

## Food price volatility in developing countries – the role of trade policies and storage\*

↳ **Lukas KORNHERA**, University of Kiel, Department of Food Economics and Consumption Studies. Corresponding author. <sup>1</sup>  
[lkornher@food-econ.uni-kiel.de](mailto:lkornher@food-econ.uni-kiel.de)

↳ **Matthias KALKUHLB**, University of Bonn, Center for Development Research (ZEF). [mkalkuhl@uni-bonn.de](mailto:mkalkuhl@uni-bonn.de)

↳ **Irfan MUJAHIDB**, University of Bonn, Center for Development Research (ZEF). [imujahid@uni-bonn.de](mailto:imujahid@uni-bonn.de)

The quest for the causes of food price volatility has produced a large body of literature examining whether financialization of commodity markets, the new nexus with energy markets, or restrictive trade policies prompted food prices to change so extremely (Abbott *et al.*, 2011; Serra and Gil, 2012; Tadesse *et al.*, 2013). Increasing volatility in international markets are a great concern for developing countries. However, surprisingly, there are not many new insights on the causes of food price instability at domestic markets in developing countries. Several papers have analyzed the transmission of international price changes to domestic markets finding mixed evidence with regard to inter-linkages between international and national level (Minot, 2011; Baquedano and Liefert, 2014).



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...../..... In contrast to pure time-series approaches, reduced form equation models that control for market fundamentals and policy variables consistently find a positive volatility spill-over from international to national markets (Lee and Park, 2013; Kornher and Kalkuhl, 2013; Pierre et al., 2014). This literature also provides evidence on the impact of prominent supply and demand factors as well as the importance of transaction costs and governance indicators. Our analysis is situated between time series approaches and structural models by estimating a dynamic panel specification with a large set of explanatory variables.

In response to increasing international price volatility, national governments imposed anti-cyclical trade and storage policies to stabilize domestic markets (Demeke et al., 2009). Policy reactions have their domestic justification, but are accompanied by negative externalities as export restrictions limit supply at international and regional markets (Martin and Anderson, 2012; Laborde et al., 2013). Similarly, sufficiently large stocks guarantee adequate supply and prevent post-harvest prices from spiking, while they also offset inter-annual supply shocks (Deaton and Laroque, 1992; Tadesse and Guttormsen, 2011). State involvement in storage increases national carry-over stocks and can thereby contribute to price stabilization (Jayne et al., 2008; Mason and Myers, 2013; Kozicka et al., 2015). Thus, policies play a crucial role to control price stability. However, there is no study available that shows the theoretical or empirical link of anti-cyclical trade and storage policies on volatility. Closely related to this, the trade regime needs to be considered when analyzing the effects of these policies.

We start off our analysis by providing a stylized theoretical model for domestic price variability. The model is based on the spatial trade equilibrium after Samuelson-Takayama-Judge and the inter-temporal arbitrage condition. The main predictions of the model are as follows: (i) the flexible component of transaction costs

(namely trade policies) allows to reduce domestic price volatility below the volatility of international prices, if trade policies are anti-cyclical (import regime) or cyclical (export regime); (ii) increased commodity storage reduces inter and intra-annual price instability; (iii) high transaction costs increase the probability of the no-trade regime; (iv) high transaction costs reduce domestic price volatility, if the variability in the no-trade regime is very low.

For the empirical investigation, we employ a comprehensive data set with great country coverage across Africa, Asia, and Latin America. The econometric model chosen is a dynamic panel estimated by system GMM that accounts for persistence of volatility as well as for the unobserved heterogeneity across countries and commodities. Our dependent variable is the logarithmized standard deviation of log returns within one calendar year. The significant coefficient of lagged price volatility in any specification confirms the choice of a dynamic specification. The estimation incorporates several variables novel to comparable research studies: first, trade policy variables that measure anti-cyclical trade policies of the home country and of its major trading partners: second, the share of trade a country shares with its partners in regional trade agreements; third, transaction costs that are measured as a weighted average of a country's mobile phone penetration rate, percentage of paved roads, the Fraser Index of Economic Freedom, and a dummy variable that accounts for the existence of a commodity exchange in the country; fourth, a dummy variable that indicates whether a country is characterized by strong state involvement in one of the staple food commodities. Notably, data on beginning stocks and production volumes do not originate from FAOSTAT or USDA, but from the FAO CBS which provides the best existing data for developing countries according to the knowledge of the authors. Different to the existing literature, the estimation is performed for the full set of countries and crops as well as for sub-samples according to trade status (as

importer, non-importer, and trade-switcher) and state involvement into food markets (high vs low intervention).

The regression results support earlier evidence that international price volatility strongly influences domestic volatility. In the short run the elasticity suggests a volatility spill-over of around 20 percent which elevates to 30 percent in the long-run. The estimate is in line with existing studies which use a similar approach (Lee and Park, 2013; Pierre et al., 2014). Furthermore, high transaction costs, as consequence of poor institutional quality of agricultural markets, are positively associated with price instability. Among supply and demand drivers, stocks and change in production significantly impact on volatility. An increase in the stocks-to-use ratio by one percent reduces price variability by 2.5 percent. The effect of production is weak and appears to be less robust across specifications which was also found in other studies (e.g. Ott, 2014). Most strikingly are the findings with respect to trade policies and regional integration. Using a unique data set on bilateral trade agreements, regional trade appears to have a dominant role in stabilizing national food prices across all types of countries. This contributes to the literature that emphasizes the positive effect of regional integration on trade flows and trade policy volatility (Cadot et al., 2009; Sun and Reed, 2010; Mujahid and Kalkuhl, 2014). With regard to the relevance of the variables, standardization shows that stocks and regional trade integration are the major determinants followed by transaction costs and international price volatility.

Distinguishing between types of countries provides striking results in multiple ways. First, volatility spillovers from international to domestic markets are almost twice as large for importers as compared to exporters and trade-switchers. Second, insulation policies are found to be a successful price stabilization tool not only for large exporting countries, but also for regional traders. Third, transaction costs are particularly

important in countries that are hardly involved in international trade. The price stabilizing effect of stocks is notably high in importing countries. Last, market forces, such as supply and demand, exhibit less impact on price volatility in countries that are characterized by public price stabilization programs. Using a two-step estimation procedure to properly identify the effect of high public intervention, no positive effect on market stability is established. Thus, we find that stocks massively diminish intra-annual price volatility, but we find no evidence that these stocks should be publicly owned instead of privately held.

Our analysis gives valuable insights in the effectiveness of policies to reduce domestic food price volatility. It does not, however, assess the costs and the benefits of these policies which need a broader consideration of fiscal costs, welfare benefits from stabilization as well as potential efficiency losses due to high state-intervention. The most important policy implications refer to the role of trade for domestic price stability: trade and improved quality of market institutions – the latter providing an important determinant for the feasibility and extent of trade through transaction costs – provide an important tool to moderate domestic supply and demand shocks. Admittedly, it simultaneously makes a country prone to international price risks. Throughout long time periods, markets at the international level are less volatile than in most developing countries (Kornher, 2014) and importers exhibit lower price volatility than non-importers. In rare events of excessive price spikes at international markets, policy makers are tempted to use anti-cyclical trade policy to insulate domestic price increases at the expense of their trading partners. Regional trade agreements provide a vehicle to stabilize regional markets and to reduce domestic volatility substantially. Hence, recent developments to create or enhance regional trade in Asia or Africa provide a promising approach to reduce food price volatility in these countries without additional market distortions.

## ▶ References

- **Abbott, P.C., C. Hurt and W.E. Tyner.** 2011. "What is driving food prices in 2011?" *Issue report, Farm Foundation*, NFP, Oak Brook, July.
- **Baquedano, F.G. and W.M. Liefert.** 2014. "Market integration and price transmission in consumer markets of developing countries." *Food Policy* 44: 103-114.
- **Cadot, O., M. Olarreaga and J. Tschopp.** 2009. "Do trade agreements reduce the volatility of agricultural distortions?" *World Bank Working Paper* 50303, May
- **Deaton, A. and G. Laroque.** 1992. "On the behaviour of commodity prices." *The Review of Economic Studies* 59 (1): 1–23.
- **Demeke, M., G. Pangrazio and M. Meatz.** 2009. "Country responses to the food security crisis: Nature and preliminary implications of the policies pursued." *Tech.Rep.*, FAO, Rome.
- **Jayne, T.S., R.J. Myers and J. Nyoro.** 2008. "The effects of NCPB marketing policies on maize market prices in Kenya." *Agricultural Economics* 38 (3): 313-325.
- **Kornher, L.** 2014. "Recent trends of food price volatility in developing and emerging economies", paper presented at the 2nd Bordeaux Workshop in International Economics and Finance: Price risk management of agricultural commodities in developing countries". December 5th, 2014, Bordeaux, France.
- **Kozicka, M., M. Kalkuhl, S. Saini and J. Brockhaus.** 2015. Modelling Indian wheat and rice sector policies. ICRIER Working Paper 295, Indian Council for Research on International Economic Relations (ICRIER).
- **Laborde, D., C. Estrades, C., and A. Bouet.** 2013. "A global assessment of the economic effects of export taxes." *IFPRI Discussion Paper* 01241, International Food Policy Research Institute (IFPRI).
- **Lee, H.-H. and C.-Y. Park.** 2013. "International transmission of food prices and volatilities: A panel analysis." *ADB Economics Working Paper Series* 373, Asian Development Bank (ADB), Manila.
- **Martin, W. and K. Anderson.** 2012. "Export restrictions and price insulation during commodity price booms." *American Journal of Agricultural Economics*, 94(2): 422-427.
- **Minot, N.** 2011. "Transmission of world food price changes to markets in Sub-Saharan Africa." *IFPRI Discussion Papers* 1059, International Food Policy Research Institute (IFPRI), Washington D.C.
- **Mujahid, I. and M. Kalkuhl.** 2014. "Do trade agreements increase food trade?" Poster presented at the at the Agricultural & Applied Economics Association's (AAEA) Annual Meeting, Minneapolis, July 27-29, 2014.
- **Myers, R.J. and T. Jayne.** 2012. "Multiple-regime spatial price transmission with an application to maize markets in southern Africa." *American Journal of Agricultural Economics* 94 (1): 174-188.
- **Ott, H.** 2014. "Volatility in cereals prices: intra- versus inter-annual volatility." *Journal of Agricultural Economics* 65 (3): 557-578.
- **Pierre, G., C. Morales-Opazo and M. Demeke.** 2014. "Analysis and determinants of retail and wholesale staple food price volatility in developing countries." *ULYSSES project, Working Paper* 7, EU 7th Framework Program, Project 312182 KBBE.2012.1.4-05.
- **Porteous, O.C.** 2012. "Empirical effects of short-term export bans: The case of African maize." *Working Paper Berkeley*, Department of Agricultural Economics, University of California.
- **Serra, T. and J.M. Gil.** 2012. "Price volatility in food markets: can stock building mitigate price fluctuations?" *European Review of Agricultural Economics* 40 (3): 1-22.
- **Tadesse, G., B. Algieri, M. Kalkuhl and J. von Braun.** 2014. "Drivers and triggers of international food prices" *Food policy*, 47: 117-128.



### Contact

[www.ferdi.fr](http://www.ferdi.fr)

[contact@ferdi.fr](mailto:contact@ferdi.fr)

+33 (0)4 73 17 75 30

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