Effects of variable EU Import Levies on Corn Price Volatility

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Abstract

Agricultural markets notoriously exhibit high degrees of price and market instability. Besides demand and supply shocks caused by natural factors, policy measures have been increasingly recognized as an important contributor to commodity market fluctuations. While the elimination of such measures has often been an integral part of international treaties and agendas, some agricultural markets remain regulated at least to a certain extent. Domestic price stabilization policies of large market stakeholders continue to fuel international price volatility, especially during price spikes. The variable import levy on grains of the European Union aims at supporting domestic producers during periods of low prices but simultaneously has been associated with an increase in global market instability. Yet, given the lack of empirical evidence, the magnitude of policy effects on domestic and international price volatility remains undetermined. This paper employs asymmetric volatility models in order to asses the precise effects of domestic policy intervention in the EU. In line with the relevant theoretical literature, we find empirical evidence that variable import levy for corn successfully decreased corn price volatility in the European market while significantly exacerbating price fluctuations to the same extent in Argentina, an important exporter of corn. This confirms the hypothesis, that domestic price stabilization comes at the cost of destabilizing prices in other countries and can only shift volatility from one country to another. Improving the farmers ability to cope with price related risk could solve the price problem without exacerbating volatility on international markets.

Keywords: Trade Policy, Import Tariffs, Price Volatility, Price Insulation

1 Introduction

The instability of prices is an inherent feature of agricultural commodity markets. Unregular exposure to extreme weather events or pests on the supply side, as well as curbing demand from transition economies on the demand side contribute to the problem of unexpected and abrupt price movements. As a consequence, Agricultural commodity markets continue to experience a high degree of policy intervention to protect domestic producers or consumers from price fluctuations in international markets.

The European Union (EU) used several instruments, such as public intervention and variable import tariffs to support domestic producers by insulating domestic agricultural markets from excess fluctuations in international markets and by providing a price floor. Domestic prices were kept at artificially high levels which were based on political decisions and market signals from international markets could not be entirely transmitted to market participants. Despite an ongoing liberalization process of agricultural trade and support mechanisms - and associated improvements in the market orientation of the EU Common Agricultural Policy (CAP) - a variable import levy for major grains remains at place (Thomson 2018; Swinnen, Knops and Van Herck 2013; Tangermann 2011b; Matthews 2010). Price insulating policies, such as the variable import levy, are subject to criticism for distorting the price formation processes and being a "beggar-thy-neighbor" policy (Martin 2018; Anderson and Nelgen 2012a; Tothova 2011). Theoretically, price insulation hampers proper transmission of price signals between markets whereas the use of a fixed ad valorem tariff allows price signals to be proportionally transmitted across countries. The EU levy is constructed to insulate the domestic market from low international prices. In periods of low prices it compensates the gap between the import price and a targeted minimum price. Domestic grain prices are expected to be stabilized at the lower end due to the price floor constructed by the EU levy (Martin 2018; Rapsomanikis 2011). Nonetheless, Martin (2018, p.194) states, that "[. . .] All it [*price insulation*] can ever achieve is to redistribute volatility from one country to another.". It implies that domestic price stabilization can have a negative effect on price stabilization in a foreign country. This creates a collective-action-problem and incentivizes other countries to implement counteractive policies to offset increased instability.

While theoretical considerations allow understanding the basic mechanisms at play, the magnitude and complexity of the problem have rarely been addressed in the existing literature. Rude and An (2015) found empirical evidence that export restrictions contribute to food price volatility. However, their results are derived from a global approach in which policy strategies are pooled together instead of examining individual policies and their effects. Furthermore, they are concerned with export restrictive policies, which by nature are usually implemented when prices are high. To our knowledge, the volatility dynamics during low price periods and their respective drivers, including policy shocks, remain empirically undetermined. Notwithstanding that there are reasons to assume that the dynamics of policy impacts during times of low prices are much different than during high price periods (Stigler and Prakash 2011; Tangermann 2011a).

This paper aims at evaluating the effect of the variable import levy for corn of the EU on corn price stability. It adds to the existing literature by specifically addressing one prominent insulating policy, namely the EU import levy, and quantifying its effects on domestic price volatility as well as how they affect foreign markets. To that end, Argentina, being a major stakeholder in the international corn market, is subject of the analysis . In additional contrast to recent studies, the analysis does not merely look at short run policies during specific events such as the food price crisis in 2007 and 2008. Instead, it analyzes a long term policy over a long time horizon and controls for short term export restrictive policy measures. In the following section an overview of the global corn market and theoretical considerations on the mechanisms of import policies and the effect on prices is provided. Section 3 derives the chosen empirical approach while section 4 describes the used dataset and the empirical specifications. Section 5 depicts the results of the application. Section 6 and 7 eventually derive policy implications and a brief conclusion.

2 Background

Corn ranks amonng the most traded agricultural commodities (USDA FAS 2018). The EU is a large producer and consumer of corn. The five years average of yearly domestic production (marketing year (MY) 2013/14 to 2017/18) is around 65 mln tons of corn whereas the consumption level is at 76 mln tons which reveals a great dependency on international markets. In the period of consideration the EU is the largest importer of corn with average imports of 15 mln tons per marketing year (MY). The relevance of imports for domestic consumption grew over the last decades. While imports of corn were below 3 mln tons in MY 2002/03 they reached some 18 mln tons in MY 2017/18. The biggest producer of corn in the EU is France, which exports significant amounts to other EU countries while Spain is the biggest importer of EU corn. The major worldwide exporter of corn is the US with average yearly exports of 53 mln tons in the considered period, followed by Brazil (25 mln tonnes), Argentina (21 mln tonnes) and the Ukraine (19 mln tonnes)(USDA FAS 2018). Given the relative importance of the EU as an importer of corn, it is likely that they play a critical role in international price formation processes.

The Uruguay Round Agreement on Agriculture (URAA) of the World Trade Organisation (WTO) established a more market-oriented trading regime for agricultural and food commodities (Josling and Tangermann 1999) and encouraged the EU to implement several reforms of the CAP: The agricultural trade regime of the EU was subject to a continuous liberalization process towards greater market orientation and less market distortion. As a result, many of the distortive price insulation mechanisms have been abolished or transformed into fixed ad valorem tariffs for numerous commodities (Josling 1998). A fixed ad valorem tariff is less distortive than a variable tariff or levy because an ad valorem tariff allows price signals to be transmitted across markets and leaves relative prices unchanged (Martin 2018; Newton 2016; Thompson, Herrmann and Gohout 2000). As a consequence of the Blair House Agreement in 1992[1], the EU was allowed to protect producers from low prices on international markets and to ensure a minimum import price. According to the agreement, the price for importing major cereals to the EU should not fall below 155 percent of the corresponding intervention price. To ensure the minimum import price, the EU implemented a variable import levy which compensates for the difference between the reference price and the minimum import price. For corn, the level of the levy is determined on the basis of the sum of the US corn price (Central Illinois, CME), a premium, and

[1] An accord between the EU and the US in view of the faltering WTO negotiations of the Uruguay Round which became part of the URAA.

shipping costs to Rotterdam. The levy is triggered automatically on a biweekly basis if the ten-days average of the reference price is below the determined threshold. A price floor is established to domestic prices which supports corn producers in the EU. However, since the EU is a large importer of corn, the price insulation is likely to affect price formation not only in the domestic markets but also on international markets (Martin 2018; Thompson et al. 2000; Josling 1998).

The effect of causing instability on international markets and of amplifying price responses to exogenous shocks is an important argument against domestic price insulation policies (Martin 2018; Pinstrup-Andersen 2013; Tangermann 2011b; Tangermann 2011a; Martin and Anderson 2011; Tyers and Anderson 1992; Sampson and Snape 1980). Many authors refer to the effect of "exporting" volatility: For economically large countries the policies are suspected to destabilize international markets. Martin and Anderson (2011) provide a theoretical framework to explain the effect of domestic price insulation policies on international markets and prices. The authors assume an exogenous shock which results in a *rise* of international prices. However, high income countries usually protect their producers rather than consumers (e.g. Anderson and Nelgen 2012b). In light of that, an exogenous shock that results in a *plunge* of international prices is more suitable to explain the effect of domestic price insulation in high income economies.

As a response to a negative price shock, the government imposes a policy, such as a quota, a tariff or a ban to impede price transmission from international to domestic markets. The policy raises the domestic price, relative to the decreased international price. Compared to the initial signal from the international market, the trade policy incentivizes producers to produce more and consumers to demand less. In the case of an economically large importer[2] the domestic policy exerts pressure on international markets which amplifies the price response to the initial shock. The rest of the world faces an even lower price level compared to that of a situation without the trade policy.

Most importantly, the policy produces a collective-action problem. Import restrictive measures encourage net-exporting countries to impose counteractive policies to offset price dumping effects. If many countries would intervene to the exact same extent, the policies would offset each other. Domestic prices in the intervening countries remain at the pre-policy level but prices for the rest of the world decrease further (Martin and Anderson 2011; Sharma 2011; Feenstra and Taylor 2017; Tyers and Anderson 1992). In fact, it is very unlikely that all countries intervene to the exact same extent. The disparity reduces international trade and thereby erodes the buffering effect of trade to domestic or regional supply and demand shocks. As a consequence, price responses of international markets to exogenous shocks are amplified. Estimates from Tyers and Anderson (1992) for example, show that trade restrictive policies in high income countries before the URAA lowered international trade volumes by 7 percent for coarse grains and by 26 percent for rice. The thinning of international markets makes markets more vulnerable to external shocks and contributes to an increase of price volatility (Anderson and Nelgen 2012b; Pinstrup-Andersen 2013; Rude and An 2015; Tangermann 2011a; Tothova 2011).

While food price volatility is rarely noticeable to consumers in developed countries, the effects on market stakeholders in developing economies are far more critical. In contrast to price levels, for which shocks are usually beneficial for either the producer or the consumer (Swinnen and Squicciarini 2012), excessive and frequent price fluctuations equally impose a threat to both producers and consumers. For producers, food price volatility generates economic uncertainty and impedes their long term investments and production decisions which, in turn, can decrease production quantities. It increases the costs of managing the associated price risks (Tadesse et al. 2014; Hajkowicz et al. 2012; Tothova 2011). Simultaneously, consumers in low income settings, who typically spend a large share of their income on food, are put at risk of experiencing sudden and unexpected hardship. Food price volatility hampers their long term budget strategies and threatens the reduction of poverty. Thereby it aggravates the achievement of the Sustainable Development Goals one (no poverty) and two (zero hunger) of the United Nations (Martin 2017; Hajkowicz et al. 2012).

[2] which can be either a single large importer or a group of net-importing countries

3 Methodology

Generalized Autoregressive Conditional Heteroscedasticity (GARCH) processes introduced by Engle (1982) and Bollerslev (1986) are commonly used for describing the conditional variance of the residuals of some mean process. In order to examine the effects of the variable import levy on price volatility, we apply univariate GARCH models with an additional exogenous variable (GARCH-X). Agricultural commodity prices often exhibit asymmetry in that positive price shocks generate higher volatility than negative shocks (Stigler and Prakash 2011; Tangermann 2011a). To account for potential asymmetry in price volatility GARCH models are inadequate and we estimate an exponential GARCH-X (EGARCH-X) model. The underlying mean process of the GARCH estimation is estimated as a vector error correction model (VECM).

As given by Engle and Granger (1987), two trending time series p_{1t} and p_{2t} that are integrated of order 1 can be examined for the existence of a long run equilibrium. To account also for short run dynamics they can be represented as a VECM in the following form:

$$\begin{pmatrix} \Delta p_{1t} \\ \Delta p_{2t} \end{pmatrix} = \begin{pmatrix} \mathrm{a}_1 \\ \mathrm{a}_2 \end{pmatrix} (p_{1t-1} - \mathrm{b}_0 - \mathrm{b}_1 p_{2t-1}) + \sum_{i=1}^{k} \mathrm{G}_i \begin{pmatrix} \Delta p_{1t-i} \\ \Delta p_{2t-i} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \qquad (1)$$

$$\varepsilon_t | \Omega_{t-1} \sim N(0, h_t^2),$$
$$t = 1, ..., T$$

where b_1 represents the cointegrating parameter of the long run equilibrium while the lagged deviations from the equilibrium are given by $p_{1t-1} - \mathrm{b}_0 - \mathrm{b}_1 p_{2t-1}$. In case of cointegrated variables, the residuals derived from the long run equation are stationary. The error correction parameters a_1 and a_2 are interpreted as the speed to which prices adjust towards the long run equilibrium, while the parameters in matrix G measure short run effects. The residuals of the whole VECM must be stationary and are represented by ε_t. The variance h_t^2 of the residuals is conditional on information Ω at $t-1$, and is interpreted as a measure of volatility (Enders 2015; Rapsomanikis 2011). The residuals ε_t are used for the estimation of the GARCH model as given in equation 3.

A GARCH-X$(1,1)$, which usually represents the best dimensional choice (Hansen and Lunde 2005) can be written as

$$h_t^2 = \omega + \lambda x_t + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \qquad (2)$$

I whereas the EGARCH-X$(1,1)$ introduced by Nelson (1991) additionally allows for asymmetry in the effect of previous shocks on volatility and can be expressed as:

$$log(h_t^2) = \omega + \lambda x_t + \alpha \left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}^2}} \right| + \gamma \left(\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}^2}} \right) + \beta log(h_{t-1}^2) \qquad (3)$$

The effect of the sign of the shocks on volatility is captured by γ. For $\gamma < 0$ a leverage is present, that is negative shocks have a greater effect on volatility than positive shocks. However, for storable goods, such as agricultural commodities we assume an inverse leverage and $\gamma > 0$ because positive shocks usually decrease stocks and markets become more vulnerable. In contrast, negative shocks are usually related to increased stocks which can act as a buffer for price shocks and thus for volatility (Stigler and Prakash 2011). The coefficient α captures the magnitude effect and measures the effect of a shock on volatility regardless of it's direction. The degree of persistency of volatility is measured by β and has to be smaller than one to fulfill the stationarity condition, λ captures the effect of an exogenous variable x on the volatility.

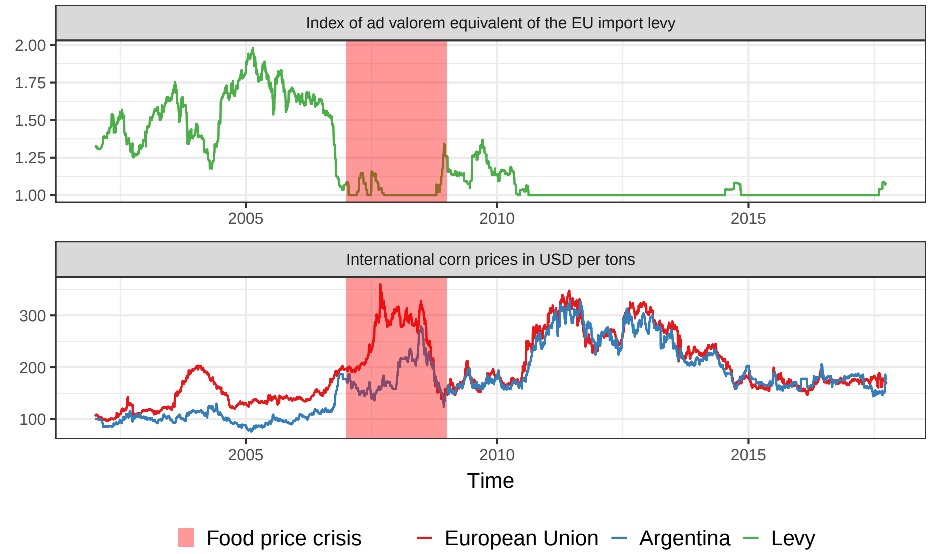

Figure 1: International corn prices and variable EU import levy

4 Data and Model Specifications

For the analysis we use daily spot prices from January 2002 until September 2017 which sum up to a total number of 3895 observations. The price in the EU p_t^{EU} is represented by the French (Bordeaux) price while the Argentinean price p_t^{ARG} is quoted as a free on board (fob) export price. Both price series are retrieved from Datastream (2018) and converted into USD per metric tonne. Figure 1 shows the two price series in question. Usually, the EU price is higher than the Argentinean price series. Particularly in times of low price levels before the beginning of the food price crisis in 2007/2008 - when the levy was above zero - the price gap is substantial. During the second half of the period the price difference is rather small and periods of an active levy are less frequent.

In order to evaluate the effect of the import levy we look at the ad valorem equivalent of the EU import levy L^{av} given at time point t. The levy was retrieved from from the TARIC database (European Commission 2018). It accounts for corn (other than seeds) imported by land, inland waterway or sea or imported by air, and is provided in EURO per tonne. Because the protective effect of a fixed levy depends on the price level, the levy was transformed to an index of the ad valorem equivalent. Even with an constant levy the ad valorem equivalent and its potential effects on price stability change with fluctuations in the price level (Martin 2018). The ad valorem equivalent is calculated as

$$L_t^{av} = \frac{L_t^{abs} * s_t}{p_t^{ARG}} + 1 \tag{4}$$

where L_t^{abs} is the levy in Euro per metric tonne and s_t is the exchange rate in EURO per USD at time t. Given that the variance of prices is not the instigator of the levy, the endogeneity of the policy is remedied.

As shown in table 1 both price series are distributed similarly around means of 197 USD and 173 USD for the EU and Argentina, respectively, with an equal standard deviation of 62 USD. The index of the levy ranges between 1 (no Levy, ad valorem equivalent is 0%) and 1.98 (the ad valorem equivalent of the tariff is 98%). In the following analysis both prices are expressed in logarithms.

Table 1: Summary statistics of corn price (USD per ton) and ad valorem equivalent of import levy

Statistic	Mean	St. Dev.	Min	Max
European Union	197	62	96	360
Argentina	173	62	76	328
Import Levy (in %)	119	27	100	198

N = 3895
For illustrative reasons L_t^{av} has been multiplied by 100

4.1 Order of integration

The mere visual inspection of the price series already leads to the presumption of non mean reversion of the two price series. Standard Augmented Dickey Fuller (ADF) (Dickey and Fuller 1979) and Phillips-Perron (PP) test routines (Phillips and Perron 1988) are employed on both time series to determine their order of integration. Table 2 depicts the test statistics under no trend and trend impositions. In both cases the hypothesis of unit root can not be rejected in levels with and without trend. Applying the same routine to the data in first differences, we find strong evidence for mean reversion under both no trend as well as trend conditions. Given these test statistics, we conclude that both series are integrated of order 1.

Table 2: Univariate order of integration tests

	ADF				PP			
	Without Trend		With Trend		Without Trend		With Trend	
	Level	1st Diff	Level	1st Diff	Level	1st Diff	Level	1st Diff
European Union	0.33	-45.63	-1.73	-45.64	-6.73	-4320.44	-6.36	-4316.77
Argentina	0.42	-41.18	-1.75	-41.18	-5.30	-3898.38	-7.52	-3897.41

4.2 Cointegration and stability testing

Considering the time period under examination three particular factors should to be taken into consideration regarding the relationship of the two variables: (i) the costs of trade (i.e. shipping costs) which have fluctuated substantially and thereby altering the price relationships momentarily, (ii) the presence of the EU import levy and, (iii) potential structural breaks in the cointegrating relationships of the prices, mainly caused by the food price crisis (e.g. Headey 2011). The former two can be accounted for quite easily by introducing the development of the costs of shipping dry bulk commodities using the Baltic Dry Index (BDI) (e.g. Lin and Sim 2013) as well as the ad valorem equivalent of the levy as specified in equation 4 to the equation of the long rung relationship. The structural break, however, is more not as straightforward to determine. Global price surges of 2007/2008 commodity price relationships have been shown to be altered substantially (Headey 2011). Intuition alone would place a structural break in the cointegration relationship towards the price hikes experienced from 2007 to 2009. Given that not only food prices have risen during this period, also a variety of short run policy measures implemented by important market participants may have led to fundamental changes in international corn price relationships. For instance, Argentina had implemented short run policy measures such as export prohibitions or quotas within this period. Additionally, both import and export policy measures of other countries are likely to have influenced the price dynamics within this period. To control for these short run policy effects of the food price crisis, we include a dummy controlling for shifts in the short run dynamics of the VECM in 2007 and 2008 (D^{FPC}). To formally allow for a structural change that might have occurred in the long run relationship the test procedure proposed by Gregory and Hansen (1996) is applied to assess the statistical significance of these events for the cointegrating relationship. The residual based test for cointegration allows to specifically test for cointegration under a supposed shift in the

Table 3: Gregory-Hansen test for structural breaks in cointegration relationship

Type	Statistic	Breakpoint
ADF^*	-6.2144	2008-04-22
Z_t^*	-6.4661	2008-01-23
Z_α^*	-82.3361	2008-01-23

level of the relationship:

$$p_t^{EU} = \mathrm{b}_0 + \mathrm{b}_1 p_t^{ARG} + \mathrm{b}_2 D_t^\tau + \mathrm{b}_3 \mathrm{BDI}_t + \mathrm{b}_4 L_t^{av} + \mu_t. \tag{5}$$

Here, τ denotes the hypothesized structural break which determines the dummy variable D. The parameters b_0 to b_4 are to be estimated. Following Gregory and Hansen (1996), the presence of a structural break is determined by means of testing for the stationarity of the error term μ, which can be carried out based on the the conventional ADF as well as the Z_α and Z_t (Phillips 1987) test statistics[3].

The test equations however require τ to be known *a priori*. Estimating the model recursively allows to determine the most likely breakpoint by minimizing the respective test statistics. Narayan (2005) for instance choose a time window of $0.15T \leq \tau \leq 0.85T$ to test each observation for a potential structural break. This procedure not only narrows down the most likely shift in the cointegration relationship of the prices, but furthermore it remedies the risk of omitting some significant structural break at another point in time, serving as an additional robustness check. The results of the Gregory-Hansen test are depicted in table 3.

5 Empirical Results

We estimate the VECM of the European and Argentinean price series including 12 lags in accordance with the Akaike-Information-Criteria. In the short run equation of the model we include the crisis dummy D^{FPC} to capture trade policies during the food price crisis. In the long run dynamics we control for fluctuations in the shipping costs and the import levy, and allow for a single structural break in the constant using a dummy variable D^τ for the break date $\tau =$ January 23, 2008. The final VECM hence is given as:

$$\begin{aligned} \begin{pmatrix} \Delta p_t^{EU} \\ \Delta p_t^{ARG} \end{pmatrix} &= \begin{pmatrix} \mathrm{a}_1 \\ \mathrm{a}_2 \end{pmatrix} (p_{t-1}^{EU} - \mathrm{b}_0 - \mathrm{b}_1 p_{t-1}^{ARG} - \mathrm{b}_2 D^\tau - \mathrm{b}_3 \mathrm{BDI}_t - \mathrm{b}_4 L_t^{av}) \\ &\quad + \sum_{i=1}^{12} \mathrm{G}_i \begin{pmatrix} \Delta p_{t-i}^{EU} \\ \Delta p_{t-i}^{ARG} \end{pmatrix} + \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} D^{\mathrm{FPC}} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \end{aligned} \tag{6}$$

The resulting coefficients of the cointegrating relationship are depicted in table 4. Most notably, the coefficient of p^{ARG} is very close to unity suggesting that the markets are perfectly integrated in the long run. Furthermore, trade costs and import levy contribute to the price gap with expected sign and reasonable size. The regime shift in the constant is negative, supporting the visual suspicion from figure 1 that prices move closer together after the structural change. With regard to the short run dynamics, the speed of adjustment differs substantially between the European and Argentinean prices. On average, the EU price corrected only 0.57 % of the divergence from its long run equilibrium with the Argentinean corn price per day. In contrast, Argentinean corn price corrected on average 1.32 % of the deviations per day. While tests on the residuals ε_t in levels indicate no autocorrelation, the squared residuals exhibit substantial degrees of serial correlation. Therefore, application of GARCH models are appropriate in order to describe the volatility.

[3] $ADF^* = \inf_{\tau \in T} ADF(\tau), \quad Z_\alpha^* = \inf_{\tau \in T} Z_\alpha(\tau), \quad Z_t^* = \inf_{\tau \in T} Z_t(\tau)$

Table 4: Long run dynamics of equation 6

	p^{EU}
Intercept	-0.6655^{***}
	(0.0568)
p^{ARG}	1.0146^{***}
	(0.0096)
L^{av}	0.0596^{***}
	(0.0120)
BDI	0.1032^{***}
	(0.0025)
D^{τ}	-0.1762^{***}
	(0.0065)

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 5: EGARCH-X Results

	European Union	Argentina
ω	-0.2601^{***}	-0.0900^{***}
	(0.0141)	(0.0134)
α	0.1805^{***}	0.4130^{***}
	(0.0237)	(0.0630)
β	0.9651^{***}	0.9895^{***}
	(0.0007)	(0.0008)
γ	0.0094	-0.0791^{***}
	(0.0140)	(0.0266)
λ	-0.0275^{***}	0.0258^{***}
	(0.0103)	(0.0094)
Shape	3.2779^{***}	2.0383^{***}
	(0.2139)	(0.0018)
Skew	1.0201^{***}	1.0172^{***}
	(0.0180)	(0.0090)

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

The coefficients of the EGARCH-X model are depicted in table 5. In both series β is close to 1 which indicates that volatility is persistent and highly dependent on its own lags. The magnitude effect α is positive significant, suggesting that the absolute size of new shocks effects volatility positively. With regard to the sign effect γ, we find asymmetry to be statistically significant only for the Argentinean price series where negative shocks have a greater effect on volatility than positive shocks. This stands in contrast to the findings of Stigler and Prakash (2011) for storable agricultural commodities or Zheng, Kinnucan and Thompson (2008) for food items, where positive price shocks tend to destabilize markets more than negative ones. A possible explanation could be the effect of the price insulation policy in the EU in a falling market, which cuts off the downward price risk in the EU at a certain point and in turn amplifies the price responses in the Argentinean market to the shock.

Most importantly we find the effect of the import levy λ to be significantly negative for the EU and significantly positive for Argentina. Import levies reduce corn price volatility in the EU and simultaneously contributes to increases in the corn price volatility of Argentinean exports. This confirms the hypothesis that price insulation cannot prevent price instability but shifts it from one country to another. In other words, granting support to European corn producers by providing a price floor and cutting off the price risk at the lower end comes at the cost of exposing Argentinean corn exporters to higher levels of price volatility. Additionally, the magnitude of these effects is nearly the same. A rise of the ad valorem equivalent of the import levy by one standard deviation, is expected to decreases the daily volatility in the European corn price by 0.73% while the daily price volatility in the Argentinean corn price is supposed to increase by 0.71%.

6 Policy Implications

Price volatility of agricultural and food commodities is a threat to all market stakeholders. It endangers the achievement of the Sustainable Development Goals and remains an predominant item on national and international agendas (Hajkowicz et al. 2012). The G20 agricultural ministers have highlighted the importance of international trade and well functioning markets for the improvement of food price volatility and food security. Trade distortive policies were recognized as obstructions to international trade and food price stability, and hence as a target of necessary reductions (G20 2011). This would mean the eradication of any domestic price insulation mechanisms, including the variable import levy of the EU.

To that end, the WTO already provides a framework on limiting price insulation policies through the URAA. According to Article 4.2 of the Agreement, the implementation of variable import levies is prohibited. The preservation of the variable EU import levy for cereals is an exception which the EU representatives negotiated with the US government to settle their differences during the Uruguay Round. A number of governments have subsequently called out the Blair House Agreement to weaken the Draft Final Act of the URAA (Group of Rio 1993). Nevertheless, since the options were either the acceptance of the entire Blair House Agreement or a failure of the Uruguay Round, all WTO members finally accepted it. However, the results of this paper show, that introducing exceptions to the prohibition of variable import levies comes at the cost of increasing international price instability. Import levies affect export price volatility of large exporters, and thereby are likely to further transmit into domestic markets of importing countries. The extent of which remains to be examined precisely in future research. In order to improve international food price stability, price insulating policies with a “beggar-thy-neighbor” nature should be consequently abolished.

With regard to the justification of the tariffs in the EU, the objectives of the CAP are formulated in Article 39 of the Treaty on the Functioning of the EU. Among other objectives, the CAP shall stabilize markets. Market stabilization can be viewed as a justification for domestic price insulation. But it neglects the fact that price movements coming from international markets, which reflect changes in supply and demand fundamentals, are important signals for domestic market participants to adjust supply and demand accordingly. Hence, prices should be allowed to transmit across markets when implementing policies that aim at stabilizing prices, domestic markets or income. This allows trade to act as an important buffer for domestic or regional supply and demand shocks which can be absorbed by international markets. The empirical findings of this study show that insulating domestic prices during periods of low prices decreases domestic price instability but concurrently contributes to price instability in other countries. Market stability, interpreted as an integrated market, which makes use of the buffering effect of international trade and thereby creates market stability in a global context, is not ensured.

The implications of the findings are not only relevant for politicians in the EU. Policymakers around the globe should consider destabilizing effects of any sort of trade reducing policies, especially in times when import tariffs and trade wars regain popularity. Instead of granting producer support by restricting trade and fixing price levels, concerns of increased price volatility for producers should better be addressed by supporting tools to manage price related risk or directly grant non-distortive income support. However, according to Anderson and Nelgen (2012b) most of the policies that aim at stabilizing the income of producers from negative price shocks actually occur at the border in terms of price support instead of granting direct income support. Policymakers in developed economies should take into consideration that this type of producer support is only beneficial for a comparable small group of stakeholders (farmers) while it comes at the costs of exposing a relatively large group of domestic consumers to a higher domestic price level. Foreign market participants are exposed to a higher level of price instability. In contrast, safety-nets during high price periods, which have been observed for example during the food price crisis (e.g. Götz, Glauben and Brümmer 2013), have a large group of beneficiaries (domestic consumers) which can be justified at least in countries with a large group of poor consumers (Tangermann 2011b).

Even if the import levy equals zero, which has been the case for quite some years, the existence of the mechanism can already have a trade reducing effect. Namely, the closer the reference price moves to the threshold price the introduction of the levy becomes increasingly likely. Consequently, the margin for trading corn to the EU could shrink substantially and trading corn on a profitable level becomes riskier. Thus, at least under a certain degree of risk aversion, traded volumes can already decrease which makes markets more vulnerable to supply or demand shocks and produces price instability.

7 Concluding Remarks

Price instability is an inherent feature of agricultural markets. Previous studies have identified several factors which contribute to price volatility including trade restrictive policies. Despite achievements from past CAP reforms and trade liberalization from the URAA, the EU still operates a variable import levy to maintain a minimum import price for grains which has been legitimized through the Blair House Agreement.

Domestic price insulation such as the variable EU import levy is expected to amplify price shocks on intentional markets. With the EU being an economically large importer, the policy is likely to destabilize international markets. In this paper we have analyzed the effect of the variable import levy on corn price volatility in the EU as well as for Argentinean exports. The contribution of this paper is to provide empirical evidence that this specific price insulation policy exports volatility, which is often mentioned in the literature but, to our knowledge, has rarely been addressed empirically. Most importantly, we quantify the effect of the price insulating policy on price volatility.

Most importantly we find an effect of the variable import levy on corn price volatility in both countries. The levy has a negative effect on domestic corn price volatility, implying the levy stabilizes European corn prices. Concurrently the domestic price stabilization in the EU contributes to corn price volatility in Argentinean export prices to the same extent and thereby is likely to affect prices of other importers as well. Additionally, we find an asymmetry in the Argentinean price volatility suggesting that on average, negative shocks have a greater effect on volatility than positive shocks. This stands in contrast to the findings of Stigler and Prakash (2011) but is in line with our expectations regarding the price insulation policy of the EU: negative shocks are amplified by the price insulation policy while positive shocks can be fully transmitted across the markets. These findings highlight the importance of enforcing the prohibition of variable import levies and eliminating all kinds of price insulation mechanisms as already requested by the WTO and affirmed by the G20 agricultural ministers. To ensure food price stability all exceptions should be eliminated.

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