Lee , Hyun-Hoon; Park, Cyn-Young

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International Transmission of Food Prices and Volatilities: A Panel Analysis

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CONTENTS

ABSTRACT

High and volatile food prices pose a significant policy challenge around the world, and an understanding of the dynamics of food price inflation and volatility is essential in designing appropriate policy responses. Using the panel data for 72 countries from 2000 to 2011, the paper assesses the international transmission of food price inflation and volatilities as well as the effects of various internal and external factors on domestic food price inflation and volatility. The paper offers evidence in support of the international transmission of food price inflation and volatility. Specifically, the paper finds that the domestic food price inflation in Asia is strongly associated with the lagged value of global food price inflation (using the FAO food price index), while volatility spillovers from global to domestic food prices are rather contemporaneous. The paper also finds that both national food price inflation rates and volatilities are strongly associated with both intra- and extra- regional food price inflation rates and volatilities, respectively. The findings also suggest that higher economic growth rates, greater shares of food in merchandise imports, and smaller increases in the share of food in merchandise imports lead to lower domestic food price inflation. An appreciation of local currency, greater political stability, and higher income level are also found to lower domestic food price inflation. On the other hand, higher economic growth rates lead to lower volatilities of food prices.

Keywords: Food price inflation, food price volatility, food price transmission, food security, food policy

JEL Classification**:** E31, N50, N55, Q18, F49

I. INTRODUCTION

Global food prices and their volatilities have risen sharply in recent years.[1] High and increasing food prices pose a significant policy challenge, particularly in developing countries where the share of food in household expenditure is relatively high (FAO et al. 2011). Volatility is an added concern. The world witnesses larger and more frequent swings in food prices, perhaps owing to the effects of climate change and the volatility of oil prices. The high volatility of food prices and the associated uncertainty may impede the production and investment decisions of food producers, and lead to inefficient resource allocation in agriculture. Noting the importance of food price volatility in policy responses, Kharas (2011) argues, "The crux of the food price challenge is about price volatility, rather than high prices per se." Roache (2010) also observes, "[V]olatility has made the policy response to changes in food prices more challenging and complicated the investment and consumption decisions of many businesses and consumers."

Understanding the dynamics of both food price inflation and its volatility is essential in designing appropriate policy responses. Byerlee, Jayne, and Myers (2006) note that the country context matters when it comes to food price shock and instability. Food price shock and instability would be a serious concern for the poor in countries where there is only one major staple—for example, rice in much of Asia and in Madagascar, wheat in Pakistan and the Middle East to North Africa, white maize in Eastern and Southern Africa, and sorghum and millet in West Africa's Sahel. The poor would be even more vulnerable in countries that are net importers of such staple food and that are exposed to world food price shocks. Given the increased frequency and severity of food price shocks in global markets, the transmission of global food prices and their volatilities to local food price inflation and volatility should be of particular interest to policy makers in developing countries.

Earlier literature has revealed an incomplete pass-through of global food price shocks to the domestic prices of advanced and emerging economies, with an estimated average pass-through coefficient of about 0.30 for most countries (Ianchovichina, Loening, and Wood 2012; International Monetary Fund [IMF] 2011; and Sharma 2003). Considerable difference exists, however, between advanced and emerging economies. The findings indicate that pass-through tends to be larger in emerging and developing economies than in advanced economies (IMF 2011). There are also differences even among emerging and developing countries. Some studies show that the African markets tend to have rather incomplete transmission compared to other regions. On the other hand, transmission appears relatively more complete among Asian countries. The picture in Latin America is more mixed (Conforti 2004). But Headey and Fan (2008) argue that the interventions of local governments in developing countries often hamper the full transmission of international prices.

There is also significant heterogeneity across commodity types. For instance, rice has on average a weaker price pass-through in developing Asia, compared to wheat (Dawe 2008). Using data from 2003 to 2007, Dawe (2008) examines the extent to which increases in international cereal prices have been transmitted to domestic prices in Asian countries. He finds that the international food price transmission was generally incomplete in these countries, as the real appreciation of their currencies against the United States (US) dollar during the sample period neutralized a considerable portion of the global price increases when cereals were imported into domestic markets. Local policies on specific agricultural commodities, particularly rice for these Asian countries, seemed to have further stabilized and shielded domestic prices

[1] Gilbert and Morgan (2010), however, find that the recent increase in food price volatility is not out of line with historical volatility, which generally went down in the last 2 decades.

from the change in world prices. Having investigated the transmission of global price shocks to domestic prices in 11 sub-Saharan African countries for eight food items during 2007–2008, Minot (2011) finds that there is a transmission of global food prices to domestic prices for rice and, to a lesser extent, maize. After studying the price transmission of global agricultural commodities to domestic food prices in India and the People's Republic of China (PRC), Imai, Gaiha, and Thapa (2008) also find that the domestic prices of wheat, maize, and rice tend to adjust to the international prices faster than those of fruits and vegetables.

Many studies highlight the importance of domestic factors and policies in limiting the pass-through of food prices. These factors include movements in foreign exchange rate, transaction costs, and subsidies for agricultural commodities, among others (Quiroz and Soto 1995; Rapsomanikis, Hallam, and Conforti 2004; Timmer 2008; Baffes and Gardner 2003; Imai, Gaiha, and Thapa 2008; Keats et al. 2010; Ianchovichina, Loening, and Wood 2012; and IMF 2011).

Some recent studies focus on food price volatility and its determinants. For example, Roache (2010) investigates a number of different potential determinants for the price volatility of different commodities such as corn, rice, sugar, palm oil, soybeans, and wheat. He finds that the variation in US inflation and the US dollar exchange explains a relatively large part of the rise in volatility since the mid-1990s. Balcombe (2009) also examines the determinants of volatility in 19 agricultural commodity prices, and finds that the volatilities of oil prices and exchange rates exert significant influence on the price volatility in the majority of the selected food commodities. However, he fails to find evidence for a systemic increase across agricultural commodity price volatilities, meaning that some commodities experience increasing volatilities, while others do not. On the other hand, he provides convincing evidence for some degree of transmission of volatility across commodities in the monthly data.

Other studies investigate volatility spillovers across different agricultural commodities. For example, Onour and Sergi (2011) find evidence for the transmission of price volatility from corn to wheat. Similarly, some studies examine the transmission of price volatility between different commodity future markets (von Ledebur and Schmitz 2009; and Hernandez, Ibarra-Ramirez, and Trupkin 2011). However, the transmission of food price volatility between countries has been less explored. Rapsomanikis and Mugera (2011) examine the transmission of price signals from selected global food markets to developing countries. Specifically, they introduce a generalized conditional autoregressive Heteroscedasticity (GARCH) effect for the market shock in a bivariate vector error correction model in order to assess volatility spillover between the global and domestic food markets of Ethiopia, India, and Malawi. Their findings suggest that volatility spillovers are significant only during periods of extreme world market volatility.

This paper aims to make a comprehensive assessment of the transmission of global food prices and their volatilities to national food prices and their volatilities during 2000–2011. While earlier studies fail to prove a meaningful international transmission of food prices and their volatilities, the global food crisis of 2007–2008—with its wide coverage and considerable effect on national food price inflation—seems to suggest there may have been a change in the speed and magnitude of international transmission in food prices and their volatilities in more recent years. It also seems that some fundamental structural changes are underway with regard to global food supply and demand, which could exert enduring effects on domestic food prices. However, many of the past studies have not covered the recent episode of global food price hikes; hence, this paper aims to capture the more recent dynamics and interactions of international food price inflation and volatility, reflecting ongoing structural changes. No doubt

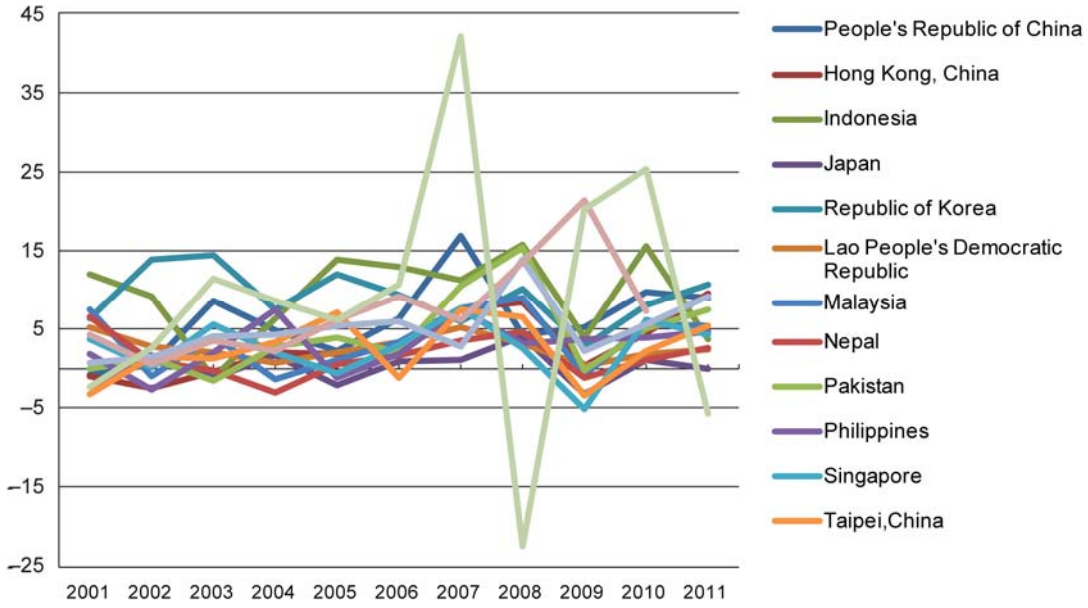
there are various factors that influence domestic food price inflation and volatility. This paper will also focus on identifying global, regional, and national sources for domestic food price inflation and volatility. By providing a regional comparison, this paper will be able to help identify any region-specific factors that influence food price inflation and volatility in Asian countries.

The remainder of this paper is organized as follows: Section II offers a brief overview of the global food price development by measuring the food price inflation and volatilities of 72 different individual countries for 2000–2011. Section III presents empirical models to assess the global transmission of food price inflation and volatilities to individual countries. The empirical results are reported in Section IV, while Section V concludes with a summary of empirical findings and discussions on policy implications.

II. GLOBAL AND NATIONAL FOOD PRICE TRENDS

Figure 1a illustrates the annual growth rates of domestic food prices across Asia for 2000–2011 in relation to the Food and Agriculture Organization of the United Nations (FAO) Food Price Index.[2] Overall, domestic food price inflation rates appear to be more stable compared to global food price inflation. Despite significant national variations in domestic food price inflation rates, there seemed to be growing co-movements in the later years among domestic food price inflation rates across Asia, except in India.

Figure 1a: Food Price Growth Rates for Asian Countries
(%, with the FAO Food Price Index)

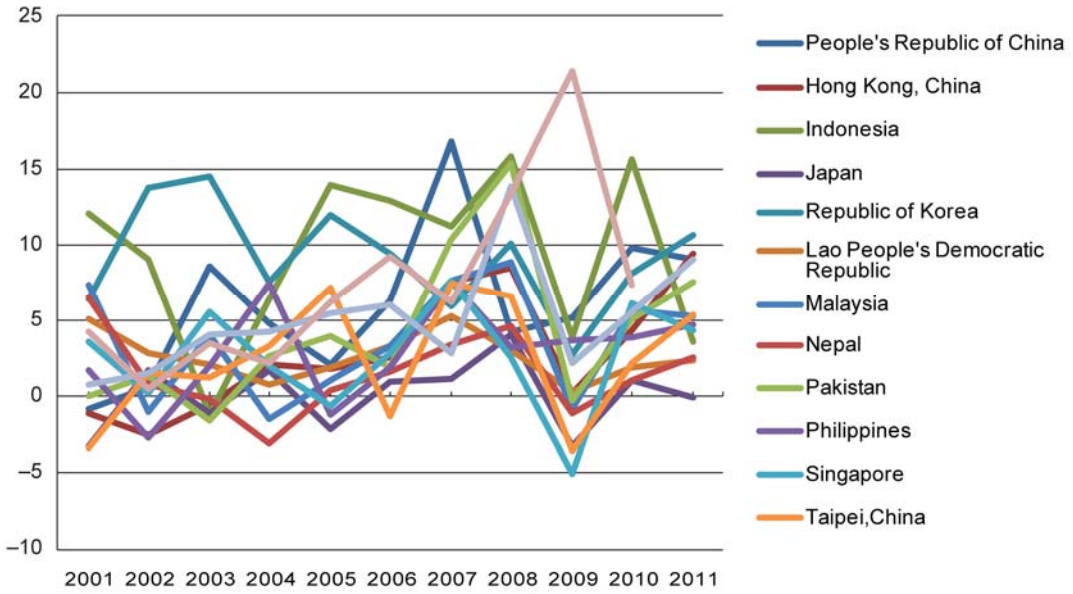


Sources: Authors' calculations using data from the Food and Agriculture Organization of the United Nations (FAO) and national sources accessed through CEIC (www.ceicdata.com).

[2] The FAO Food Price Index is a measure of the monthly change in international prices of a basket of food commodities, consisting of the average of five commodity group price indices, weighted with the average export shares of each of the groups for 2002–2004. The five commodity groups are cereal, oils/fats, dairy, meat, and sugar.

Figure 1b, which shows Figure 1a without global food price inflation, demonstrates this point more clearly. Domestic food inflation rates continued to move quite differently from global food prices represented by the FAO Food Price Index. Nevertheless, it seems that global food price inflation led domestic food price inflation rates by roughly 1 year.

Figure 1b: Food Price Growth Rates for Asian Countries
(%, without the FAO Food Price Index)



Sources: Authors' calculations using data from the Food and Agriculture Organization of the United Nations (FAO) and national sources accessed through CEIC (www.ceicdata.com).

Table 1 reports the average annual growth rate of food prices for different countries and regions during 2000–2011. Domestic food price inflation in Asian countries averaged 4.29% per annum, lower than the regional average of Latin America (8.63%) and sub-Saharan African countries (5.70%). Among the Asian countries, Indonesia (9.39%), the Republic of Korea (9.18%), India (7.43%), and the PRC (6.05%) had the highest food price inflation rates during the period, while Japan and Nepal reported very low inflation in domestic food prices. By comparison, the average inflation of the European countries was much lower at 3.74%.

For world price inflation, two measures are presented: first, the annual growth rate of the FAO Food Price Index (World_1), which stood at 7.30% during the period; and second, a simple average of domestic food price inflation of all countries included in this study (World_2), which is lower at 5.73%. It is important to note that a significant difference in terms of the nature and composition of the index may exist between World_1, which is based on food commodity prices, and World_2, which is based on consumer prices for food.

Table 1: Annual Food Price Inflation Rates, 2000–2011
(%)

Asia		Latin America		Sub-Saharan Africa		Europe		Others	
People's Republic of China	6.05	Argentina	12.29	Botswana	9.64	Austria	2.64	Algeria	5.25
Hong Kong, China	2.95	Bolivia	3.94	Cote d'Ivoire	2.23	Belgium	2.69	Canada	2.85
India	7.43	Brazil	7.89	Kenya	12.36	Croatia	2.82	Cyprus	4.49
Indonesia	9.39	Chile	4.99	Malawi	3.33	Denmark	2.58	Egypt	9.77
Japan	0.07	Dominican Republic	13.11	Mauritius	5.64	Finland	2.55	Iran	9.06
Republic of Korea	9.18	Ecuador	3.54	Nigeria	1.36	France	2.02	Israel	3.16
Lao People's Democratic Republic	2.63	El Salvador	4.13	South Africa	5.39	Germany	1.88	Jordan	5.83
Malaysia	3.65	Guatemala	8.79			Greece	3.19	Malta	7.32
Nepal	1.52	Honduras	6.72			Hungary	5.96	Morocco	8.88
Pakistan	4.23	Jamaica	11.37			Iceland	5.54	New Zealand	13.67
Philippines	2.93	Mexico	2.10			Ireland	1.13	Saudi Arabia	2.27
Singapore	2.66	Panama	10.86			Italy	2.48	Turkey	17.36
Taipei,China	2.43	Paraguay	3.29			Luxembourg	9.36	United States	2.81
Thailand	5.04	Peru	5.08			Netherlands, The	3.23		
		Trinidad and Tobago	11.52			Norway	11.12		
		Venezuela	29.70			Poland	1.57		
						Portugal	4.68		
						Slovakia	7.97		
						Spain	3.13		
						Sweden	1.91		
						Switzerland	0.27		
						United Kingdom	3.61		
Regional average	4.29	Regional average	8.63	Regional average	5.70	Regional average	3.74	Regional average	7.12
World_1	8.79	World_1	8.79	World_1	8.79	World_1	8.79	World_1	8.79
World_2	5.73	World_2	5.73	World_2	5.73	World_2	5.73	World_2	5.73

Note: World_1 is the average of world food price inflation rates calculated with the Food and Agriculture Organization of the United Nations (FAO) Food Price Index. World_2 is a simple average of national food prices of all countries included in this study.

Source: Authors' calculations.

Table 2 reports the simple correlation coefficients between national food price inflation rates and the two contemporaneous measures of worldwide food price inflation rates, World_1 and World_2. It also shows the correlation between national food price inflation and the 1-year lagged values of the world food price growth rate given by the FAO (L.World_1). The correlation analysis suggests that the national food price inflation rates of all countries in the sample, except for India, closely track the growth rates of the FAO Food Price Index with a 1-year lag.

Table 2: Correlation between National and Global Food Price Inflation Rates, 2000–2011

Asia				Latin America				Sub-Saharan Africa				Europe				Others			
	World_1	L.World_1	World_2		World_1	L.World_1	World_2		World_1	L.World_1	World_2		World	L.World	World_2		World_1	L.World_1	World_2
People's Republic of China	–0.07	0.77	0.52	Argentine	–0.01	0.16	–0.12	Botswana	–0.36	0.55	0.81	Austria	0.21	0.51	0.46	Algeria	–0.16	0.33	0.35
Hong Kong, China	0.01	–0.18	–0.05	Bolivia	0.80	0.77	–0.32	Cote d'Ivoire	–0.60	0.27	0.56	Belgium	0.04	0.64	0.69	Canada	–0.81	0.75	0.73
India	–0.08	0.47	0.48	Brazil	–0.08	0.47	0.39	Kenya	–0.02	0.08	0.43	Croatia	0.19	0.51	0.53	Cyprus	–0.57	0.51	0.44
Indonesia	–0.20	0.72	0.70	Chile	–0.06	0.72	0.72	Malawi	–0.46	0.86	0.75	Denmark	–0.01	0.65	0.67	Egypt	–0.03	0.09	0.23
Japan	–0.40	0.26	0.17	Dominican Republic	–0.06	0.26	0.05	Mauritius	–0.36	0.60	0.69	Finland	–0.59	0.95	0.87	Iran	–0.74	0.20	0.05
Republic of Korea	0.05	0.37	0.59	Ecuador	–0.21	0.37	0.48	Nigeria	0.07	–0.04	0.23	France	–0.30	0.66	0.60	Israel	0.24	0.24	0.64
Lao People's Democratic Republic	–0.12	0.73	0.75	El Salvador	–0.13	0.73	0.65	South Africa	–0.39	0.64	0.40	Germany	0.32	0.47	0.51	Jordan	–0.04	0.52	0.68
Malaysia	–0.31	0.63	0.65	Guatemala	–0.28	0.63	0.54					Greece	–0.22	0.66	0.50	Malta	0.21	0.42	0.70
Nepal	–0.21	0.81	0.75	Honduras	–0.05	0.81	0.81					Hungary	0.46	0.13	0.32	Morocco	–0.02	0.17	0.17
Pakistan	0.37	0.23	0.13	Jamaica	0.25	0.23	0.51					Iceland	–0.69	0.56	0.68	New Zealand	–0.39	0.29	0.11
Philippines	0.22	0.57	0.50	Mexico	–0.23	0.57	0.86					Ireland	–0.12	0.60	0.69	Saudi Arabia	0.03	0.71	0.70
Singapore	–0.05	0.70	0.41	Panama	0.11	0.70	0.10					Italy	–0.26	0.35	0.68	Turkey	–0.26	–0.15	0.12
Taipei,China	–0.57	0.86	0.62	Paraguay	–0.28	0.86	0.66					Luxembourg	–0.29	–0.04	–0.06	United States	–0.29	0.80	0.73
Thailand				Peru	–0.46	–0.18	0.56					The Netherlands	–0.29	0.78	0.84				
				Trinidad and Tobago	–0.46	–0.23	0.42					Norway	–0.11	0.66	0.58				
				Venezuela	–0.38	–0.18	0.65					Poland	–0.27	0.68	0.56				
												Portugal	0.05	0.75	0.73				
												Slovakia	–0.36	0.31	0.60				
												Spain	0.02	0.24	0.39				
												Sweden	–0.08	0.53	0.79				
												Switzerland	–0.14	0.24	0.66				
												United Kingdom	–0.20	0.72	0.81				
Regional average	–0.06	0.83	0.77	Regional average	–0.15	0.54	0.78	Regional average	–0.37	0.44	0.76	Regional average	0.28	0.80	0.92	Regional average	–0.66	0.57	0.60

Note: World_1 is the Food and Agriculture Organization of the United Nations (FAO) world food price index. L.World_1 is a 1-year lag of the FAO index. World_2 is a simple average of national food prices of all countries included in this study.

Source: Authors' calculations.

Food price volatility can be measured in different ways. Many studies, including the ones cited earlier, use the GARCH or spline-GARCH model to obtain estimates of the volatilities of different commodities. However, long-term series of food price indexes are not readily available in many developing countries, disallowing the use of GARCH or spline-GARCH. We follow an approach used by Balcombe (2009) and use the volatility measured by the square root of the sum of the squared percentage changes in the quarterly series. Thus, volatility can be defined as

$$V_{it} = 100X\sqrt{\frac{\sum_{j=1}^{12}\left(\Delta \ln\left(p_{i,j,t}\right)\right)^2}{11}} \quad (1)$$

where $P_{i,j,t}$ is the food price of country i in the jth month in year t.

In this paper, this measure is calculated using quarterly data in a 3-year moving window. As such, the volatility for 2001 is calculated using the quarterly data for 2000, 2001, and 2002. Figure 2a shows the trend of short-term food price volatility for the same set of countries in Asia. Three observations can be made:

(i). The volatility of global food prices (using the FAO Food Price Index) was far greater than those of national food prices.

(ii). There was significant heterogeneity in national level volatilities. That is, some countries experienced greater price volatility than others throughout the entire sample period.

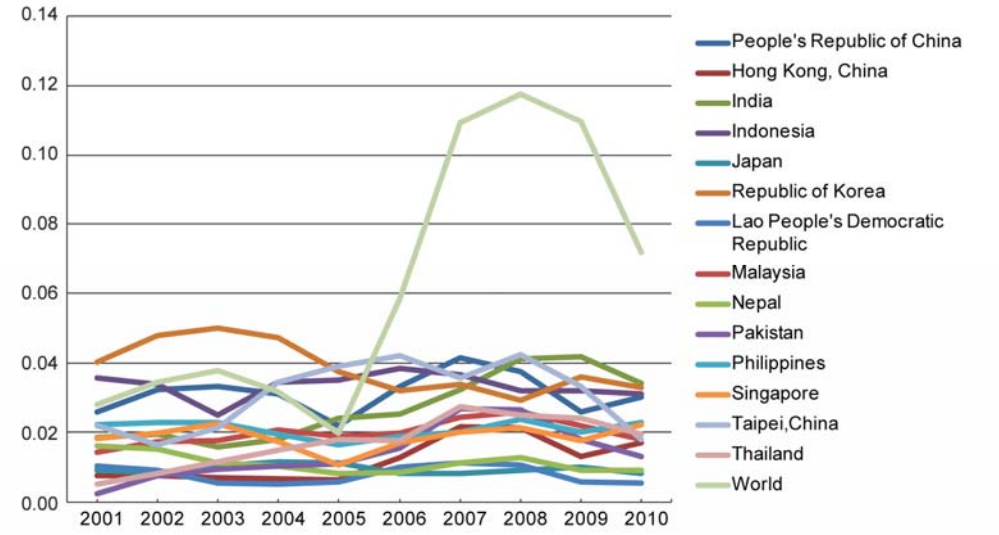
(iii). Volatility seemed to be persistent regardless of periodic fluctuations: it showed an increase in 2007–2008 followed by a decrease in 2009 before rising again in 2010 for many countries in Asia.

Figure 2b, without the world price volatility, illustrates points 2 and 3 more clearly. The volatilities of national food prices also exhibited growing co-movements in recent years.

Table 3 reports the food price volatilities for individual countries in different regions during 2000–2011. The volatilities of food prices for Asian countries were on average smaller than those of Latin American countries and sub-Saharan African countries. By comparison, however, industrialized countries in Europe and North America (Canada and the US) showed generally lower food price volatilities than developing countries including those in Asia. In Asia, the PRC, India, Indonesia, the Republic of Korea, and Taipei,China reported relatively high volatilities of food prices, while those for Hong Kong, China; Japan; the Lao People's Democratic Republic (Lao PDR); Nepal; and Pakistan were relatively low during the last decade.

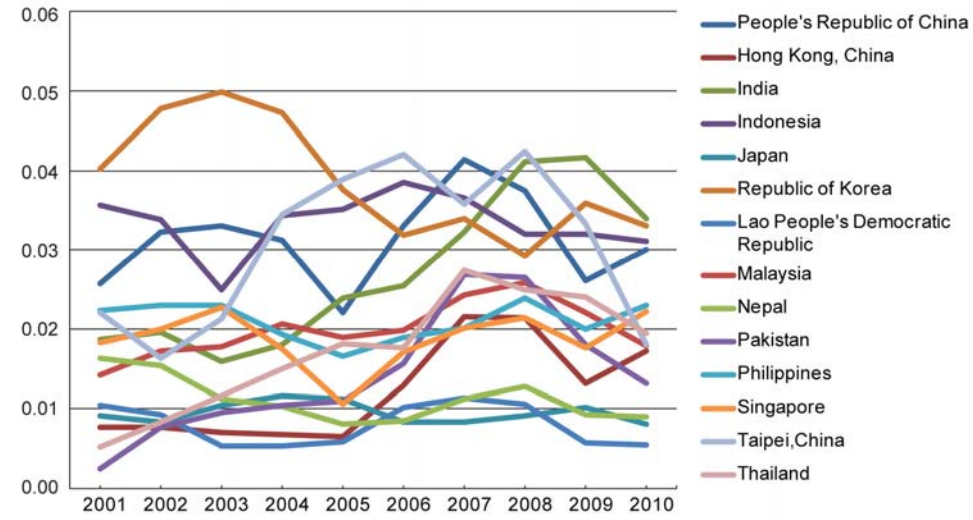
Volatility is also reported for two different measures of world food prices: the FAO Food Price Index (World_1), and the simple average of the national food price volatilities of all countries included in this study (World_2). The volatility of the FAO index was more than double the simple average of national food prices volatilities (6.19 versus 2.67).

Figure 2a: Food Price Volatilities for Asian Countries
(with the FAO Food Price Index)



Sources: Authors' calculations using data from the Food and Agriculture Organization of the United Nations (FAO) and national sources accessed through CEIC (www.ceicdata.com).

Figure 2b: Food Price Volatilities for Asian Countries
(without the FAO Food Price Index)



Sources: Authors' calculations using data from the Food and Agriculture Organization of the United Nations (FAO) and national sources accessed through CEIC (www.ceicdata.com).

Table 3: Average of Food Price Volatilities, 2000–2011

Asia		Latin America		Sub-Saharan Africa		Europe		Others	
People's Republic of China	3.12	Argentina	4.13	Botswana	2.88	Austria	1.33	Algeria	4.28
Hong Kong, China	1.22	Bolivia	2.91	Cote d'Ivoire	4.35	Belgium	1.09	Canada	1.24
India	2.71	Brazil	2.75	Kenya	6.61	Croatia	2.08	Cyprus	1.86
Indonesia	3.34	Chile	2.37	Malawi	1.11	Denmark	1.15	Egypt	4.19
Japan	0.95	Dominican Republic	4.53	Mauritius	1.88	Finland	1.62	Iran	9.13
Republic of Korea	3.87	Ecuador	5.24	Nigeria	1.30	France	1.06	Israel	1.74
Lao People's Democratic Republic	0.80	El Salvador	2.15	South Africa	2.10	Germany	1.29	Jordan	2.50
Malaysia	1.99	Guatemala	2.79			Greece	2.33	Malta	2.19
Nepal	1.12	Honduras	2.36			Hungary	2.75	Morocco	4.07
Pakistan	1.41	Jamaica	3.73			Iceland	2.92	New Zealand	5.34
Philippines	2.10	Mexico	1.89			Ireland	1.12	Saudi Arabia	0.78
Singapore	1.87	Panama	4.45			Italy	0.82	Turkey	5.55
Taipei,China	3.04	Paraguay	1.28			Luxembourg	9.99	United States	0.97
Thailand	1.72	Peru	1.70			Netherlands, The	1.18		
		Trinidad and Tobago	6.40			Norway	3.50		
		Venezuela	7.23			Poland	1.01		
						Portugal	1.61		
						Slovakia	2.31		
						Spain	1.08		
						Sweden	0.97		
						Switzerland	0.76		
						United Kingdom	1.36		
Regional average	2.09	Regional average	3.49	Regional average	2.89	Regional average	1.97	Regional average	3.37
World_1	6.19	World_1	6.19	World_1	6.19	World_1	6.19	World_1	6.19
World_2	2.67	World_2	2.67	World_2	2.67	World_2	2.67	World_2	2.67

Notes: 1. World_1 is the world's food price volatility calculated with the Food and Agriculture Organization of the United Nations (FAO) world food price index. World_2 is the simple average of food price volatilities of all countries included in this study.
2. See page 7 for the calculation of volatilities.

Source: Authors' calculations.

Table 4 reports correlation coefficients between national and global food price volatilities during 2000–2011. The results show that national food price volatilities were highly correlated with the contemporaneous volatilities of the FAO Food Price Index and with the national food price volatility average. Among Asian countries, the national food price volatilities in the PRC; Hong Kong, China; India; Malaysia; Pakistan; and Thailand showed relatively strong correlations with global food price volatility.

Figure 3 shows the average food price inflation rates for different regions and their increasing co-movements in recent years. The average volatilities of regional food prices, reported in Figure 4, also showed growing co-movements during the period.

Table 4: Correlation between National and Global Food Price Volatilities, 2000–2011

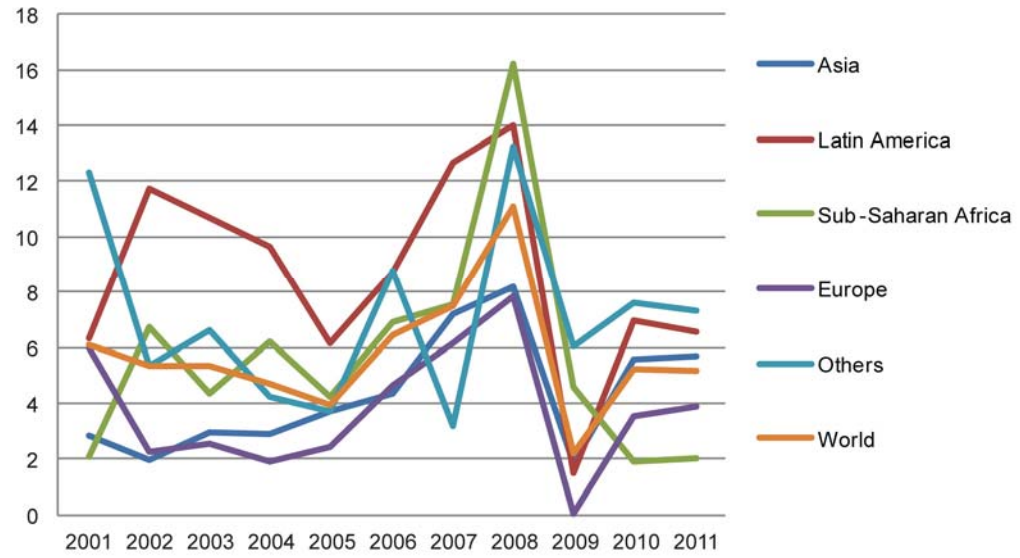
Asia				Latin America				Sub-Saharan Africa				Europe				Others			
	World_1	L.World_1	World_2		World_1	L.World_1	World_2		World_1	L.World_1	World_2		World_1	World_1	World_2		World_1	L.World_1	World_2
People's Republic of China	0.55	0.02	0.70	Argentine	–0.57	–0.46	–0.54	Botswana	0.75	0.22	0.88	Austria	0.32	–0.06	0.59	Algeria	–0.35	–0.63	–0.06
				Bolivia	0.94	0.58	0.95	Cote d'Ivoire	0.53	0.83	0.18	Belgium	0.11	–0.23	0.43	Canada	0.64	0.51	0.67
Hong Kong, China	0.90	0.64	0.88	Brazil	–0.12	–0.09	–0.14	Kenya	0.44	0.47	0.33	Croatia	–0.29	–0.49	–0.01	Cyprus	0.34	0.57	0.16
India	0.90	0.88	0.69	Chile	0.86	0.37	0.95	Malawi	0.95	0.67	0.90	Denmark	0.62	0.19	0.83	Egypt	0.55	0.58	0.32
Indonesia	–0.02	–0.28	0.31	Dominican	–0.47	–0.48	–0.48	Mauritius	0.29	–0.09	0.35	Finland	0.80	0.89	0.58	Iran	0.32	–0.32	0.68
Japan	–0.38	–0.19	–0.46	Republic				Nigeria	–0.27	–0.18	–0.18	France	0.00	0.09	0.12	Israel	0.83	0.39	0.89
Republic of Korea	–0.68	–0.55	–0.66	Ecuador	–0.56	–0.31	–0.44	South Africa	–0.15	0.37	–0.48	Germany	0.01	–0.16	0.24	Jordan	0.51	0.10	0.66
Lao People's Democratic Republic	0.31	–0.09	0.61	El Salvador	0.94	0.65	0.90					Greece	–0.71	–0.75	–0.55	Malta	0.49	–0.11	0.79
				Guatemala	0.17	0.41	0.06					Hungary	0.71	0.59	0.71	Morocco	0.90	0.83	0.72
Malaysia	0.81	0.48	0.80	Honduras	0.87	0.43	0.94					Iceland	0.76	0.36	0.85	New Zealand	–0.74	–0.80	–0.46
Nepal	–0.15	–0.07	–0.07	Jamaica	0.52	–0.06	0.69					Ireland	0.74	0.72	0.64	Saudi Arabia	0.84	0.39	–0.95
Pakistan	0.89	0.52	0.91	Mexico	0.01	–0.15	0.18					Italy	0.20	–0.08	0.41	Turkey	–0.43	–0.30	–0.35
Philippines	0.23	0.40	0.03	Panama	–0.36	–0.90	–0.06					Luxembourg	0.64	0.77	–0.43	United States	0.96	0.70	0.89
Singapore	0.39	0.35	0.24	Paraguay	0.78	0.56	0.70					The Netherlands	0.85	0.86	0.70				
Taipei,China	0.38	0.00	0.51	Peru	0.84	0.55	0.81					Norway	0.94	0.83	0.78				
Thailand	0.84	0.64	0.79	Trinidad and Tobago	0.54	0.89	0.21					Poland	0.53	0.84	0.39				
												Portugal	0.86	0.47	0.91				
				Venezuela	0.83	0.57	0.73					Slovakia	0.34	0.13	0.44				
												Spain	–0.01	–0.47	0.36				
												Sweden	0.52	0.27	0.65				
												Switzerland	0.11	0.55	–0.06				
												United Kingdom	0.90	0.57	0.92				
Regional average	0.90	0.50	0.93	Regional average	0.46	0.34	0.40	Regional average	0.80	0.90	0.54	Regional average	0.86	0.57	0.90	Regional average	0.38	–0.26	0.75

Notes: 1. World_1 is the Food and Agriculture Organization of the United Nations (FAO) world food price index. L.World_1 is a 1-year lag of the FAO world food price index. World_2 is the simple average of national food prices of all countries included in this study.

2. See page 7 for the calculation of volatilities

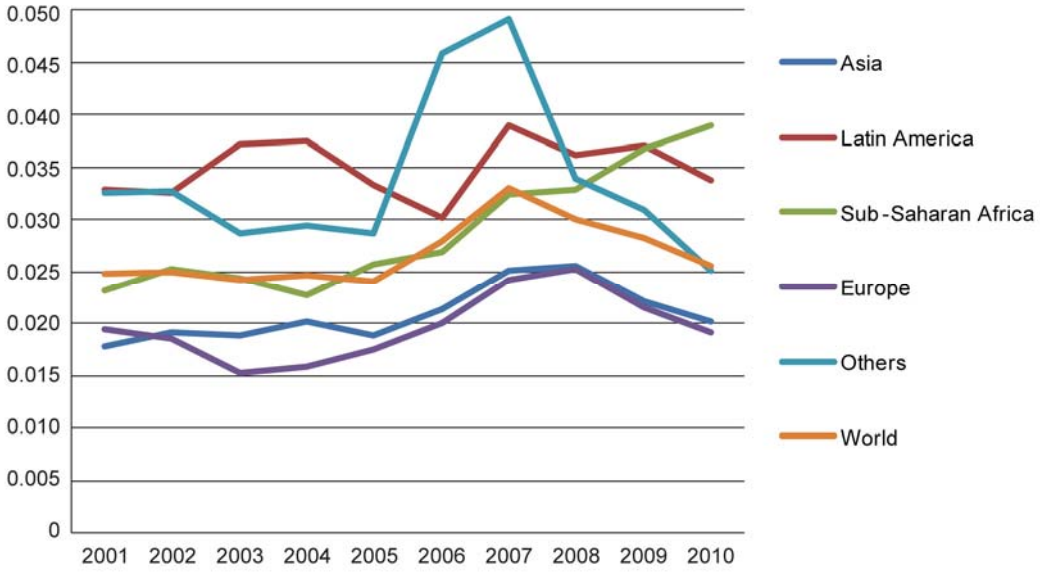
Source: Authors' calculations.

Figure 3: Food Price Inflation Rates for Different Regions
(%)



Sources: Authors' calculations using data from the Food and Agriculture Organization of the United Nations (FAO) and national sources accessed through CEIC (www.ceicdata.com).

Figure 4: Food Price Volatilities for Different Regions



Sources: Authors' calculations using data from the Food and Agriculture Organization of the United Nations (FAO) and national sources accessed through CEIC (www.ceicdata.com).

The trend of food price inflation and volatility shows that there may be spillovers from global food price inflation and volatility to national food price inflations and volatilities in recent years, particularly since the late 2000s. In the following sections, we will formally test if and to what extent the international transmission of food price inflation and volatility takes place. Using the annual data from 2000 to 2011, we employ the panel data analysis to assess the

transmission of global food price inflation and volatility to national food price inflations and volatilities. We will also assess if regional differences exist in terms of global food price transmission, by focusing on the Asian region and examining how it is different from other regions such as Latin America, sub-Saharan Africa, and Europe.

III. MODEL SPECIFICATIONS

We construct a panel data set using the inflation and volatility measures obtained in the previous section as two different dependent variables.

A. Model Specification for National Food Price Inflation

Explanatory variables are grouped into external and internal (domestic) variables. The equation to be estimated is

$$C_{it} = \beta_0 + EV_{it}\beta_1 + IV_{it}\beta_2 + \varepsilon_{it}. \quad (1)$$

where C_{it} is the annual food price inflation rates, *EV* is a vector of external variables, *IV* is a vector of internal variables, and ε_{it} is an error term.

1. External variables:

To assess the effects of transmission of global and regional food price inflations to individual countries, we construct three separate types of external variables.

a. Global food price inflation rates

World_C1: Global food price inflation using the FAO Food Price Index.

L.World_C1: 1 year lag of global food price inflation using the FAO index. This is to account for the lagging influence of global food commodity prices on the food prices of individual countries, as described in the previous section.

World_C2: Average of national food price inflations rates of all countries included in this study.

b. Intraregional food price inflation rates

The intraregional food price inflation rates for different regions are constructed as the simple average of food price inflation rates of the countries in the same region. It is noted that when calculating this measure for each country, that country's food price inflation is excluded.

Asia_Intra_C: Simple average of food price inflation rates of the countries in Asia.

Latin_America_Intra_C: Simple average of food price inflation rates of the countries in Latin America.

Sub_Sahara_Intra_C: Simple average of food price inflation rates of the countries in sub-Saharan Africa.

Europe_Intra_C: Simple average of food price inflation rates of the countries in Europe.

c. Extra-regional food price inflation rates

The extra-regional food price inflation rates for different regions are constructed as the simple average of food price inflation rates of all countries located outside the region.

Asia_Extra_C: Simple average of food price inflation rates of countries outside Asia.

Latin_America_Extra_C: Simple average of food price inflation rates of countries outside Latin America.

Sub_Sahara_Extra_C: Simple average of food price inflation rates of countries outside sub-Saharan Africa.

Europe_Extra_C: Simple average of food price inflation rates of countries outside Europe.

2. Internal variables:

a. Domestic demand factors

GDPPC_C: Difference in log of gross domestic product (GDP) per capita in US dollars. This is to capture the country's economic conditions in terms of business cycle as well as the income-driven increase in the demand for food. Source: World Bank World Development Indicators (WDI).[3]

POP_C: Difference in log of population. This is to capture the population-driven increase in the demand for food. Source: World Bank WDI.

b. Domestic supply factors

FPI_C: Difference in log of food production index. This is to capture the country's general food production conditions. Source: World Bank WDI.

FOOD_IMPORT: Share of food in merchandise imports. This is to assess whether countries with greater dependence on food imports experience higher food price inflation rates. Source: World Bank WDI.

FOOD_IMPORT_C: Difference in log of share of food in merchandise imports. This is to assess how high food inflation is associated with a change in food imports as a share of merchandise imports. The causality here may be two ways, as domestic food price increase will induce more imports of foreign food products, which in turn may result in lower prices of domestic food products. A positive sign will indicate that the first causality is stronger, while a negative sign will indicate that the second causality is stronger.

XRate_C: Difference in log of exchange rates (LOC/ $). As depreciation of local currency (LOC) against the US dollar will result in higher domestic prices of imported food products in local currency, this variable is expected to carry a positive sign. Source: IMF International Financial Statistics.[4]

[3] See http://data.worldbank.org/data-catalog/world-development-indicators
[4] See http://elibrary-data.imf.org/

c. Overall condition of domestic market

M1_C: Money growth rates measured as the difference in log of M1. This is to capture the overall inflation pressure due to the expansion of money supply in the market. Source: IMF International Financial Indicators.

L.M1_C: 1 year lag of M1_C. This is to capture the lagged effect of money supply on prices.

POL_STABILITY: This is a measure of political stability to capture the institutional quality of the market. This measure is also expected to capture the efficiency and consistency of public policies aimed at reducing the impact of various external and internal sources contributing to food price inflation. Source: World Bank WDI.

GDPPC: Log of GDP per capita in US dollars. This is to capture the quality of the market as high-income countries are generally expected to reveal lower growth rates in money supply and higher political stability. This is included here as a control variable. Source: World Bank WDI.

B. Model Specification for Food Price Volatility

The model for food price volatility is similar to that of national price inflation. The dependent variable is replaced with the food price volatility measured as described in the previous section. Explanatory variables are also grouped in two categories: external variables and internal (domestic) variables. The equation to be estimated is

$$V_{it} = \beta_0 + EV_{it}\beta_1 + IV_{it}\beta_2 + \varepsilon_{it}. \quad (2)$$

where V_{it} is the annual food price volatilities, *EV* is a vector of external variables, *IV* is a vector of internal variables, and ε_{it} is an error term.

1. External variables:

To assess the effects of transmission of global and regional food price inflations and volatilities to individual countries, we construct three separate types of external variables.

a. Global food price volatilities

World_V1: Global food price volatilities measured as the square root of the sum of the squared percentage changes in the quarterly series of every 3-year moving window, using the FAO Food Price Index.

L.World_V1: 1 year lag of World_V1. This is to account for the lagged influence of global food commodity price volatilities on the food price volatilities of individual countries, as described in the previous section.

World_V2: Average of national food price volatilities of all countries included in this study.

b. Intraregional food price volatilities

The intraregional food price volatilities for different regions are constructed as the simple average of food price inflation rates of the countries in the same region. It is noted that when calculating this measure for each country, that country's food price volatility is excluded.

Asia_Intra_V: Simple average of food price volatilities of the countries in Asia.

Latin_America_Intra_V: Simple average of food price volatilities of the countries in Latin America.

Sub_Sahara_Intra_V: Simple average of food price volatilities of the countries in sub-Saharan Africa.

Europe_Intra_V: Simple average of food price volatilities of the countries in Europe.

c. Extra-regional food price volatilities

The extra-regional food price volatilities for different regions are constructed as the simple average of food price volatilities of all countries located outside the region.

Asia_Extra_V: Simple average of food price inflation rates of countries outside Asia.

Latin_America_Extra_V: Simple average of food price volatilities of countries outside Latin America.

Sub_Sahara_Extra_V: Simple average of food price volatilities of countries outside sub-Saharan Africa.

Europe_Extra_V: Simple average of food price volatilities of other countries outside Europe.

2. Internal variables:

In the equations for food price volatility, except for one variable, all internal variables are identical to those included in the equations for food price inflations. The exception is XRate_C, difference in log of exchange rates, which is replaced with XRate_V, which is defined below:

XRate_V: Volatilities of quarterly series of exchange rates (LOC/ $) in a 3-year moving window. Volatile exchange rates increase the riskiness of returns; hence, there may be a positive transmission of exchange rate volatility to the volatility of food prices.

IV. RESULTS

A. Results for Food Price Inflation

Table 5 reports the estimated results for changes in national food price indices using the fixed-effects model. Column (1) presents the results with both year dummies and country dummies included. Global food price changes are not included here because year dummies account for worldwide fluctuations of business cycles, food prices, and so on. Thus, Column (1) presents the estimated results for the internal factors only in the most comprehensive empirical framework.

Table 5: Determinants of National Food Price Inflation: Benchmark Model

	(1)	(2)	(3)	(4)	(5)
Change in FAO world food index (t)		–0.019		0.060***	
		(0.015)		(0.019)	
Change in FAO world food index (t-1)			0.101***	0.144***	
			(0.017)	(0.021)	
Change in average of national food prices (t)					0.007***
					(0.001)
GDP per capita growth rate	–0.260**	0.057	–0.151*	–0.253***	–0.083
	(0.102)	(0.086)	(0.089)	(0.093)	(0.083)
Population growth rate	–0.265	0.322	–0.006	–0.128	–0.007
	(0.644)	(0.686)	(0.661)	(0.655)	(0.648)
Free trade index of Economic Freedom of the World	0.011	0.020***	0.016**	0.016**	0.015**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Change in Food Production Index	–0.003	0.010	0.006	0.015	–0.013
	(0.038)	(0.040)	(0.038)	(0.038)	(0.037)
Share of food imports in merchandise imports	–0.006***	–0.007***	–0.005***	–0.005***	–0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Change in share of food imports in merchandise imports	0.006***	0.007***	0.006***	0.006***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Change in exchange rate (LOC/ $)	0.108***	0.117***	0.087***	0.096***	0.089***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.015)
M1 growth rate	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M1 growth rate (t-1)	0.000*	0.000	0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Political stability index	–0.038***	–0.039***	–0.037***	–0.033***	–0.040***
	(0.011)	(0.012)	(0.011)	(0.011)	(0.011)
Log of GDP per capita	0.081*	0.053*	0.032	0.024	-0.005
	(0.046)	(0.030)	(0.029)	(0.029)	(0.029)
Constant	–0.711*	–0.486*	–0.294	–0.225	0.005
	(0.410)	(0.279)	(0.270)	(0.268)	(0.272)
Year dummies	Yes	No	No	No	No
Country dummies	Yes	Yes	Yes	Yes	Yes
Number of observations	497	497	497	497	497
Number of groups	64	64	64	64	64
R2	0.330	0.212	0.272	0.290	0.300

FAO = Food and Agriculture Organization of the United Nations, GDP = gross domestic product, M1 = money supply, R2 = R-squared.

Notes: 1. Numbers in parentheses are standard errors. .
2. ***, **, and * denote 1%, 5%, and 10% level of significance, respectively.

Source: Authors' calculations.

Among the demand-side factors, GDP per capita growth rate is found to carry a significant negative coefficient. That is, domestic food price inflation seems to be negatively associated with fast-growing income. This is an interesting finding, as growing incomes in poor countries will likely increase food consumption, contributing to food price inflation. However, given the low income elasticity of food consumption, growing incomes in rich countries would not necessarily increase food consumption, leading to food price inflation. As the panel data includes both developing and industrialized countries, the results seem to suggest that many countries in the sample have already reached the threshold for an additional increase in income not necessarily leading to food price inflation.

Among the supply-side factors, a country's import reliance seems to be negatively associated with food price inflation. That is, countries with a relatively high share of food imports seem to experience less food price inflation. However, countries with greater food share increases in their merchandise imports experience high food price inflation. The results suggest that countries that are more open to global food trade may control food price inflation better. On the other hand, a sudden increase of food imports in the share of total imports, perhaps associated with any disruption in domestic food supply, could stoke food price inflation by exposing the country to highly priced global food markets.

The depreciation of local currency against the US dollar (i.e. an increase in the local currency value of $1) is positively associated with domestic food price inflation. We also found that greater political stability and higher GDP per capita are strongly associated with lower food price inflation. Conversely, high money growth rates lead to high food price inflation rates.

Columns (2)–(4) report the regression results when global food price inflation rates instead of yearly dummies are used. Column (2) reports the results estimated by including the contemporaneous annual global food price inflation rates using the FAO Food Price Index, while Column (3) reports the estimation results including the lagged value of the global food inflation rates. While the contemporaneous global food price inflation does not affect national food price inflation rates, its lagged value does at the 1% level. Specifically, a 10% increase in world food prices incurs an increase of 1.15% in national food prices after 1 year. When we included both in Column (4), the coefficients for both contemporaneous global food price inflation and its 1-year lagged value become significant. However, the coefficient for the lagged value remains much higher (more than two times larger) than the one for contemporaneous global inflation.

On the other hand, Column (5) presents the results using the average value of all national food price inflation rates as the global food price inflation rate. The results generally confirm that there is an emerging tendency that national food price inflation rates move together.

Table 6 reports the results incorporating regional dummies for interactions among the countries in the same region. As with Table 5, Columns (1)–(2) are estimation results using contemporaneous and 1-year lagged values of global food price inflation, respectively, based on the FAO Food Price Index. Column (3) employs both. Column (4) shows the results using the average of national food price inflation rates as the global food price inflation rate.

Table 6: Determinants of National Food Price Inflation: Differential Effects of Global Food Prices in Different Regions

	(1)	(2)	(3)	(4)
Change in FAO world food price index * Asia dummy (t)	–0.014		0.062	
	(0.035)		(0.041)	
Change in FAO world food price index * Latin America dummy (t)	–0.024		0.104***	
	(0.030)		(0.036)	
Change in FAO world food price index * Europe dummy (t)	0.002		0.086***	
	(0.025)		(0.030)	
Change in FAO world food price index * sub-Saharan Africa dummy (t)	–0.096**		–0.036	
	(0.042)		(0.049)	
Change in FAO world food price index * Asia dummy (t-1)		0.076**	0.117***	
		(0.034)	(0.042)	
Change in FAO world food price index * Latin America dummy (t-1)		0.158***	0.233***	
		(0.031)	(0.038)	
Change in FAO world food price index * Europe dummy (t-1)		0.087***	0.150***	
		(0.027)	(0.033)	
Change in FAO world food price index * sub-Saharan Africa dummy (t-1)		0.132***	0.115**	
		(0.042)	(0.050)	
Change in average of national food prices * Asia dummy (t)				0.005**
				(0.002)
Change in average of national food prices * Latin America dummy (t)				0.008***
				(0.002)
Change in average of national food prices * Europe dummy (t)				0.007***
				(0.002)
Change in average of national food prices * sub-Saharan Africa dummy (t)				0.009***
				(0.003)
All internal variables are included but not shown.				
Constant	–0.497*	–0.313	–0.221	–0.096
	(0.279)	(0.269)	(0.266)	(0.273)
Year dummies	No	No	No	No
Country dummies	Yes	Yes	Yes	Yes
Number of observations	497	497	497	497
Number of groups	64	43	64	43
R2	0.220	0.283	0.312	0.288

FAO = Food and Agriculture Organization of the United Nations, R2 = R-squared.

Notes: 1. Internal variables are not shown for brevity.
2.Numbers in parentheses are standard errors. .
3.***, **, and * denote 1%, 5%, and 10% level of significance, respectively.

Source: Authors' calculations.

In Column (1), the regional interactions seem to be insignificant when the contemporaneous global food price inflation rate is used. However, Column (2) shows that the 1-year lagged values of global food price inflation are significantly and positively associated with national food price inflation rates in all regions. This positive relationship seems to be the strongest among Latin American and sub-Saharan African countries. For example, a 10%

increase in world food prices incurs an increase of 1.6% in food prices in Latin American countries and 1.4% in sub-Saharan African countries, but only 0.8% in Asian countries. Column (4) also shows that regional food price inflations are significantly and positively associated with the average food price inflation rates for all countries.

To further assess whether the global food price co-movements are due to intraregional co-movements or/and extra-regional co-movement, Table 7 reports the results obtained when including the simple average of food price inflation rates for the countries in the same region (Column 1) and the simple average of food price inflation rates for the countries outside each region (Column 2). The results suggest that national food price inflation rates move together not only with the countries in the same region but also with those located outside the region. Indeed, for sub-Saharan African countries, national food price inflations show stronger co-movements with extra-regional food price inflation rates than with intraregional food price inflation rates.

Table 7: Determinants of National Food Price Inflation: Intraregional Co-movement vs. Extra-regional Co-movement

	(1)	(2)
Change in intraregional food prices (Asia)	0.005*	
	(0.002)	
Change in intraregional food prices (Latin America)	0.005***	
	(0.002)	
Change in intraregional food prices (Europe)	0.007***	
	(0.002)	
Change in intraregional food prices (sub-Saharan Africa)	0.004***	
	(0.001)	
Change in extra-regional food prices (Asia)		0.005**
		(0.002)
Change in extra-regional food prices (Latin America)		0.006***
		(0.002)
Change in extra-regional food prices (Europe)		0.007***
		(0.002)
Change in extra-regional food prices (sub-Saharan Africa)		0.009***
		(0.003)
All internal variables are included but not shown		
Constant	–0.137	–0.000
	(0.292)	(0.294)
Year dummies	No	No
Country dummies	Yes	Yes
Number of observations	405	405
Number of groups	64	64
R2	0.310	0.316

R2 = R-squared.

Notes: 1. Internal variables are not shown for brevity.
2. Numbers in parentheses are standard errors. .
3. ***, **, and * denote 1%, 5%, and 10% level of significance, respectively.

Source: Authors' calculations.

Table 8: Determinants of Volatilities of National Food Price Index: Benchmark Model

	(1)	(2)	(3)
Volatility of national food price index (t-1)	0.834***	0.567***	0.656***
	(0.121)	(0.066)	(0.053)
Volatility of FAO world food price index (t)		0.076***	
		(0.009)	
Average of national food price volatilities (t)			0.907***
			(0.083)
GDP per capita growth rate	–6.231***	0.603	–2.506**
	(1.808)	(1.027)	(1.023)
Population growth rate	–3.642	8.034	–2.122
	(11.341)	(17.650)	(14.324)
Free trade index of Economic Freedom of the World	–0.103	0.103	0.088
	(0.186)	(0.104)	(0.104)
Change in Food Production Index	–0.301	–0.800**	–0.558
	(0.699)	(0.396)	(0.404)
Share of food imports in merchandise imports	–0.038	–0.126***	–0.104***
	(0.039)	(0.034)	(0.030)
Change in share of food imports in merchandise imports	–0.035	-0.021	-0.037**
	(0.027)	(0.015)	(0.017)
Volatility of exchange rate (LOC/ $)	0.210	1.024***	0.621***
	(0.704)	(0.281)	(0.130)
M1 growth rate	0.001	0.005**	0.002
	(0.003)	(0.002)	(0.002)
M1 growth rate (t-1)	0.000	0.001	0.000
	(0.002)	(0.001)	(0.001)
Political stability index	0.039	0.223	0.114
	(0.240)	(0.174)	(0.155)
Log of GDP per capita	–0.260	–1.337***	–0.908***
	(0.369)	(0.287)	(0.289)
Constant	3.888	12.543***	6.837**
	(3.734)	(2.939)	(2.877)
Year dummies	Yes	No	No
Number of observations	497	497	497
Number of groups	64	64	64
Arellano-Bond test			
AR(1)	–2.032	–2.217	–2.344
p-value	0.042	0.027	0.019
AR(2)	–1.577	–1.423	–1.585
p-value	0.114	0.155	0.113
Overidentification test (Sagan)			
Chi-squared	12.477	38.657	27.398
p-value	0.488	0.194	0.699

AR = autoregressive lag, FAO = Food and Agriculture Organization of the United Nations, GDP = gross domestic product, M1 = money supply.

Notes: 1. Estimates are made with system Generalized Method of Moments (GMM) estimator.
2. Numbers in parentheses are standard errors. .
3. ***, **, and * denote 1%, 5%, and 10% level of significance, respectively.

Source: Authors' calculations.

B. Results for Food Price Volatilities

Table 8 reports the results when the dependent variable is the volatility of national food prices. The volatility is constructed using a 3-year moving window, and therefore is highly auto-correlated by construction, causing the error term to be serially correlated in a regression analysis. Figure 2b shows that the volatilities for most countries appear to exhibit persistency. To overcome this drawback, we employ the two-step system generalized method of movements (GMM) estimator for dynamic panel data following the model of Blundell and Bond (1998). The lagged and first difference variables of all explanatory variables enter as exogeneous variables.

Column (1) reports the regression results without external food price volatilities but with year dummies included. The consistency of the dynamic GMM estimator requires the presence of first-order correlation and the absence of second-order correlation in the residuals of the differenced specification. Test results for the first-order and second-order correlations, as reported in the bottom row of the column, show the consistency of the dynamic GMM estimator. The overall appropriateness of the instruments is also successfully verified by the Sargan test of over-identifying restrictions. The volatilities of national food price indices in the previous year appear to persist very strongly. Among the internal factors, growth rate of GDP per capita is the only variable that carries a statistically significant coefficient. That is, fast-growing countries appear to have smaller volatilities of national food prices. Thus, these countries appear to be associated not only with lower food price inflation rates as shown in Table 5, but also with smaller volatilities.

Column (2) reports the results when the volatility of the FAO Food Price Index is included in place of year dummies. The lagged value of the dependent variable continues to reveal a strong positive coefficient. The volatility of the global food commodity price index also appears to very strongly influence that of the national food prices, but in terms of size of the coefficients, the influence of global volatility is only about 8% (=0.058/0.688) of the influence of its own volatilities in the previous year.

In Column (3), we see the results when the national food price volatility average is used instead of the global volatilities constructed with the FAO index. The very large and significant coefficient is interesting to note. This suggests that national food price volatilities fluctuate together. Note that the size of the coefficient for the average volatility of national food prices is greater than that for the lagged value of the dependent variable (i.e., national food price volatilities).

Table 9 reports the results when the equation is reestimated with the inclusion of the interaction terms of global food price volatility and regional dummies. Column (1) shows the result with the global food price volatility calculated from the FAO Food Price Index: all the regions reveal a positive and significant co-movement of food price volatilities with the global food price volatility.

Column (2) reports the corresponding result when the average of national food price volatilities is used in place of the volatilities of the FAO index. We see that in all of the regions except sub-Saharan Africa, the volatilities of national food prices are strongly and positively linked with the overall volatilities of worldwide food prices.

Table 9: Determinants of Volatilities of National Food Price Index: Differential Effects of Global Food Prices in Different Regions

	(1)	(2)
Volatility of national food price index (t-1)	0.558***	0.652***
	(0.022)	(0.025)
Volatility of FAO world food price index * Asia dummy	0.012***	
	(0.004)	
Volatility of FAO world food price index * Latin America dummy	0.059***	
	(0.008)	
Volatility of FAO world food price index * Europe dummy	0.017***	
	(0.006)	
Volatility of FAO world food price index * sub-Saharan Africa dummy	0.048***	
	(0.009)	
Average of volatilities of national food prices * Asia dummy		0.015*
		(0.008)
Average of volatilities of national food prices * Latin America dummy		0.036***
		(0.010)
Average of volatilities of national food prices * Europe dummy		0.045***
		(0.008)
Average of volatilities of national food prices * sub-Saharan Africa dummy		0.012
		(0.009)
All internal variables are included but not shown.		
Constant	–2.115***	–0.201
	(0.678)	(0.695)
Number of observations	497	497
Number of groups	64	64
R2		
Arellano-Bond test		
AR(1)	–2.882	–2.921
p-value	0.004	0.004
AR(2)	–1.533	–1.428
p-value	0.125	0.153
Overidentification test (Sagan)		
Chi-squared	53.983	56.485
p-value	0.908	0.860

AR = autoregressive lag, FAO = Food and Agriculture Organization of the United Nations, R2 = R-squared.

Notes: 1. Estimates are made with system Generalized Method of Moments (GMM) estimator.
2. Internal variables are not shown for brevity.
3. Numbers in parentheses are standard errors.
4. ***, **, and * denote 1%, 5%, and 10% level of significance, respectively.

Source: Authors' calculations.

Finally, Table 10 reports the results for assessing the intra- and extra-regional co-movement of food price volatilities. Column (1) shows the results with the inclusion of the simple food price volatility average for countries in the same region. Food price volatilities of the countries in all the regions except sub-Saharan Africa seem to show a co-movement within the region. On the other hand, Column (2) reports the strong existence of the extra-regional co-movements of volatilities. Thus, the volatilities of national food price inflation move together not only with the countries in the same region but also with the countries located outside the region.

Table 10: Determinants of Volatilities of National Food Price Index: Intraregional Co-movement vs. Extra-regional Co-movement

	(1)	(2)
Volatility of national food price index (t-1)	0.484***	0.805***
	(0.021)	(0.016)
Volatility of intraregional food prices (Asia)	73.215***	
	(15.394)	
Volatility of intraregional food prices (Latin America)	35.721***	
	(7.464)	
Volatility of intra-regional food prices (Europe)	48.615***	
	(11.742)	
Volatility of intraregional food prices (sub-Saharan Africa)	–.089	
	(7.363)	
Volatility of extra-regional food prices (Asia)		62.478***
		(7.730)
Volatility of extra-regional food prices (Latin America)		65.499***
		(3.735)
Volatility of extra-regional food prices (Europe)		42.219***
		(5.716)
Volatility of extra-regional food prices (sub-Saharan Africa)		40.176***
		(5.391)
All internal variables are included but not shown		
Constant	11.656***	7.216**
	(4.207)	(3.618)
Number of observations	405	405
Number of groups	52	52
R2		
Arellano-Bond test		
AR(1)	–2.329	–2.336
p-value	0.020	0.020
AR(2)	–1.339	–1.218
p-value	0.181	0.223
Overidentification test (Sagan)		
Chi-squared	41.905	47.778
p-value	1.000	0.970

AR = autoregressive lag, R2 = R-squared.

Source: Authors' calculations.

V. SUMMARY AND POLICY IMPLICATIONS

The main purpose of this paper is to offer a comprehensive assessment of what influenced national food price inflation and its volatilities during 2000–2011. In particular, this paper examined whether and to what extent the domestic food price inflation and volatilities of Asian countries are influenced by those of the other countries in the region, as well as global food price inflation and volatility.

We find that domestic food price inflation is strongly associated with the lagged value of global food price inflation using the FAO Food Price Index. Interestingly, volatility spillovers from global to domestic food prices seemed to be contemporaneous.

We also find that movements in both national food price inflation rates and volatilities are strongly associated with those in both intra- and extra-regional food price inflation rates and volatilities, respectively. It also seems that the inflation of global food prices affects the national food markets in all regions but with a time lag.

This paper finds that global food price shocks affect the domestic food price inflation and volatilities in different countries across different regions in different degrees. This finding may be due to the fact that the present study utilized more current data up to 2011, while earlier studies such as those by Byerlee, Jayne, and Myers (2006); Dawe (2008); and Headey and Fan (2008) used data before the recent (since 2007) spikes of global cereal prices.

It is crucial for governments and the international community to understand how to limit the transmission of global food prices and their volatilities to the national markets. Our findings suggest that higher economic growth rates, greater share of food in merchandise imports, smaller increase in share of food in merchandise imports, appreciation of local currency, greater political stability, and higher income level all lead to lower domestic food price inflation. In terms of food price volatility, only economic growth rates matters: countries with higher economic growth rates appear to have lower volatilities of national food prices.

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International Transmission of Food Prices and Volatilities: A Panel Analysis

The rise of global food prices and volatilities in recent years has made an understanding of their dynamics and influences more important than ever. High food prices pose a significant challenge in developing countries where food is a key household expense, while volatility may impede production and lead to inefficient agricultural resource allocation. In this paper, Hyun-Hoon Lee and Cyn-Young Park study the global, regional, and national factors behind domestic food price inflation and volatility in Asian countries during 2000–2011. By providing comprehensive comparisons, this paper will help policymakers craft more effective responses to high and volatile food prices.

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