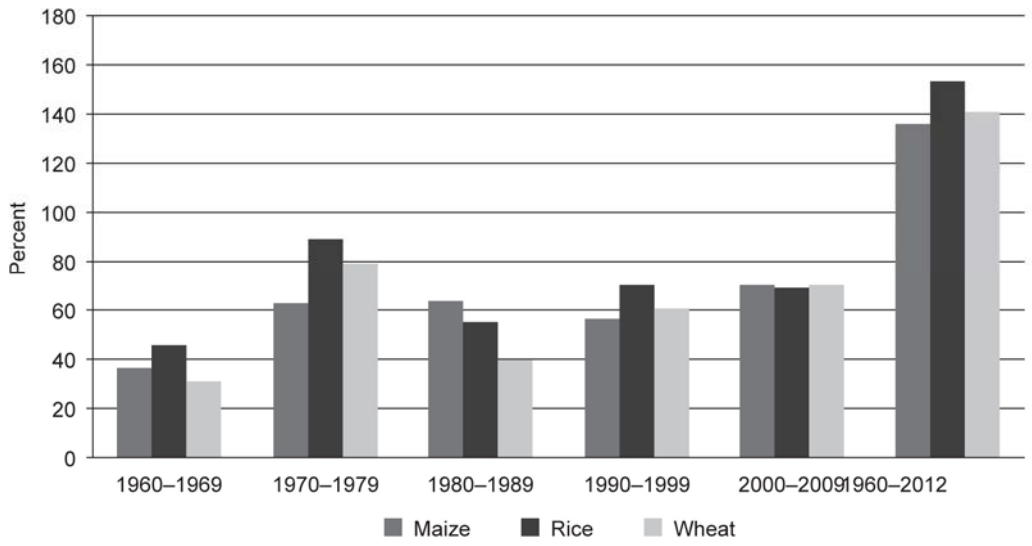
Source: World Bank Commodity Price Data (Pink Sheet)

For the entire period of February 1960–May 2012, rice had the largest price volatility at 153.73%, compared to wheat at 141.42%, and maize at 136.26% (Figure 5).[5] This price volatility ranking did not change except in the 1980s when rice prices came second to maize. Maize and wheat prices had been virtually as volatile except in the 1970s.

The 10-year average price volatility indices indicate that cereal prices have become increasingly unstable through the years. Cereal prices dropped in the 1980s from their historic peak levels in the 1970s but have since gradually increased.

[5] These numbers are larger compared to the average price volatility of each of the 5 decades since the 1960s, attributable to the scaling done on the standard deviation by the square root of the number of observations.

Figure 5: Price Volatility of Cereals, February 1960–May 2012



Source: World Bank Commodity Price Data (Pink Sheet).

B. Price Volatility and Tradability

Table 6 compares the estimated price volatility indices and the XORs for the three cereals by decade since the 1960s. Except for the 1980s and 2000s, the numbers for rice appear to support the claim that price volatility is inversely related to tradability—that is, rice, which had been the least tradable of the three cereals, registered with the highest price volatility. Throughout the 1960s until 2010, rice prices had the highest price volatility (152.28%), followed by wheat (139.08%) and maize (133.72%).

Table 6: Average Cereal Price Volatility and Export-to-Output Ratios: 1961–2010
(%)

	Maize		Rice		Wheat	
	Price Volatility	XOR	Price Volatility	XOR	Price Volatility	XOR
1961–1969	32.64	9.99	44.97	4.46	29.40	16.95
1970–1979	62.72	14.88	89.45	3.94	80.86	17.07
1980–1989	64.78	16.20	56.02	4.21	40.73	19.97
1990–1999	56.19	13.29	70.69	5.20	61.46	18.64
2000–2010	74.52	13.18	71.41	6.86	80.22	20.18
1961–2010	133.72	13.57	152.28	4.98	139.08	18.63

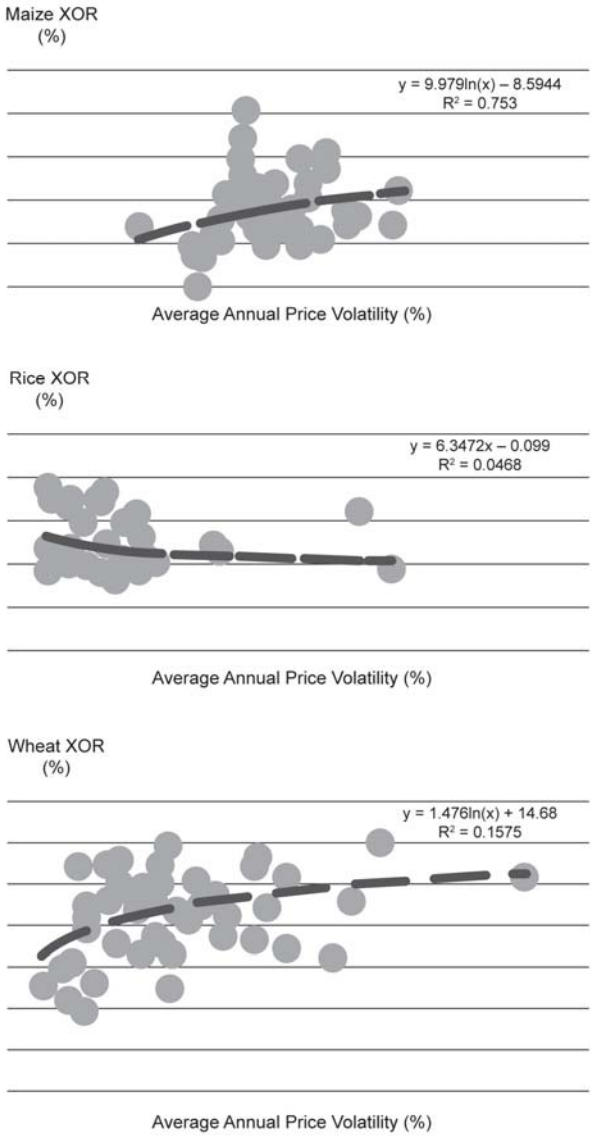
XOR = export-to-output ratio.

Sources: Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT) for trade data; World Bank Commodity Price Data (Pink Sheet) for prices.

That price volatility is inversely related to tradability has not consistently held up for maize and wheat. The price volatility of maize, which is less traded than wheat, was slightly lower than that of wheat prices throughout 1961–2009, and in all of the decades except the1960s and 1980s.

Figure 6 plots the XORs of the three cereals against their respective average annual price volatilities. The panel for each cereal shows that most of the observations are clustered between 10% and 20% price volatility. An upward sloping trend may be observed. The case of wheat, as the second panel shows, reveals a similar pattern of direct correlation between tradability and price volatility. The plot of observations has a wider range of price volatility from 5% to nearly 40%. Wheat is shown as having the highest XOR.

Figure 6: Annual Export-to-Output Ratios and Price Volatility of Cereals, 1961–2010



XOR = export-to-output ratio.

Sources: Food and Agriculture Organization of the United Nations (FAO) for trade data; World Bank for prices.

The plot of observations for rice, in contrast, has a discernible downward sloping line, indicating some support to the claim that price volatility is inversely correlated with tradability. As expected, the XOR for rice is relatively low and its price volatility indices have the largest span, from less than 10% to as high as over 60%.

The case of rice deserves closer scrutiny. The extent of international trading for this commodity has been persistently low for nearly half a century, especially when compared with two equally important cereals, maize and wheat, despite the advent of trade liberalization. Further, while price volatility spurs trade for the global maize and wheat markets, it tends to exacerbate the already low level of trade for rice. The remainder of this paper will focus on this issue, and ask what can be done to expand rice trade.

IV. SELF-PERPETUATING CYCLE: THIN TRADE IN RICE

In the aftermath of the 2008 rice price crisis, the rice-importing countries in Southeast Asia revitalized their respective programs for self-sufficiency in rice. In Malaysia, the government is targeting an increase in rice yield from 2.47 to 4.48 tons per hectare (ha) with public support. Sabah and Sarawak have been identified as the new frontiers for production. In April 2008, the Philippine government launched its FIELDS program,[6] which aims to produce at least 98% of the country's rice consumption requirements in 2 years. This program has continued under the present government, in which the Philippines seeks to be 100% self-sufficient in rice production by 2013.

Indonesia has also been working for full self-sufficiency, devoting public resources to increasing rice production. Even Brunei Darussalam, which easily obtains its rice requirements from trade, launched a rice hybrid development program in September 2009, targeting 1,344 ha to help attain 26% self-sufficiency in rice.

The question is: Are rice-importing countries in ASEAN pursuing self-sufficiency programs in rice to protect their rice farmers from import competition,[7] or because they want to insure themselves against the risk of not having rice if they overly depend on rice trade?

Rice is Southeast Asia's top source of livelihood for the majority of the rural population in places where the crop is grown. It is also the region's staple food, providing about 20% of the global average calorie intake (FAO 2005). Historically, policy makers have viewed the commodity as a politically sensitive topic and have accorded their producers special treatment. Rice imports are thought to undermine the objectives of increasing farmers' incomes and making rice farming profitable for food security.

However, the programs for rice self-sufficiency comprise a significant amount of public outlay for agriculture, which stunts the growth of the non-rice industries of the sector, where these countries may have the comparative advantage. The menu of measures for self-sufficiency includes those designed to protect local producers from import competition,

[6] The Philippines' FIELDS rice program stands for Fertilizer, Irrigation, Education and training of farmers, Loans, Dryers and other postharvest facilities, and Seeds of high-yielding rice varieties. Since 2010, the current government has called its version of rice self-sufficiency the Food Staples Self-Sufficiency Program (www.gov.ph/agriculture-food-staples-self-sufficiency).

[7] This argument is akin to the infant industry protection reasoning, in which high tariffs are imposed to shield local producers of import substitutes from foreign competition until such time that they build their competitiveness.

penalizing rice consumers in these countries for accessing other sources of rice with better quality and at more affordable prices.

The region's thin trade in rice can be self-perpetuating. Large rice-deficit countries in ASEAN—Indonesia and the Philippines—adopt self-sufficiency programs apparently to insure themselves against the risk of relying on thin trade for their rice requirements each year. Their stochastic performance in implementing these programs has shaped their "stop-and-go" behavior in rice importation. The situation likewise does not encourage long-term investments to attain higher rice productivity in rice-exporting countries, particularly in Cambodia and Myanmar, both of which have the potential of increasing their exportable rice surpluses.

By restricting exports, the top rice exporters in the region contribute to stunting the growth of rice trade, which in turn only hardens the resolve of rice-deficit countries to stay away from rice trade or to use it as their last resort for ensuring food security. In 2008, Viet Nam restricted rice exports to insulate the economy from excessive price fluctuations overseas. In October 2011, Thailand reintroduced its rice-pledging program, under which it procures paddy rice as loan collateral to farmers at about 100% subsidy rate. The effect on trade has been enormous: the difference between Thailand's rice exports 1 year before and 1 year after the program's implementation is a staggering reduction in volume by 78%, or 5 million tons (ADB 2013).

It is important to expand regional rice trade if only to help deepen global rice trade and prevent extreme rice price volatility. Two of the top rice exporters and two of the top rice importers in the world are ASEAN members. Yet, rice trade in the region remains shallow, in turn keeping global rice trade from rising. When rice price spikes occur in the region, these tend to be transmitted to the global market.

The thin trade in rice may reflect the degree of confidence of rice-importing countries in the capacity of trade to assure them of rice supply when needed. Given that rice trade is relatively thin and unstable, ASEAN members have thus tended to insure themselves from risk by implementing national self-sufficiency programs in rice.

The excessive price volatility of rice reflects the concern that rice trade is not dependable. If the insurance hypothesis about self-sufficiency programs is correct, one can attribute thin rice trade to excessive price volatility. If, however, the trade protection motivation for self-sufficiency programs is valid, then the direction of causality ought to be the reverse. That is, thin trade causes excessive rice price volatility.

The next sections use various data to test whether it is the insurance motivation or the trade protection motivation that serves as the rationale for rice self-sufficiency programs. Extreme instead of average rice price volatility is used for testing.

A. Extreme Rice Price Volatility

Food price crises involve sharp changes of food prices that are largely unexpected by both consumers and producers. Accordingly, they cause substantial adjustment costs in the economy, including reallocations in household spending, hunger, and financial losses. In their report (Group of 20 2011), the G20 leaders argued that excessive volatility would not only undermine access to food, particularly of the poor, but also weaken the incentives of farmers to produce food. The World Bank (1986) has identified food price fluctuations to be an important

cause of transitory food insecurity. Moreover, every food crisis tends to undermine the trust of stakeholders of food markets in international food trade.

Extreme food price volatility refers to the set of rates of changes of food prices with the likelihood of realization equal to no more than some low level of chance. To consumers, extreme price volatility refers to high-order surges of periodic rice prices. In the case of farmers, unexpected slumps in rice prices may inflict financial losses, which may lead to business closures. The likelihood that either situation will happen is low.

Martins-Filho, Yao, and Torero (2010) suggested a likelihood of no more than 2.5% of the time for extreme price volatility. Following this convention, the rice price crises that concern consumers involve rates of changes of periodic rice prices in the upper tail end of the frequency distribution.[8]

As shown in Table 5, most of the rates of changes in monthly rice prices since the 1960s are no more than the absolute value of 10%. Thus, these rates are very likely to occur, and are likely to be expected by the market stakeholders. Such fluctuations are regarded as part of the normal operations of the rice market. However, the high-order rates of changes, at least equal to the absolute value of 15%, are very unlikely to happen. If one assumes that these rates of price changes are distributed normally, then extreme rice price volatility is located in the upper or lower tail of that frequency distribution.

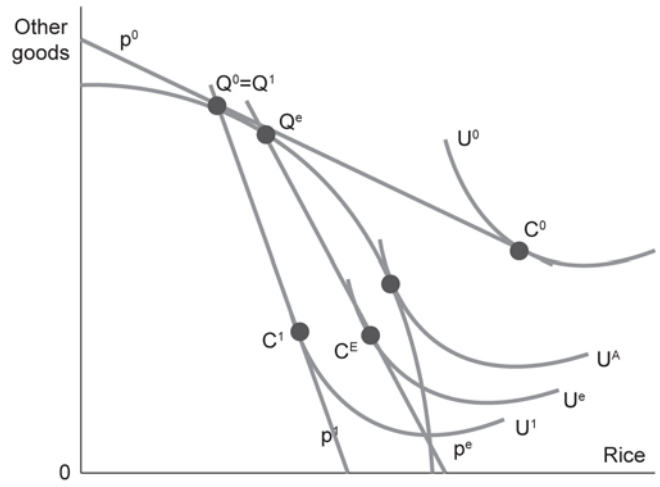
There are several approaches in the literature for measuring excessive price volatility. Labao (2012) reviewed three approaches for estimating conditional high-order quantiles to determine if price volatility is extreme. The first one assesses extreme price volatility using a trend represented by the mean of the incrementally increasing dataset. The spline-backfitted kernel high-order quantile threshold (Martins-Filho, Yao, and Torero 2010) makes use of a generalized Pareto distribution of extreme value theory to identify tail-end extreme price fluctuations. The generalized autoregressive conditional heteroskedasticity, or GARCH (Bollerslev 1986), is the third approach. According to Labao, the GARCH model produces the most flexible conditional high-order quantiles in that its estimated thresholds of rates of price changes behave gradually and address the problem of volatility clustering.

B. Causality Tests

In Figure 7, the possible welfare effects of rice price volatility on trade are shown conceptually. Let p^0 represent the world price of rice relative to other goods, which occurs with the probability, x while its higher level, p^1 happens with the probability equal to $1 - x$. The symbol, p^e, in Figure 7 is the expected world price ratio (i.e., $p^e = xp^0 + (1 - x)p^1$). Let there be an adjustment cost such that at the higher price p^1, local rice farmers cannot respond and rice production remains at Q^0 creating the problem of a food shortage. Such adjustment cost may be for the short term, but nonetheless, U^e is less preferred to U^A. From the analysis, the country is better off investing in a program that takes it to full self-sufficiency, and attains U^A.

[8] Martins-Filho, Yao, and Torero (2010) used a nonparametric generalized additive model of commodity price movements that was estimated using the spline-backfitted kernel (SBK) estimator in computing the higher-order quantiles.

Figure 7: Effects of Rice Price Volatility on Trade



Source: Authors

The expected price, p^e is depicted in Figure 7 such that the volume of trade is less than the import requirements of the country at the lower price, p^0. In one extreme situation wherein $x=0$, then the expected welfare level, U^1, would fall below U^e. For this to happen, adjustment costs in production are assumed to be substantial enough as to prevent farmers from responding positively to the higher price of rice at p^1. Indeed, the spike in rice prices only brings misery to consumers but does not reward farmers, who on account of the short-term nature of the sharp increase of the price are unable to increase production.

In contrast, the alternative hypothesis that a given country protects its rice farmers for reasons other than those arising from its lack of confidence in trade will reduce trade and cause extreme price volatility. An example of such reasoning is providing livelihood to rice farmers in a situation where other means of livelihood are not yet readily available.

Table 7 shows the results of the Granger causality tests of whether extreme rice price volatility reduces trade or low rice trade causes extreme rice price volatility. In the first level of the test, the quantity of rice exports is regressed against lagged quantities of rice exports and extreme rice price volatility variables, whose values are represented by the number of months in which monthly rates of change in rice price exceed the threshold value for excessive price volatility.[9] In Test 1, the conditional fixed-effects Poisson regression is used on 10,833 observations. The lagged price volatility variable, *exconstlag*, was estimated to be significantly reducing rice exports. However, the other price volatility variable, *exconstlag2*, was insignificant. The test as to whether extreme price volatility causes rice exports to decline is significant at 10% level of confidence.

[9] The threshold value is determined such that 97.5% of the observed rates of monthly rice price changes are less than that value.

Table 7: Granger Causality Tests: Extreme Rice Price Volatility and Rice Trade

Test 1: Extreme rice price volatility causes lower trade						
Quant	**Coef.**	**Std. Err.**	**Z**	**P>|z|**	**[95% Conf. Interval]**	
quant						
Lquantlag	0.3695	0.0292	12.64	0.000	0.3122	0.4268
lquantlag2	0.0596	0.0155	3.84	0.000	0.0292	0.0900
exconstlag	–0.0418	0.0242	–1.72	0.085	–0.0892	0.0057
exconstlag2	–0.0539	0.0403	–1.34	0.181	–0.1328	0.0250
Wald chi2(4) = 242.09		Prob > chi2 = 0.0000				
Prob > chi2 = 0.0649* pairwise significant at 10%						

Test 2: Low rice trade causes extreme rice price volatility						
Exconst	**Coef.**	**Std. Err.**	**Z**	**P>|z|**	**[95% Conf. Interval]**	
exconst						
exconstlag	–0.0565	0.0221	–2.56	0.011	–0.0998	–0.0132
exconstlag2	0.0597	0.0202	2.96	0.003	0.0201	0.0992
Lquantlag	0.0007	0.0134	0.05	0.960	–0.0256	0.0270
lquantlag2	–0.0164	0.0124	–1.33	0.184	–0.0406	0.0078
Wald chi2(4) = 14.89		Prob > chi2 = 0.0049				
Prob > chi2 = 0.3376 * insignificant						

Source: Authors' estimates.

In Test 2, the regression analysis makes use of 10,524 observations, and excessive price volatility is regressed against lagged export values, *quantlag* and *quantlag2*. Both are statistically insignificant. The test as to whether exports cause rice price volatility is rejected. These results apparently support the notion that rice self-sufficiency programs are implemented as a virtual national self-insurance against the risk of excessive rice price volatility.

V. GIVING TRADE A CHANCE THROUGH REGIONAL ACTIONS

An immediate implication of the results of this study is that rice-importing and -exporting countries in Southeast Asia tend to respond individually to international price volatility with autarkic measures such as self-sufficiency, which in turn, in the aggregate, further dampen the level of rice trade. It is imperative that collective actions such as those through ASEAN be pursued to manage the risks of extreme rice price volatility while simultaneously building the confidence of the ASEAN members in rice trade. This appears to be the first order of business for regional policy makers. With rice price volatility kept within normal levels, ASEAN members can focus on measures that truly integrate rice into the region's economic community. These reforms will eventually foster enhanced and more cost-effective food security in the region. They are also particularly important for the global rice market, considering that the top players in the global rice industry and trade are in the region.

Complementing the ASEAN effort of expanding rice trade, many other institutions examined the causes, consequences, and possible remedies of extreme food price volatility. The G20 convened experts from various multilateral organizations to identify its options for reducing and mitigating more effectively the risks induced by the price volatility of food and other

agriculture commodities. The G20 report (Group of 20 2011) called for the provision of food market information, food stockpiling, trade facilitation, development of commodity futures markets, and reduction of postharvest losses. In a related study, Torero (2011) reviewed several proposed mechanisms to determine their relative implementation cost and contribution toward managing volatility.

Of the recommendations by numerous analysts in the aftermath of the recent rice crisis, what are the most viable actions that governments can take that have great potential for reducing excessive price volatility? There are three broad categories of such actions: food stocks, market information, and trade facilitation.

A. Food Stocks

Wright (2009) stressed the importance of food stocks in explaining the recent food crisis of 2007–2008. A low level of food stocks makes markets vulnerable to excessive price volatility even with only low levels of supply or demand shocks. Timmer (2010a) prioritized policy actions designed to prevent extreme price volatility over those meant to cope with its impact, particularly on the poor. In the case of rice, he advocated undertaking rice reserves in Asia. Dawe (2009) and Wright (2009) gave an even lower stock-to-use ratio just before the 2008 rice crisis, after controlling for the relatively large holding of rice stocks of the PRC, which is not a major rice exporter.

Several versions of food reserves have been proposed, including international coordinated grain reserves (Lin 2008). Timmer (2010b) proposed the same for rice in Asia at four levels: private stocks, public stocks in small importing countries, public stocks in large importing and exporting countries, and international stocks. Regional reserves, such as the arrangement of ASEAN, the PRC, Japan, and the Republic of Korea (ASEAN Plus 3) for rice, illustrate a multicountry effort of coordinating publicly held rice reserves (Box: The ASEAN Plus Three Emergency Rice Reserve).

Box: The ASEAN Plus Three Emergency Rice Reserve

The ASEAN Plus Three Emergency Rice Reserve (APTERR) was established in July 2011 by an agreement signed by the ministers of agriculture and forestry of the 13 member countries of the ASEAN Plus Three. The ASEAN Plus Three is composed of the 10 member nations of ASEAN—Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam—plus the three East Asian nations of the People's Republic of China, Japan, and the Republic of Korea.

APTERR seeks to address immediate threats to food security caused by disasters and market volatility associated with calamities. Earmarked rice reserves currently total 787,000 tons. Voluntary donations to APTERR in the form of cash or rice consist of stockpiled reserves. APTERR stocks are released to a country that is unable to cope with an emergency state or condition through its national reserve and is unable to procure the needed supply of rice through normal trade. Day-to-day management is undertaken by a secretariat hosted by Thailand, under the supervision of the APTERR Council.

Source: ASEAN Plus Three Emergency Rice Reserve (2011).

International stocks run a high risk of coordination failure and incur a high cost. For example, Lin's proposal (2008) on international coordinated grain reserves costs about

$1.05 billion per year. APTERR is presently capitalized at $4 million for the first 5 years of operation. Although APTERR may likely have a lower operating cost than the international coordinated grain reserves, its managers would need to pay attention to the coordination failure that had marked previous efforts.[10] The investment of APTERR in developing its rules and procedures and in its capability to anticipate rice shortages is noteworthy.

Designed as a social protection measure, emergency reserves play a very small role in reducing food price volatility. These reserves, however, are important in meeting the food needs of the population in an area hit by calamities or where the normal functioning of food markets is temporarily suspended due to an emergency. The proposal on international coordinated grain reserves entails setting up a physical reserve, amounting to about 5% of current levels of food aid or about 300,000 metric tons of food in wheat units. It is recommended that the World Food Programme manage these food reserves strategically located throughout the world. The Group of 8 Plus 5 countries[11] have been tapped for food stock contributions to the reserves and for financing (von Braun and Torero 2008).

Each of the members in the ASEAN maintains country rice reserves. Timmer (2010a) stressed the need to expand these reserves particularly for the large rice-importing and -exporting countries in Asia. In ASEAN, these countries would be three of the largest rice-importing countries in the world—Indonesia, Malaysia, and the Philippines—and two of the largest rice exporters, Viet Nam and Thailand.

Other proposals focus on the operation of a food reserve system. An international food agency is being proposed to coordinate the operations of the reserves, and to gather and disseminate information about food stocks.[12]

B. Market Information

Wright (2009) pointed out the importance of sharing information about food stocks. He suggested creating a system for information sharing regarding food stocks to improve policy responses to food shortages as they develop and allay the fears of stakeholders. While very useful for assessing as correctly as possible the impact of supply shocks on the market, this information nonetheless is difficult to obtain. Incentives for disclosing information about food stocks need to be developed. Generating and correctly interpreting market information are needed to nip in the bud any herding process that may lead to a self-fulfilling crisis. The point made by Headey (2011) that trade shocks played a very important role in explaining the 2008 rice crisis may not comprise a fundamental explanation for it; after all, trade shocks are the outcome of decisions made by market stakeholders. Even the policy actions of India, the Philippines, and Viet Nam were made in response to abnormal household spending on rice in response to unfolding yet unverified information of a possible rice shortage.

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[10] Most of the international commodity agreements that were established after the Second World War to stabilize global commodity prices collapsed by the early 1960s.

[11] The Group of 8 consists of Canada, France, Germany, Italy, Japan, the Russian Federation, the United Kingdom, and the United States, while the Plus 5 countries refer to the emerging economies of Brazil, the People's Republic of China, India, Mexico, and South Africa.

[12] Evans (2009) called for an international agency—even an existing body, such as the World Food Programme—to manage the food reserves, which he identified as for "emergency purposes" and not for stabilizing rice prices. However, instead of helping reduce price volatility, this would confine to humanitarian purposes the meaning of "emergency" and the actions taken in response to it.

Timmer (2009) argued that speculative behavior destabilized rice price formation in 2007 and in early 2008. He said that instead of being driven by financial speculation, the price spikes in 2008 may be traced to "the psychology of hoarding behavior… by millions of households, farmers, traders and some governments."

Herd behavior is anchored on the notion of information cascades where buyers ascribe greater weight to the actions taken by the developing majority of those who bought before them. It is a simple follow-the-leader process: "followers" respond to signals derived from the actions of the "leader." If one buyer starts to stock up on rice to avoid higher rice prices in the future, for example, other buyers follow suit. As the information is passed on to a larger group of buyers, the tipping point for a crisis is then reached. This typically happens when the followers have only vague information about the market situation, which they easily adjust based on their observations of the actions of previous buyers. Accordingly, buyers would rather be part of a consensus because it could be more costly for them to gather information about the true state of the market (Bikhchandani and Sharma 2001). Banerjee (1992) discussed this type of action extensively and established that the resulting equilibrium is normally inefficient.

The G20 report (2011) recognizes the importance of investing in information about the food market system. This is only one part of the equation; the other part is the interpretation of such information. The latter requirement may be met by having a regular forum of policy makers who go over the market situation to further share and interpret information as accurately as possible, and to coordinate policies in response to developing events with the potential of causing excessive volatility in the market.

Complementing this effort is having a vibrant regional futures trading in rice. Aside from reducing market risk, futures trading provides a convenient platform for market information. The participation of many traders that are guided by market information and their interpretation of it, provides signals to other participants as to where the market is moving. Like its counterpart in financial securities or other commodities, rice futures trading would need to be regulated well to keep and improve its integrity.[13]

C. Rice Trade Liberalization and Facilitation

Sarris (2009) proposed the creation of a food import financing facility for net food-importing developing countries and an international grain clearance arrangement. Although in place since 1981, this facility was hardly used because of the policy conditions attached to its access. Sarris proposed the facility to operate without the conditions of the International Monetary Fund to increase access and facilitate trade. Wiggins and Keats (2009) view the international grain clearance arrangement as being capable of providing guarantees for grain forward-trade contracts to reduce counterparty risks.

It is worth noting that the level of imports, not exports, constrains regional rice trade in ASEAN as shown in Figure 2. The expansion of the capacity of the ASEAN to export rice was due to the entry of Viet Nam into the league of the world's top five rice exporters. In the 2000s, ASEAN's rice imports hardly increased, unlike its exports. Rice exports have increasingly been sold to markets outside the region.

Exporting countries have the capacity to expand their exports if there is added demand for rice in the world market. Like Viet Nam, Cambodia and Myanmar have the potential to

[13] For more on commodities trading and how it can address rice price volatility, see Pochara (2012).

augment the regional supply of rice. With adequate rice demand and investments in the supply chain, the rice export supply capacity of the region can increase. In Cambodia, investments aimed at modernizing road infrastructure, logistics, and rice mills have the potential of increasing the country's marketable surplus to the world.

But are the rice-importing ASEANs ready to make their rice trade policies more open? Preferential rice tariff rates in the ASEAN Free Trade Area do not suggest they are. Although some countries have agreed to reduce their respective preferential import tariffs—the Philippines to 30%, Indonesia to 25%, and Malaysia to 20%—these rates are significantly higher than what free trade area tariff rates ought to be. In addition, the Philippines is negotiating with the World Trade Organization (WTO) to extend its special treatment on rice. Indonesia, on the other hand, has reintroduced a rice-import licensing system, which has been in use since 2004.

Article 24 of the ASEAN Trade in Goods Agreement (ATIGA) recognizes an earlier protocol agreement on providing special considerations for rice. The purpose of the protocol is to allow a member state to request to temporarily raise its import duties on rice. As matters on the protocol stand now, it may be productive to put more structure in the decision-making process in ASEAN with respect to requests for waivers under this protocol. Trade remedies under the WTO have gone through this process. In their earlier pronouncements providing for these measures, contracting parties of the former General Agreement on Tariffs and Trade realized the gaps, and had to agree on implementing rules and regulations to reduce the possible diminution of predictability on trade rules brought about by the invocation of these remedial measures.

The region's large exporting countries, Thailand and Viet Nam, have likewise contributed to reducing rice trade. In 2008, Viet Nam restricted rice exports to avoid importing excessive price fluctuations into the country. ATIGA requires member states to avoid and desist from imposing prohibitions or quantitative restrictions on the exportation of goods destined for the region. However, the agreement does not prevent member states from maintaining export restrictions when the domestic price of an exportable product is held below the world price by the exporting member state that is implementing a price stabilization program. Export restrictions may likewise be imposed in situations when the exportable product such as rice is in short supply.

Unilateral export restrictions need not come in the form of minimum export prices, export taxes, or outright prohibitions. The paddy-pledging program of Thailand, without an export subsidy, is virtually a rice export-limiting policy. At the rate it is announced to be operating, the farm price subsidy is about $500 per metric ton. Assuming there are adequate fiscal resources to pay for the cost of this subsidy, all rice in Thailand is priced at twice that of the world market. While Thailand may be able to pass on some of those subsidy costs to the world market, its capacity is limited. Other large rice exporters such as India, Pakistan, and Viet Nam do not need to make world rice consumers pay more than the production cost of rice. Thus, some of these rice stocks get diverted to the domestic market or to the warehouses as rice stocks. By the end of 2012, the year-on-year loss in the quantity of Thailand's rice exports was estimated at about 4 million tons or $1.9 billlion in value.[14]

Wright (2009) called for the strengthening of international trading rules on export restrictions. Stronger disciplines at the multilateral or regional level may provide a counterweight

[14] These estimates were calculated using the quantity and value of Thailand's rice exports in 2011 and 2012. Data were generated from http://www.trademap.org/

to pressures from the urban population of exporting countries to divert exports toward the domestic market.

Negotiating for multilateral rules on export restrictions or even on a reduction in import restrictions on rice is likely to be very difficult. However, one promising area of regional cooperation is for rice-importing countries to agree to reduce their levels of self-sufficiency in exchange for the commitments of rice-exporting countries to stay away from unilateral export restrictions. This has the potential of deepening regional rice trade and making the region better prepared for supply or demand shocks.

D. Regional Cooperation: Making the Case for the ASEAN Integrated Food Security Program

Extreme rice price volatility in 2008 brought with it a unique opportunity for the region to break out of its food insecurity, particularly in rice. After the crisis, the ASEAN heads of state came up with the ASEAN Integrated Food Security Framework and its implementing mechanism, the Strategic Action Plan on Food Security in the ASEAN Region. The plan has taken major strides toward preventing or mitigating the problem of extreme rice price volatility through collective action on major fronts: establishing regional and national food reserves, expanding food trade, strengthening market information, and increasing food productivity.

In three areas of strategic action—rice trade facilitation, market information and intelligence, and rice stocks—the regional organization has initiated steps toward building a set of institutions for attaining rice security, with the establishment of APTERR, the ASEAN Food Security Information System **(**AFSIS) project, and the pilot implementation of the ASEAN Rice Trade Forum.

The decision of ASEAN in 2011 to institutionalize APTERR in partnership with the PRC, Japan, and the Republic of Korea is a much welcome development (Box: The ASEAN Plus Three Emergency Rice Reserve). Designed to complement existing national rice reserves of member states and their partners, the regional emergency rice reserve helps absorb the adverse effects of supply shocks. Using forward contract arrangements and streamlined release procedures, ASEAN and its partners build their capability to quickly respond to supply shocks.

However, rice reserves cannot take on the role that rice trade plays in stabilizing regional rice markets and ensuring rice security. Regional cooperation needs to be tapped and strengthened to find innovative ways of addressing the problem of extreme volatility of international rice prices and finding doable ways of deepening rice trade in the region.

Another positive move in 2011 was the decision of the ASEAN Ministers on Agriculture and Forestry to pilot the ASEAN Rice Trade Forum in June 2012. Convened by the ASEAN Food Security Reserve Board, the forum provides a platform for ASEAN member states to share and collectively analyze rice market information and to come up with evidence-based coordinated policy actions for mitigating the adverse effects of extreme rice price volatility. Through the forum, measures can be collectively discussed that are aimed at making regional rice trade more open and conducive, developing incentives for increased private sector participation in the regional rice value chain, and finding ways to improve rice productivity.

Gathering and sharing market data and information, devising an appropriate model of the regional rice market to assess the market situation, analyzing the impact of economic shocks and policy developments on the market, and disseminating the results can significantly help prevent and reduce extreme price volatility in the regional rice market. With stable rice

prices, member states gain more trust in regional rice trade, paving the way for its sustained development.

Building confidence in trade remains a major task in ASEAN. Toward this end, several actions may be considered by ASEAN, including (i) pursuing arrangements whereby rice-importing countries gradually reduce their rice self-sufficiency targets in exchange for import guarantees from the rice-exporting countries; (ii) instituting clearer criteria for the use of rice waivers under ATIGA; (iii) decoupling Thailand's paddy-pledging program; and (iv) expanding coordinated rice policy actions with India and Pakistan. These actions include measures for enhancing the productivity of rice farming and processing, particularly in Cambodia and Myanmar.

Gathering, analyzing, and disseminating market information are important measures for correcting and preventing the cascade of inaccurate information about the market, and for preventing a self-fulfilling price bubble. The AFSIS project has been gathering and disseminating market information and developing an early warning mechanism to respond to any developing crisis situation. While it is necessary to provide AFSIS with reliable, up-to-date, and demand-driven information, it is also important to develop the capability to interpret market information accurately. This can be facilitated with a rice market model capable of generating not only a market situation and outlook but also policy analysis.

Besides leveling intrayear or multiyear rice price volatility, rice stocks are necessary for building the confidence of stakeholders in rice trade. Toward this end, it is necessary to determine the appropriate levels of rice stocks at the regional and country levels. This may be an initiative under the ASEAN Rice Trade Forum in coordination with APTERR. To expand the regional rice reserve system, ASEAN may consider initiating a dialogue on the proposal for the ASEAN Plus Six Emergency Rice Reserve, which would include the 10 ASEAN member countries plus Bangladesh, India, and Pakistan.[15]

There is a need for continuing the implementation of the ASEAN Rice Trade Forum.[16] The forum can serve several purposes, including (i) gathering market information and intelligence as well as analyzing the impact of demand and supply shocks on the rice market, and (ii) providing a platform for discussing the proposals presented in this paper or any other ideas for deepening rice trade in the region and reducing and managing the risk of extreme rice price volatility. These policy actions may cover a trade facilitation program for rice, including the development and use of a certification system for the product grades of rice which may be traded in a regional rice futures exchange, or an accelerated reduction of rice import tariffs to raise the level of integration of rice in ATIGA.

VI. CONCLUSION

This paper highlights the thinness of rice trade relative to wheat and maize, and the contrasting price volatility and tradability relations for wheat and maize, which display a positive correlation, and for rice, which show an inverse relation. Several factors explain these unique features of rice trade, but the political motivation of ensuring self-sufficiency in rice has been the driving force behind this inverse correlation between price volatility and trade among Southeast

[15] This is drawn from a proposal by Timmer (2010a).

[16] The senior officials of the ASEAN agriculture and forestry ministries endorsed the continuation of the ASEAN Rice Trade Forum during its 34th meeting in September 2012.

Asian countries. The analytical and empirical exposition demonstrates that trade is not the cause of price volatility for rice. An already very low global trading activity in rice tends to self-perpetuate its dampening effect on trade. While fiscally costly, rice self-sufficiency measures serve as insurance to compensate for the high risks of unreliable rice supply and unaffordable rice prices.

The first order of the day is for collective action on measures for reducing the chances of extreme price volatility while simultaneously building confidence in international trade. The ASEAN Integrated Food Security Program is a regional public good that provides a menu of policies for reducing excessive price volatility and for serving as an alternative to autarkic rice policies. The most novel approaches are the regional rice reserve, the rice trade forum, and market information and sharing.

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Rice Trade and Price Volatility: Implications on ASEAN and Global Food Security

About half of the world's population depends on rice as a staple food. But with the instability of rice prices and the thinness of rice trade as compared to other cereals, how can food security be assured? Focusing on Southeast Asia—home to the world's largest rice exporters and importers—this paper examines trends in rice price and trade to determine whether trade causes volatility or the other way around. In the context of self-sufficiency measures by importers and restrictions by exporters, the paper also discusses measures to reduce extreme price volatility while building confidence in international trade. .

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