Study on the Contemporary Relationship between International and Domestic Grain Prices in Developing Countries: Focusing on Long Run and Short Run

Shuqin Yan[1*], Kolawole Ogundari[1], Zhengwei Cao[1], Hiroshi Isoda[1], Shoichi Ito[1] and Hisamitsu Saito[2]

This study attempts to analyze long-run and short-run relationships between domestic and international grain prices; and judge whether there was a significant causality relationship between them. The results indicate that international grain prices have a positive effect on the domestic prices, and international prices increased the domestic prices during and after the 2007-2008 grain price-crisis. For causality, in short-run term, for rice in Nicaragua and Tunisia, for wheat in Georgia, Pakistan and Armenia, international prices significantly affected domestic prices; in the long-run, for rice in Dominican, Nicaragua and Tunisia, for wheat in Armenia, Georgia, Mauritania and Pakistan, and for maize in Chad, Guatemala and Nicaragua, domestic prices may be influenced by international prices.

Key words: grain price-crisis, international/domestic price, causality relationship

1. Introduction

The global agricultural prices have fluctuated highly during the last eight years. Between 2007 and mid-2008, the international price of agricultural commodities have risen sharply. In mid-2008 the prices of rice, wheat and maize were more than two times as high as the prices in 2006 and they reached the highest point and then sharply declined (Shrestha [8], IFAD [5]). Then again, agricultural commodities prices surged in 2011-2012, and prices became higher than they were in 2010 (Baquedano and William [2]). At the same time, volatility of grain prices also occurred in many developing countries. Whether and how international agricultural prices influence domestic prices has become a hot topic. The international Fund for Agricultural Development (IFAD [5]) reports that the effects of the price surge reverberated globally, though the worst hit were low-income, food-deficit countries with meager stocks. It is very important to analyze how international grain prices influence domestic grain prices in developing countries.

So far, there have been already many scholars who have done research on this issue. For instance, Baltzer [1] summarized evidence of price transmission patterns from international maize, rice, and wheat markets to domestic markets in fourteen developing countries during the global food crisis in 2007-2008. A great variation in price transmission patterns is observed; from almost no price pass-through in China and India, to a close relationship between global and domestic prices in Brazil and South Africa, and substantial domestic price overshooting in Ethiopia and Nigeria. Much of this variation can be explained by price stabilization policies, public policy failure, incomplete market integration, and coinciding domestic shocks. Robles [7] found positive transmission effects in the case of wheat in Latin American countries and in two out of three Asian countries. There is also evidence of positive transmission effects in the case of rice for most Latin American and all Asian countries. Imai *et al.* [4] studied the issue of the extent to which changes in global agricultural prices are transmitted to domestic prices in India and China. The focus of this research was on short and medium-run adjustment processes using the VECM model.

Transmission of global agricultural prices to domestic prices has been analyzed in some other studies. We introduce slope-dummy variables to analyze how grain-price crises in international grain markets influence domestic grain prices in developing countries in long-run. This study complements the existing literature by investigating whether domestic grain prices are higher during the post-crisis periods relative to pre-crisis periods using slope-dummy variables. That lends support to the argument that there is a surge in domestic grain prices during the grain-price crisis in developing countries. This approach has not been done before. Also, unlike the previous studies, this study uses cointegration regression (DOLS) to further validate the findings. In addition, an attempt was made in the study to investigate both the short-run and long-run causality effects of

[1] Kyushu University
[2] Hokkaido University
Corresponding author*: ysq2003508@163.com

international grain prices on domestic grain prices, but the short-run and long-run causality test in the study is different with general Causality test in past literatures.

This study attempts to investigate whether domestic grain prices are higher during the post-crisis periods relative to pre-crisis period, to analyze the long-run equilibrium relationship between domestic grain prices and international grain prices, to determine how international grain prices influence the domestic grain prices in developing countries, and judge whether there was a significant causality relationship between international and domestic grain prices in the long-run term and short-run term.

2. Data and Methodology

1) Data definition and sources

Time series monthly data were used in the research. These included three kinds of grain prices, which were retail price data for rice, wheat (or wheat flour) and maize in the international and domestic markets in 24 developing countries basically from January 2005 to July 2013. Different countries have different numbers of observations, because the numbers of observations from data sources are different. We have added some details in Table 2. The data of international grain prices were collected from International Financial Statistics (IFS) website; and the domestic grain prices data comes from Food and Agriculture Organization website, GIEWS Food Prices Data and Analysis TOOL. In this study, we focused on the general condition of the relationships between international and domestic markets in developing countries. We thought these kinds of data we selected could reflect the general relationships between them. For example, wheat price data in the form of wheat flour, and maize data in yellow maize or white maize. We used the national price data preferentially in the data website; if there are no national price data, we chose a representing series data in a major city for our analysis. Basically, there are similar change trends among these series of data, and one series could stand for the fluctuated situation for this country. Before studying our analyses, we checked seasonality in price movement in each country, but we could detect no obvious seasonal fluctuation patterns. Therefore, we believed that the data we selected can reflect the general relationships between these two markets.

2) Methodology

In the first step of this study, the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test were employed to check whether or not the price data in these two markets are stationary on the level or first difference.

At the second step, the Johansen co-integration test was used to check whether long-run relations exist between these two markets. In this part, we can first determine which country had long-run co-integrationships between these two markets. At the same time, because of perceived structural differences in the periods (before and after 2007-2008 grain price-crisis) in international grain markets, the study employed the Zivot-Andrews Unit Root (ZauRoot) Test to examine whether they are structural breakpoints. Zivot and Andrews [9] calculated the ZauRoot Test for a time series allowing for one structural break in the series, which may appear in intercept, trend or both. In this study, only the intercept was applied.

The Zivot and Andrews' model endogenises one structural break in a series , such as y_t, as follows:

$$\Delta y_t = \mu + \theta DV_t + \alpha y_{t-1} + \sum_{j=1}^{k} c_j y_{t-j} + \varepsilon_t \quad (1)$$

In Equation (1) DV_t is a sustained dummy variable capturing a shift in the intercept. At time T_b, where $DV_t=1$, if $t > T_b$, and $DV_t=0$, otherwise. K is number of lag, Equation (1) is sequentially estimated and $t=T_b$ is chosen in order to minimize the one-sided t-statistics of the hypothesis of unit root with a drift and excludes any structural break in the intercept.

Dummy variables were then introduced to analyze how the international grain-price crisis influenced the domestic prices in developing countries during and after the grain price-crisis. A dummy variable takes 1 during and after the grain-price crisis and 0 before the grain-price crisis.

Equation (2) is shown as follow:

$$\mathrm{Ln}P_t^D = \alpha + \beta \mathrm{Ln}P_t^I + \eta \mathrm{Ln}P_t^I \times DV_t^I + \varepsilon_t \quad (2)$$

where, P_t^D is domestic grain price, P_t^I is international grain prices, DV_t^I is dummy variable, Ln is natural logarithmic form, β (β_0 and β_1 in Table 1) represents price elasticity of the international price in the long-run term, while η (η_0 and η_1 in Table 1) is coefficient of slope-dummy variable, and ε_t is the error term. At the third step, we employed a Vector Error Correction Model (VECM) for only one-way from international market to domestic market to find the short-run relationship between them. The equilibrium dynamics relationship in short-run term is specified in equation (3):

$$\Delta \mathrm{Ln}P_t^D = \alpha_{0+}\alpha_i \sum_{1}^{j} \Delta \mathrm{Ln}P_{t-i}^D + \beta_i \sum_{1}^{j} \Delta \mathrm{Ln}P_{t-i}^I + \gamma ECM_{t-1} + \varepsilon_t \quad (3)$$

where, P_t^D is domestic grain prices, P_t^I is international grain prices, DV_t^I is dummy variable, i is lagging number, Ln is the natural logarithmic form, $\triangle$ is the first difference, ECT is error correction term, γ is the coefficient of the error correction term, which denotes the speed of adjustment towards long-run equilibrium, ε_t is the error term of the regression.

At the last step, this research applied the Wald test to find out whether it had a causality relationship in both short-run and long-run between these two markets. Because the traditional Granger causality test, which has some weakness, may not be suitable to be used for variables which are integrated or cointegrated (Ngepah [6]). Base on this, short-run and long-run causality tests were employed to provide the evidence for causality relationship, and this is different from the traditional Granger causality test. Based on Equation (3):

a) Short-run causality test

The underlying null hypothesis for testing whether it had short-run causality is based on significance of the coefficient of the international grain prices:

H^1_0: β_i=0, (short-run from P_t^I to P_t^D) (4)

b) Long-run causality test

The underlying null hypothesis for testing whether it had long-run causality is based on significance of the coefficient of ECT term, which is the speed of the adjustment of equation (3):

H^2_0: $\gamma = 0$ (long-run from ECT term to P_t^D) (5)

The characteristics of target countries in this research were shown in Footnote-Table 1[1]. These developing countries are distributed throughout different regions of the world, and cover different income levels, from low income levels to upper middle income levels.

3. Result

1) Stability valuation

From the results of ADF test, all of grain prices data were non-stationary on their own level, but stationary on their 1st difference at 1% significance level. And the results of PP test confirm this result except maize price in Togo. So we can take the Johansen co-integration test using the data for those countries except Togo (Detailed test results are available from the authors upon request).

Table 1 Long-run relationship between international and domestic grain prices

Grain	Country	OLS						DOLS					
		α_0		β_0(LnP^I)		η_0 (LnP^I×DV)		α_1		β_1(LnP^I)		η_1 (LnP^I×DV)	
		Coeff.	Std.E	Coeff.	Std.E	Coeff.	Std.E	Coeff.	Std.E	Coeff.	Std.E	Coeff.	Std.E
Rice	Benin	5.627***	0.299	0.146**	0.052	0.061***	0.006	5.924***	0.47	0.094	0.082	0.068***	0.009
	Cameroon	4.984***	0.178	0.241***	0.031	0.024***	0.004	4.947***	0.291	0.247***	0.051	0.024***	0.006
	Dominican	5.236***	0.302	0.062	0.062	0.025***	0.01	5.398***	0.496	0.031	0.102	0.028	0.016
	Nicaragua	3.944***	0.305	0.318***	0.053	0.034***	0.006	3.905***	0.55	0.326***	0.096	0.033***	0.011
	Niger	4.818***	4.510	0.270***	0.028	0.056	0.006	5.091***	0.605	0.248**	0.106	0.031**	0.012
	Guatemala	4.623***	0.267	0.203***	0.047	0.049***	0.005	4.781***	0.467	0.175**	0.082	0.052***	0.009
	Panama	6.056***	0.218	-0.023	0.038	0.049***	0.004	6.262***	0.312	-0.059	0.054	0.052***	0.006
	Sri Lanka	4.232***	0.353	0.316***	0.067	0.085***	0.009	4.239***	0.582	0.317**	0.110	0.084***	0.014
	Tunisia	5.342***	0.466	0.183**	0.082	0.058***	0.009	5.471***	0.744	0.161	0.130	0.062***	0.015
Wheat	Armenia	3.843***	0.267	0.410***	0.052	0.046***	0.006	3.684***	0.463	0.441***	0.09	0.044***	0.01
	Georgia	4.428***	0.262	0.368***	0.051	0.053***	0.006	4.264***	0.371	0.400***	0.072	0.051***	0.008
	Mauritania	5.597***	0.205	0.103**	0.04	0.042***	0.005	5.536***	0.335	0.115	0.065	0.042***	0.007
	Pakistan	4.971***	0.281	0.068	0.053	0.070***	0.006	4.992***	0.388	0.065	0.074	0.070***	0.008
Maize	Chad	5.792***	0.375	0.031	0.079	0.035**	0.012	5.682***	0.662	0.057	0.139	0.031	0.022
	Guatemala	3.405***	0.203	0.522***	0.043	0.025***	0.007	3.312***	0.402	0.543***	0.084	0.022	0.013
	Nicaragua	5.022***	0.325	0.006	0.068	0.046***	0.011	4.951***	0.589	0.021	0.124	0.044**	0.019

Note: ** is 5% significant level; *** is 1% significant level. LN is the log form. P^I indicate international price for rice, wheat and maize. DV is Dummy variables.

2) Long-run co-integrationships between international and domestic grain market in developing countries

The lag numbers were selected according to the Akaike Information Criterion (AIC) and Schwarz Criterion (SC). The number of lags estimated by the AIC and SC are to ensure that there are no serial correlations in the data. In the Johansen co-integration test, the lags used were selected lags in the ADF test minus 1.Results of Johansen co-integration test indicated

[1] Footnote-Table 1. The basic situation of the target countries

Income level	East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & North Africa	South Asia	Sub-Saharan Africa
Low income (≦$1,035)		Kyrgyzstan			Nepal	Benin, Niger Burundi, Chad Madagascar, Togo
Lower middle income ($1,036～ 4,085)	Laos, Philippines	Armenia, Georgia	Guatemala, Nicaragua		Pakistan Sri Lanka	Cameroon, Cape Verde, Mauritania
Upper middle income ($4,086～12,615)			Brazil, Dominican, Panama, Peru	Tunisia		

Source: The World Bank, Country-classifications，2013.

that there are long-run co-integrationships between the international and domestic grain prices in some developing countries in this research. For rice, they may have a co-integration relationship in nine countries, such as Benin, Cameroon, Dominican, Guatemala, Nicaragua, Niger, Panama, Sri Lanka and Tunisia, while for wheat in Armenia, Georgia, Mauritania and Pakistan, and for maize in Chad, Guatemala and Nicaragua.

According to the ZauRoot test, we found the structural breakpoint for rice, wheat and maize were September 2007, May 2007, and July 2007, respectively. So the study introduced dummy variables to analyze how international grain-price crisis would have affected the domestic prices in developing countries during and after the grain-price crisis, the dummy variable was 1 during and after the grain-price crisis (structural breakpoint) in 2007, otherwise it was 0.

Kao and Chiang [3] reported that Monte Carlo illustrates the sampling behavior of the proposed estimators and showed that (1) the OLS estimator has a non-negligible bias in finite samples, and (2) the DOLS outperforms both the OLS and FMOLS estimators. In this research, therefore we estimated the results of long-run elasticity of international grain prices using slope-dummy variables for both ordinary least squares (OLS) and dynamic OLS (DOLS). The result of DOLS supports the results of OLS (Table 1). The results of the estimated coefficients were all significant at the 5% level or better, except for Panama, which was not significant at the 5% level; the mean of coefficients of β_0 and β_1 in table 1 shows that international prices would cause an increase in the domestic grain prices in developing countries. The magnitude of the coefficients varies depending on the country. For example, because international rice price increased by 1%, domestic rice price in Benin raised by 0.146%.

The values of the slope-dummy variables are positive. That means that international grain prices have stronger effects on the domestic prices during and after grain-price crisis periods. The domestic grain price levels in the post-crisis period were significantly higher than the pre-crisis period, and this lends support to the argument that there is a surge in domestic grain prices during the grain-price crisis in developing countries.

When we analyze their situations regarding production, consumption, import and export in developing countries, we can summarize them into two categories: the first category is the countries which have no trade with other countries and can be mainly self-sufficient, such as Chad and Pakistan; the second is the countries, where import volume and export account for high rate in the domestic total consumption. For example, in Armenia, import for wheat is 310,000 tons per year, and total consumption is 516,000 tons. Compared these two kinds of countries, it was found that the effects in the second category countries are bigger than those in the first category. For example, in Armenia, the price would increase by 0.41%，because consumption of wheat depends on import, while in Pakistan, whose consumption of wheat is self-sufficient, the price would increase by 0.07%. That means that the effect of international grain prices on Armenia is bigger than on Pakistan.

3) Short-run relationship between international and domestic grain market in developing countries

Following the long-run relationship, we discuss the short-run relationship between the domestic prices and international prices. In this part, the lag value used is the same as the lag value selected in step 1, Stability valuation.

The results of the short-run dynamics model are presented in Table 2. Different countries have different estimates in this part and the estimates in some countries such as Benin, Cameroon, Guatemala, Niger and Sri Lanka are not significant for rice prices. In the result, coefficients of the error correction term (ECT_{t-1}) mean that a significant short-run adjustment can force it back to the equilibrium state when previous domestic grain prices are biased to their own equilibrium value, but these coefficients are expected to be significant smaller than 0. Also, if the coefficients are even closer to 0, the speed of returning to their equilibrium is slower. For example, in Armenia, the coefficient of ECT_{t-1} was found to be -0.081, which implies that an 8.1% deviation of domestic price from long-run equilibrium is corrected in the current period.

Also according to coefficients such as 0.247 and 0.118 for wheat in Armenia, the coefficients indicate that the 1% increase of domestic wheat price last year can make the domestic price continue to rise about 0.247%, and the 1% increase of international wheat price last year would raise domestic price by 0.118% in short-run term. For rice, the adjustment speed in the Dominican Republic, 0.162 is the fastest, followed by Tunisia's 0.163, Nicaragua's 0.143, and Panama's adjustment speed of 0.119. The error correction term coefficients of other countries are not statistically significant. Overall, the error correction term coefficients in developing countries are not very high. This means they do not have a strong enough force to take their grain prices to back to their previous equilibrium state.

4) Causality relationship in both short-run and long-run

In this part, the lag value used is the same as the lag value in the Vector Error Correction Model (VECM). The results are

Table 2 Short-run equilibrium dynamics estimates

Rice	coefficient	t-static	coefficient	t-static	coefficient	t-static	coefficient	t-static
	Dominican		Panama		Nicaragua		Tunisia	
ECT(-1)	-0.162***	-3.162	-0.119	-1.502	-0.143***	-3.37	-0.163***	-4.681
D(LNDR(-1))	-0.224**	-2.181	-0.322**	-2.466	0.154	1.644	-0.124	-1.388
D(LNDR(-2))	-0.116	-1.150	-0.239	-1.897	0.177	1.86	0.218**	2.322
D(LNDR(-3))	0.003	0.034	0.231	1.702				
D(LNIR(-1))	-0.085	-1.553	-0.016	-0.163	-0.103**	-2.124	-0.183	-3.086
D(LNIR(-2))	-0.015	-0.241	-0.109	-0.925	0.018	0.305	0.008	0.110
D(LNIR(-3))	0.077	1.343	0.028	0.296				
C	0.000	0.047	0.007	1.21	0.003	1.079	0.006	1.59
R-squared	0.252		0.298		0.22		0.344	
AIC/SC	-4.036/ -3.807		-3.049/-2.809		-4.143/ -3.986		-3.785/-3.624	
Observation	86 (2006.01-2013.06)		86 (2006.01-2013.06)		100 (2005.01-2013.07)		95 (2005.01-2013.02)	
Rice	Benin		Cameroon		Niger		Sri Lanka	
ECT(-1)	-0.056	-1.039	-0.070	-0.867	-0.043	-0.718	-0.023	-0.423
D(LNDR(-1))	-0.198	-1.811	0.172	1.473	0.084	0.712	0.415	3.390
D(LNDR(-2))	-0.148	-1.378	-0.041	-0.355	0.003	0.027	-0.039	-0.309
D(LNIR(-1))	0.066	0.694	-0.001	-0.023	-0.071	-0.878	0.056	0.662
D(LNIR(-2))	-0.054	-0.539	0.094	1.469	0.064	0.777	-0.026	-0.293
C	0.006	0.977	0.002	0.597	0.005	0.916	0.003	0.499
R-squared	0.075		0.091		0.026		0.158	
AIC/SC	-2.814/-2.655		-3.798/-3.636		-3.241/-3.068		-3.076/-2.900	
Observation	97 (2005.01-2013.04)		94 (2005.01-2013.01)		85 (2005.01-2012.04)		82 (2006.07-2013.07)	
Maize	Chad		Guatemala		Nicaragua		Guatemala (Rice)	
ECT(-1)	-0.223***	-3.675	-0.07***	-3.209	-0.274***	-4.099	-0.024	-1.527
D(LNDM(-1))	0.296***	2.989	0.200**	2.007	0.195	1.941	0.525	4.897
D(LNDM(-2))	0.019	0.190	-0.035	-0.360	0.156	1.520	0.049	0.464
D(LNIM(-1))	0.029	0.197	0.016	0.471	-0.017	-0.10917	0.010	0.520
D(LNIM(-2))	-0.118	-0.796	-0.008	-0.22	-0.113	-0.755	-0.001	-0.043
C	0.002	0.157	0.007***	2.924	0.003	0.315	0.002	1.699
R-squared	0.188		0.199		0.162		0.413	
AIC/SC	-1.752/-1.595		-4.754/-4.596		-1.663/-1.506		-6.002/-5.845	
Observation	99 (2005.01-2013.06)		99 (2005.01-2013.06)		99 (2005.01-2013.06)		99 (2005.01-2013.06)	
Wheat	Pakistan		Armenia		Georgia		Mauritania	
ECT(-1)	-0.079***	-3.855	-0.081***	-3.061	-0.127***	-3.837	-0.135***	-3.768
D(LNDW(-1))	0.138	1.359	0.247**	2.526	-0.153	-1.674	-0.179	-1.897
D(LNDW(-2))	-0.313***	-3.148	0.050	0.554	0.113	1.268	-0.047	-0.49
D(LNDW(-3))	-0.263**	-2.435						
D(LNIW(-1))	0.018	0.383	0.118**	2.570	0.112**	2.057	-0.052	-1.021
D(LNIW(-2))	-0.010	-0.202	0.017	0.352	0.067	1.229	0.044	0.839
D(LNIW(-3))	0.055	1.171						
C	0.009**	2.489	0.003	0.808	0.005	1.29	0.003	0.942
R-squared	0.366		0.387		0.384		0.206	
AIC/SC	-3.953/-3.724		-4.022/-3.866		-3.788/-3.632		-3.751/-3.593	
Observation	86 (2006.01-2013.06)		100(2005.01-2013.07)		100 (2005.01-2013.07)		98 (2005.01-2013.05)	

Note: D is the 1st difference. LN is the log form. Negative number means lags. DR, DW and DM indicate domestic price for rice, wheat and maize; IR, IW and IM indicate international price for rice, wheat and maize.

shown in Table 3. For causality, more developing countries were influenced by international markets in the long-run term than the short-run term. In the short-run, the domestic rice prices were affected by international rice prices in Nicaragua and Tunisia, and the international wheat price could affect the domestic wheat price in Georgia, Pakistan and Armenia. In the long-run, domestic prices for rice in the Dominican Republic, Nicaragua and Tunisia, for wheat in Armenia, Georgia, Mauritania and Pakistan, and for maize in Chad, Guatemala and Nicaragua, might be influenced by international prices.

Table 3 Causality tests for one way from international to domestic markets

Rice	F-static	P-value	F-static	P-value	F-static	P-value	F-static	P-value
	Dominican		Panama		Nicaragua		Tunisia	
Short-run	2.083	0.109	0.638	0.593	2.412*	0.095	5.327***	0.007
long-run	9.998***	0.002	2.255	0.138	11.356***	0.001	21.913***	0.000
Wheat	Pakistan		Armenia		Georgia		Mauritania	
Short-run	7.862***	0.000	3.394**	0.038	2.853*	0.063	0.817	0.445
long-run	14.862***	0.000	9.367***	0.003	14.723***	0.000	14.198***	0.000
Maize	Chad		Guatemala		Nicaragua			
Short-run	0.330	0.720	0.134	0.874	0.303	0.739		
long-run	13.504***	0.000	10.300***	0.002	16.802***	0.000		

Note: * is 10% significant level; ** is 5% significant level; *** is 1% significant level

4. Conclusions and Policy Discussions

1) Conclusions

The domestic grain price during crisis and post-crisis periods are significantly higher than the pre-crisis period, and this lends support to the argument that there is a surge in domestic grain prices during and after the grain-price crisis in developing countries. International grain prices have positive effects on the domestic prices. This finding is consistent with those of past studies, such as, Robles [7] mentioned, but effects of changes are not very large compared with previous studies. International grain prices have stronger positive effects on the domestic prices during and after the grain-price crisis. The effects of international markets on domestic markets not only depends on the basic situation about grain production, consumption, import and export in these developing countries, but also on trade policies in the domestic market and trade with international markets. In this study, we analyzed the relationship between international and domestic markets, and then we studied the situation about grain production, consumption, import and export in these developing countries (because of limited space, we did not include this table). We found that grain prices in developing countries are influenced by international market at different degrees. In developing countries, where import and export account for high rate in total consumption, the domestic grain prices are more affected by international grain prices, such as those in Armenia for wheat. In other developing countries which have no trade and are mainly self-sufficient, the domestic grain prices are less affected by international grain prices. Such an example is wheat in Pakistan. For the causality part, in the rice market, only Nicaragua and Tunisia may be influenced by international rice prices in the short-run, and in the wheat market, Georgia, Mauritania and Pakistan are influenced by the international wheat price. But in the long-run, for rice, international prices possibly influence domestic prices in the Dominican Republic, Nicaragua and Tunisia, for wheat in Pakistan, Armenia, Georgia and Mauritania, and for maize in Chad, Guatemala and Nicaragua. It was also found that more countries were influenced by international markets in the long-run term than the short-run term.

2) Policy Discussions

In order to reduce the effects of high grain price in the international markets on the domestic markets, many developing countries have already taken some measures, such as changes in trade policies, changes in domestic taxes and subsidies and administrative measures. At the same time, as these policies are implemented, export restrictions and increasing trade tax would increase international price in turn in some degree (Milan and Christiaensen [10]). So on the one hand, enhanced regional collaboration and global cooperation are critical in resolving the problem of high world grain prices. For example, an agreement on reducing export restrictions between main participants would lower the grain prices; on the other hand, developing countries should lower the domestic price through trade policies, subsidies and administrative measures in the short-run, and increase the food supply in the medium-term and the long-run term.

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