

Short Communication

On perishability and Vertical Price Transmission: empirical evidences from Italy

FABIO GAETANO SANTERAMO^{1,*}, STEPHAN VON CRAMON-TAUBADEL²

¹ Department of Agricultural, Food and Environmental Sciences, Università di Foggia, Italy

² Department of Agricultural Economics and Rural Development, Georg-August-Universität Göttingen, Germany

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Abstract. Studies on the causes for asymmetries in vertical price transmission date back to decades ago, but the attention of theorists and empirical economists is still vivid. In particular the role of perishability is not fully defined. We investigate the vertical price transmission for a heterogeneous group of fruits and vegetables that differ for their degree of perishability. The error correction model we estimate allows to conclude that asymmetries in vertical price transmission tend to vanish for perishable products.

Keywords. Asymmetries, AVECM, fruits and vegetables, perishability, Vertical Price Transmission

JEL code. Q11, Q13, C32, D40

1. Introduction

The interest in price transmission, and the number of studies focused on these topics, have rapidly increased during last decades (e.g. Griffith and Piggott, 1994; Benson *et al.*, 2008; Santeramo, 2010; Cioffi *et al.*, 2011; Santeramo and Cioffi, 2012a; Santeramo and Cioffi, 2012b; Abdelradi and Serra, 2015; Kinnucan and Zhang, 2015; Santeramo, 2015; Garcia-German *et al.*, 2016): the implications they have on agricultural markets, industrial strategies, producer and consumer welfare are strong. Studies on vertical price transmission (VPT) have preeminently addressed four topics (Vavra and Goodwin, 2005): the magnitude of price shocks transmission along the supply chain, the speed of transmission, the nature of price transmission in term of symmetry and asymmetries, and the direction of transmission (*i.e.* whether a shock is transmitted upwards or downwards). Asymmetries in VPT may be due to imperfect competition (*i.e.* market power), adjustment costs, inventory management, political interventions, or asymmetric information (Meyer and von Cra-

*Corresponding author: fabiogaetano.santeramo@gmail.com

mon-Taubadel, 2004). A vast majority of studies (and scholars) have analyzed the effects of imperfect competition on VPT (e.g. McCorrison *et al.*, 1998; McCorrison *et al.*, 2001; Bunte and Peerlings, 2003; Lloyd *et al.*, 2006; Tekgüç, 2013; Assefa *et al.*, 2014); the other possible explanations for asymmetries remain quite underinvestigated (few exceptions are Saghalian, 2007; Abbassi *et al.*, 2012; Santeramo, 2015).

We depart from previous studies by focusing on the role of adjustments costs and in particular on the role of perishability on VPT. We use monthly prices of ten products that differ for their degree of perishability. Apart from reviewing the current knowledge on VPT our main contribution is to provide empirical evidence on how perishability and asymmetries are related.

2. What causes Asymmetries in vertical price transmission?

Asymmetric VPT (AVPT) has been motivated in several ways: market power, adjustment costs, inventory management, government interventions, asymmetric information, perishability.

McCorrison *et al.* (1998, 2001) and Lloyd *et al.* (2006) link market power and imperfect VPT. Bailey and Brorsen (1989) point out that there is not an *a priori* explanation on whether market power leads to positive or negative asymmetry. A vast majority of authors (e.g. Boyd and Brorsen, 1988; Karrenbrock, 1991; Appel, 1992; Griffith and Piggott, 1994; Mohanty *et al.*, 1995) suggest that market power can lead to asymmetric transmission, most predicting a positive asymmetric price transmission¹. Peltzman (2000) shows that positive asymmetric price transmission is detected in both concentrated and atomistic markets², while Tappata (2009) derives a model of asymmetric price transmission in highly competitive markets.

Another major explanation for asymmetric price transmission (AVPT) is provided by asymmetric adjustment costs³ arising when firms change the quantities and/or prices of inputs and/or outputs. Bailey and Brorsen (1989) and Peltzman (2000) argue that positive AVPT is consistent with the easiness for firms facing output reduction to disemploy inputs rather than to recruit new inputs in order to increase output. On the contrary, Ward (1982) suggests that AVPT is plausible in markets of perishable products in that retailers might hesitate to raise prices for fear of reduced sales leading to spoilage. Heien (1980) argues that changing prices is less of a problem for perishable products as their prices are more dynamics.

Inventory management determines how firms adjust to exogenous shocks and thus may lead to AVPT (Balke *et al.*, 1998). Blinder (1982) argues that inventory management leads to positive AVPT: in periods of low demand firms will adjust the quantity produced and increase inventory rather than decrease output prices, increasing prices during periods of high demand (Reagan and Weitzman, 1982).

¹ According to Meyer and von Cramon-Taubadel (2004), positive price transmission mean that prices react more to price rises than to price falls.

² The results by Peltzman (2000) on positive asymmetric price transmission are confirmed by several applied studies in agricultural sectors: pork (Abdulai, 2002; Gervais, 2011); vegetables (Brooker *et al.*, 1997); fruits (Pick *et al.*, 1990), among others.

³ The adjustment costs are defined as costs associated with changing retail prices and subsequently adapting retail logistics, wholesale costs and sales (e.g. advertisement and relabeling costs, storage and volume discounts, etc.).

Gardner (1975) explains the asymmetries in farm-to-retail price dynamics focusing on the role of government interventions to support producer prices. Kinnucan and Forker (1987), and Serra and Goodwin (2003) provide some evidence for dairy products in support of Gardner’s thesis.

Kinnucan and Forker (1987) and von Cramon-Taubadel (1998) predict a stronger impact of retail-level demand shifts than of farm-level supply shifts on the farm-retail price spread. According to Kinnucan and Forker (1987) the different impacts imply AVPT, while Von Cramon-Taubadel (1998) underlines that only if one type of shift is predominantly positive or negative AVPT will arise.

Bailey and Brorsen (1989) conclude on the role of asymmetric information in determining AVPT and point out that asymmetries in price series data can result from a distorted price reporting process.

As for perishability, contradictory theories have been proposed. Ward (1982) suggests that in perishable goods markets price decreases are likely to be fully passed on to the retail and producer level sectors while price increases are partially transmitted. Girapunthong *et al.* (2003) confirm Ward’s theory for fresh tomatoes markets: wholesale prices react more to falling producer prices than to rising producer prices. Heien (1980) argues that changing prices is less of a problem for perishable products than it is for those with a long shelf life. Sexton *et al.* (2003) suggest that price rises are faster transmitted than price falls which can be avoided by retailers able to exert market power on wholesalers. The empirical literature provides mixed results (Table 1).

3. Perishability and Vertical Price Transmission

In order to understand the role played by perishability on AVPT we proceed in two steps. First (LHS of equation 1) we ask ourselves if price changes at different levels of the supply chain of perishable products (e.g. producer ΔP^1 and wholesaler prices ΔP^2 , or wholesaler ΔP^1 and retailer prices ΔP^2 *etc.*) react differently to positive ΔP^1_+ and negative ΔP^1_- price changes. Second (RHS of equation 1), we observe how the degree of perishability (i.e. the expected losses for spoilage) is related with AVPT:

$$0 \neq E \left[\frac{\Delta P^2}{\Delta P^1_+} - \frac{\Delta P^2}{\Delta P^1_-} \right] = f(Per.) \quad (Perishability \text{ and AVPT}) \tag{1}$$

We do not have *a priori* expectations: Heien (1980) argues that changing prices is less of a problem for perishable products than it is for those with a long shelf life, because for the latter changing prices incurs higher time costs and losses of goodwill; on the contrary Ward (1982) hypothesizes that retailers selling perishable goods might be reluctant to raise prices in line with an increase in farm-level prices given the risk that they will be left with unsold spoiled product.

We have extracted monthly prices (at wholesale level, and representative of national prices) for 29 products from the ISMEA Osservatorio Prezzi Ortofrutta database: 14 fresh vegetables (artichokes, carrots, cauliflowers, onions, green beans, fennel, radishes, lettuces, eggplants, potatoes, peppers, tomatoes, spinaches and zucchinis), and 15 fresh

Table 1. Major findings in applied analyses of Vertical Price Transmission in perishable markets

Author	Journal	Year	Product	Frequency	Results
Aguiar & Santana	Agribusiness	2002	Tomatoes	Monthly	Positive Asymmetry
Bakucs, <i>et al.</i>	Studies in Agricultural Economics	2007	Onions	"	Symmetry
			Potatoes	Monthly	Symmetry
			Carrots	"	Symmetry
			Parsley	"	Symmetry
			Tomatoes	"	Positive Asymmetry
Bernard & Willett	Journal of Agricultural and Applied Economics	1996	Peppers	"	Symmetry
			Broiler	Monthly	Negative Asymmetry
Bernard & Willett	Applied Economics Letters	1998	Broiler	Weekly	Symmetry
Brooker <i>et al.</i>	Journal of Food Distribution Research	1997	Broiler	Monthly	Positive Asymmetry
			Peppers	Weekly	Positive Asymmetry
Hassan & Simioni	Économie Rurale	2004	Tomatoes	Weekly	Negative Asymmetry
			Chicory	"	Negative Asymmetry
Girapunthong <i>et al.</i>	Journal of Food Distribution Research	2003	Tomatoes	Monthly	Asymmetry ^b
			Chicory	Weekly	Symmetry
Hassan & Simioni	Économie Rurale	2004	Tomatoes	"	Symmetry
			Tomatoes	Monthly	Positive Asymmetry
Heien	American Journal of Agricultural Economics	1980	Apples	"	Symmetry
Kuiper & Lansink	Agribusiness	2013	Oranges	"	Negative Asymmetry
			Lettuce	"	Symmetry
			Tomatoes	"	Symmetry
			Broiler	Monthly	Positive Asymmetry
			Apples	Monthly	Symmetry
Pick <i>et al.</i>	Agribusiness	1990	Carrots	"	Symmetry
			Potatoes	"	Symmetry
			Lemons	Weekly	Positive Asymmetry ^c
Powers	Agribusiness	1995	Oranges	"	Positive Asymmetry ^c
			Lettuce	Weekly	Positive Asymmetry

Author	Journal	Year	Product	Frequency	Results
Schertz Willet <i>et al.</i>	Agribusiness	1997	Apples	Monthly	Positive Asymmetry
Ward	American Journal of Agricultural Economics	1982	Carrots	Monthly	Symmetry
			Celery	"	Negative Asymmetry
			Cabbage	"	Negative Asymmetry
			Cucumbers	"	Symmetry
			Peppers	"	Negative Asymmetry
			Potatoes	"	Negative Asymmetry
			Tomatoes	"	Negative Asymmetry
Worth	Economic Research Service	1999	Carrots	Monthly	Positive Asymmetry
			Celery	"	Symmetry
			Lettuce	"	Symmetry
			Onions	"	Symmetry
			Potatoes	"	Symmetry
			Tomatoes	"	Positive Asymmetry

^a Results on symmetry, positive and negative asymmetry depend on time frequency.

^b Positive asymmetry among wholesaler and retailer prices; Negative asymmetry among wholesaler and producer prices

^c However, over time price changes appear to be symmetric.

fruits (kiwis, apricots, watermelons, oranges, cherries, clementines, strawberries, tangerines, lemons, apples, melons, pears, peaches and nectarines, plums and table grapes)⁴. We observe prices at three stages of the supply chain - origin, wholesale, and retail - from 2001 to 2011: producer prices are collected on more than thirty collection points, representative markets for volume of production and geographical position; wholesaler prices are collected by Fedagromercati on the main wholesaler markets; retail prices are based on sales from surveys on domestic purchases of Italian families. We selected products in order to include heterogeneous products according to their perishability, avoiding price series with discontinuities and several missing values⁵. The final dataset consists of three *low perishable* vegetables - carrots, potatoes and peppers - four *medium perishable* vegetables - tomatoes, cauliflowers, radishes, eggplants⁶, and three *low perishable* fruits - lemons, apples and pears.

In line with several scholars (Griffith and Piggott, 1994; Powers, 1995; Brooker *et al.*, 1997; and Worth, 1999; Girapunthong *et al.*, 2003; Sexton *et al.*, 2003), we assume that producer prices lead wholesale prices, and wholesale prices lead retail prices. We estimated an unrestricted error correction model (von Cramon-Taubadel, 1998; Peltzman, 2000) which allows to capture asymmetries, and long-run and short-run adjustments, and to control for seasonality:

$$\Delta P_t^i = \gamma_0 + \gamma_T T + \gamma_1 \Delta P_{t-1}^i + \gamma_2 \Delta P_{t-1}^j + \alpha^+ ECT_{t-1}^+ + \alpha^- ECT_{t-1}^- + \varepsilon_t \quad (2)$$

$$\text{and } ECT_{t-1} = P_{t-1}^i - \beta_0 - \beta_1 P_{t-1}^j \quad (3)$$

$\Delta P_t^i = P_t^i - P_{t-1}^i$ the apexes i and j represent the supply chain level (origin, wholesale or retail), ECT the error correction term, $T = 11, \dots, 12$ controls for α^+ and α^- adjustment coefficients) are statistically different the price transmission is asymmetric.

We test for unit-roots using augmented Dickey-Fuller (Dickey and Fuller, 1981), Philips-Perron (Perron, 1988), and Zivot-Andrews (Zivot and Andrews, 1992) tests. All series are stationary in level or in their first difference (Table 2).

The estimates of the error correction models (Tables 3 and 4) suggest that prices tend to correct their dynamics and converge towards the equilibrium.

The test for asymmetries (Table 5) is in 17 out of 40 (43%) cases in favor of AVPT. However, asymmetries are found in 16 out of 24 (67%) cases for “low perishable” vegetables and for fruits and only in 1 out of 16 (6%) cases for “medium perishable” vegetables. Our evidence favors several theories and empirical studies: Peltzman (2000) observes weaker evidence of AVPT for perishable products; Ward (1982) argues that sellers of perishable goods might be reluctant to raise prices in line with an increase in farm-level prices given the risk that they will be left with unsold spoiled product; Serra

⁴ Some of these products are characterized by different market cycles and seasonality in production and consumption, therefore prices cannot be observed throughout the entire year.

⁵ In order to avoid bias due to missing values we restricted the analysis to time series for which missing values represent less than 5% of the total sample. The series have been interpolated in order to obtain continuous series.

⁶ Our classification of fruits and vegetables according to their perishability relies on a report from the USDA (2009). We consider medium perishable the vegetables incurring in average losses for spoilage during transportation larger than the 10% of the traded volume, and low perishable those for which spoilage is lower.

Table 2. Unit root tests (p-values for ADF, PP tests and test statistics for ZA test).

	LowerishableVegetables				Medium perishableVegetables				Fruits		
	Carrots	Peppers	Potatoes		Cauliflower	Eggplants	Tomatoes	Radishes	Apples	Lemons	Pears
Producer											
ADF	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.016	<0.01	<0.01
PP	<0.01	<0.01	0.047	<0.01	<0.01	<0.01	<0.01	<0.01	0.044	<0.01	<0.01
ZA	-7.85	-7.54	-4.17	-7.51	-6.97	-7.76	-7.76	-6.63	-4.10	-5.92	-5.88
Wholesaler											
ADF	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.048	<0.01	0.014
PP	<0.01	<0.01	0.013	<0.01	<0.01	<0.01	<0.01	<0.01	0.164	0.015	0.076
ZA	-7.33	-7.47	-4.54	-7.72	-6.88	-7.47	-7.14	-7.14	-3.93	-5.24	-4.30
Retailer											
ADF	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011
PP	<0.01	<0.01	0.471	<0.01	<0.01	<0.01	<0.01	<0.01	0.016	<0.01	0.047
ZA	-5.10	-7.92	-4.14	-8.01	-7.46	-7.34	-7.14	-7.14	-4.91	-5.19	-5.09

The null hypothesis for the ADF and PP tests is unit root. The null hypothesis for the ZA test is stationarity. The number of lags is suggested by Information Criteria.
 ZA critical values 1% = 5.57 , 5% = -5.08 , 10% = -4.82.

Table 3. Estimated ECM model for producer and wholesaler prices.

	LowperishableVegetables				Medium perishableVegetables				Fruits			
	Carrots	Peppers	Potatoes		Cauliflower	Eggplants	Tomatoes	Radishes	Apples	Lemons	Pears	
$P^w = f(P^p)$												
γ_0	0.051 (0.015)	0.114 (0.066)	0.039 (0.012)	0.029 (0.048)	-0.187 (0.079)	-0.044 (0.077)	0.174 (0.137)	0.058 (0.021)	0.056 (0.028)	0.047 (0.024)		
γ_T	-0.006 (0.002)	-0.009 (0.009)	-0.004 (0.001)	-0.005 (0.006)	0.031 (0.010)	0.011 (0.009)	-0.031 (0.015)	-0.004 (0.003)	-0.004 (0.004)	-0.002 (0.003)		
γ_1	0.225 (0.090)	0.151 (0.124)	-0.018 (0.107)	0.515 (0.170)	0.075 (0.140)	0.393 (0.173)	0.027 (0.141)	0.113 (0.098)	0.141 (0.124)	0.026 (0.126)		
γ_2	-0.022 (0.070)	0.220 (0.220)	0.381 (0.133)	-0.721 (0.245)	0.033 (0.186)	-0.272 (0.186)	0.111 (0.208)	-0.038 (0.164)	0.694 (0.341)	0.094 (0.168)		
α^+	-0.524 (0.160)	-0.530 (0.144)	-0.516 (0.138)	-0.935 (0.302)	-0.177 (0.173)	-0.449 (0.314)	-0.276 (0.202)	-0.795 (0.183)	-0.497 (0.162)	-0.491 (0.152)		
α^-	-0.325 (0.205)	-0.161 (0.258)	-0.123 (0.204)	-0.735 (0.346)	-0.142 (0.204)	-0.204 (0.357)	-0.467 (0.334)	0.069 (0.198)	0.108 (0.275)	0.092 (0.169)		
$P^p = f(P^w)$												
γ_0	0.066 (0.021)	0.031 (0.043)	0.027 (0.012)	-0.027 (0.035)	-0.196 (0.059)	-0.106 (0.070)	0.154 (0.096)	0.002 (0.013)	0.008 (0.009)	0.007 (0.019)		
γ_T	-0.007 (0.003)	-0.004 (0.006)	-0.001 (0.001)	-0.002 (0.004)	0.029 (0.007)	0.015 (0.008)	-0.021 (0.011)	0.000 (0.002)	0.000 (0.001)	0.002 (0.002)		
γ_1	0.044 (0.096)	0.002 (0.145)	0.313 (0.135)	-0.430 (0.147)	-0.036 (0.140)	-0.334 (0.170)	-0.028 (0.145)	0.379 (0.100)	0.136 (0.110)	0.398 (0.132)		
γ_2	-0.238 (0.124)	0.063 (0.082)	-0.246 (0.109)	0.267 (0.097)	0.026 (0.105)	0.315 (0.158)	0.067 (0.099)	-0.046 (0.060)	0.097 (0.040)	-0.180 (0.099)		
α^+	-0.087 (0.221)	-0.115 (0.095)	-0.457 (0.140)	0.415 (0.365)	0.156 (0.130)	0.339 (0.287)	0.008 (0.141)	0.108 (0.112)	-0.026 (0.052)	-0.172 (0.119)		
α^-	0.752 (0.284)	-0.101 (0.170)	0.336 (0.207)	-0.812 (0.615)	0.088 (0.153)	0.222 (0.327)	0.127 (0.234)	0.029 (0.121)	0.240 (0.089)	0.112 (0.133)		
Obs.	124	124	124	124	124	124	124	124	124	124	124	

Standard errors in parenthesis.

 P^p and P^w stand for producer and wholesaler price respectively.

Table 4. Estimated ECM model for wholesaler and retailer prices.

	Lowperishable Vegetables				Medium perishable Vegetables				Fruits		
	Carrots	Peppers	Potatoes	Cauliflower	Eggplants	Tomatoes	Radishes	Apples	Lemons	Pears	
$P^r = f(P^w)$											
γ_0	0.068 (0.022)	0.097 (0.079)	0.105 (0.025)	0.087 (0.049)	-0.182 (0.064)	-0.006 (0.063)	0.166 (0.106)	0.064 (0.025)	0.057 (0.030)	0.078 (0.036)	
γ_T	-0.007 (0.002)	-0.001 (0.009)	-0.007 (0.003)	-0.012 (0.006)	0.031 (0.009)	0.012 (0.008)	-0.027 (0.013)	-0.003 (0.003)	-0.003 (0.004)	-0.006 (0.004)	
γ_1	0.128 (0.128)	0.090 (0.158)	-0.230 (0.089)	-0.037 (0.154)	0.135 (0.180)	0.231 (0.193)	0.521 (0.155)	0.176 (0.127)	0.031 (0.142)	0.272 (0.166)	
γ_2	-0.082 (0.153)	0.225 (0.161)	0.259 (0.174)	0.106 (0.138)	0.026 (0.173)	-0.018 (0.187)	-0.365 (0.129)	-0.085 (0.165)	0.168 (0.134)	-0.221 (0.221)	
α^+	-0.617 (0.297)	-0.602 (0.281)	-0.867 (0.148)	-0.467 (0.341)	-0.333 (0.293)	-0.731 (0.328)	-0.479 (0.223)	-1.221 (0.169)	-0.370 (0.230)	-0.659 (0.227)	
α^-	0.219 (0.318)	0.269 (0.264)	0.346 (0.185)	-0.216 (0.278)	-0.296 (0.370)	0.060 (0.316)	-0.616 (0.256)	0.047 (0.199)	0.221 (0.168)	0.012 (0.287)	
$P^w = f(P^r)$											
γ_0	0.026 (0.019)	0.053 (0.071)	0.030 (0.015)	0.071 (0.054)	-0.257 (0.067)	-0.052 (0.068)	0.076 (0.129)	0.061 (0.024)	0.057 (0.033)	0.048 (0.029)	
γ_T	-0.004 (0.002)	0.003 (0.008)	-0.003 (0.002)	-0.004 (0.007)	0.039 (0.010)	0.016 (0.009)	-0.017 (0.016)	-0.005 (0.003)	-0.005 (0.004)	-0.002 (0.003)	
γ_1	0.156 (0.132)	0.092 (0.144)	0.238 (0.100)	0.026 (0.152)	-0.175 (0.181)	0.105 (0.202)	-0.326 (0.156)	0.274 (0.155)	0.057 (0.148)	0.021 (0.180)	
γ_2	-0.054 (0.110)	0.177 (0.141)	0.043 (0.051)	-0.010 (0.169)	0.281 (0.188)	0.094 (0.208)	0.506 (0.188)	-0.155 (0.119)	0.212 (0.157)	0.060 (0.136)	
α^+	0.338 (0.257)	-0.056 (0.251)	-0.042 (0.085)	-0.320 (0.374)	0.183 (0.305)	-0.183 (0.353)	0.101 (0.270)	-0.514 (0.159)	0.013 (0.254)	-0.304 (0.186)	
α^-	-0.168 (0.275)	0.740 (0.236)	0.113 (0.106)	0.669 (0.305)	0.052 (0.386)	0.441 (0.340)	-0.186 (0.310)	0.237 (0.187)	0.429 (0.186)	0.240 (0.235)	
Obs.	124	124	124	124	124	124	124	124	124	124	

Standard errors in parenthesis. P^w and P^r stand for wholesaler and retailer price respectively.

and Goodwin (2003) find asymmetric price transmission in the dairy sector while no evidences of asymmetric price transmission along the supply chain of perishable dairy products; Kim and Ward (2013, p. 234) state that “*prices higher in the vertical system respond quicker to rising than falling prices, again, except for the most perishables.*”

4. Concluding remarks

Asymmetries in VPT may be due to imperfect competition, adjustment costs, inventory management, political interventions, or asymmetric information. Evidences and theories on the effects of perishability on vertical price transmission are mixed. We examined how the degrees of asymmetries in VPT and perishability are related.

Our evidences suggest that VPT is asymmetric for products not affected by large losses for spoilage (e.g. fruits and low perishable vegetables), and tends to be symmetric for more perishable products. Our results are consistent with numerous studies (Ward, 1982; Peltzman, 2000; Serra and Goodwin, 2003) and in contrast with the results of a meta-analysis conducted by Kim and Ward (2013, p. 234), who state that “*the perishables are where the most dramatic differences are seen, where falling farm prices are transmitted far faster than rising farm prices. Much of this has to be due to perishability, where rising prices in a highly perishable good can lessen volume sales among goods that have a very short shelf life.*” Based on our findings, several policy considerations may be expressed, and in particular it may be inferred on the level at which market crises should be administered in F&Vs markets (Santeramo *et al.*, 2014), or on the efficacy of trade policies (Seccia *et al.*, 2009; Cioffi *et al.*, 2011; Santeramo and Cioffi, 2012; Dal Bianco *et al.*, 2016). Deepening on these issues is beyond the scope of the present short note, and is left to future research.

We acknowledge that our findings rely on one time frequency (monthly data), however by adopting monthly data our analysis is directly comparable with the vast majority of empirical studies on price transmission.

Understanding the role of perishability on the VPT seems a promising area of research and it is worth exploring why perishability may induce AVPT: perishability implies larger management costs (i.e. specific logistic, refrigeration, packaging, etc.) and increase uncertainty (i.e. potential losses for spoilage reflected in lower price and/or quantity sold) when the transportation occurs. To the extent that transactions are more and more based on contracts (McDonald, 2015), the uncertainty and the losses for spoilage tend to be reduced. These issues are left for future research.

References

- Abbassi, A., Tamini, L.D. and Gervais, J.P. (2012). Do Inventories Have an Impact on Price Transmission? Evidence from the Canadian Chicken Industry. *Agribusiness* 28: 173-186.
- Abdulai, A. (2002). Using Threshold Cointegration to Estimate Asymmetric Price Transmission in the Swiss Pork Market. *Applied Economics* 34: 679-687.
- Abdelradi, F. and Serra, T. (2015). Asymmetric Price Volatility Transmission Between Food and Energy Markets: The case of Spain. *Agricultural Economics* 4: 503-513.

Table 5. Asymmetries in F&Vs prices (p -values and type of asymmetries).

	LowperishableVegetables				Medium perishableVegetables				Fruits			
	Carrots	Peppers	Potatoes	Cauliflower	Eggplants	Tomatoes	Radishes	Apples	Lemons	Pears		
$P^w = f(P^p)$												
α^+	0.001	0.001	0.001	0.002	0.308	0.155	0.176	0.001	0.002	0.001		
α^-	0.116	0.532	0.546	0.036	0.487	0.569	0.165	0.729	0.695	0.589		
H_0	0.101	0.002	0.007	0.357	0.731	0.501	0.373	0.005	0.006	0.014		
Type	APT+	APT+	APT+	SYM	SYM	SYM	SYM	APT+	APT+	APT+		
$P^p = f(P^w)$												
α^+	0.695	0.231	0.001	0.258	0.234	0.240	0.954	0.335	0.618	0.152		
α^-	0.009	0.554	0.107	0.189	0.564	0.498	0.589	0.812	0.008	0.401		
H_0	0.144	0.335	0.001	0.389	0.594	0.655	0.731	0.619	0.254	0.141		
Type	SYM	SYM	APT+	SYM	SYM	SYM	SYM	SYM	SYM	SYM		
$P^r = f(P^w)$												
α^+	0.040	0.034	0.001	0.173	0.258	0.027	0.034	0.001	0.109	0.004		
α^-	0.492	0.309	0.064	0.438	0.426	0.850	0.018	0.814	0.191	0.967		
H_0	0.095	0.055	0.001	0.941	0.644	0.168	0.852	0.001	0.100	0.031		
Type	APT+	APT+	APT+	SYM	SYM	SYM	SYM	APT+	APT+	APT+		
$P^w = f(P^r)$												
α^+	0.190	0.824	0.625	0.392	0.551	0.605	0.707	0.001	0.958	0.104		
α^-	0.543	0.002	0.289	0.034	0.892	0.197	0.549	0.207	0.026	0.308		
H_0	0.245	0.322	0.404	0.048	0.703	0.268	0.558	0.005	0.076	0.104		
Type	SYM	APT-	SYM	APT-	SYM	SYM	SYM	APT+	APT-	SYM		

SYM= Symmetric price transmission ; APT+= positive price transmission ; APT- = negative price transmission

- Aguiar, D.R.D. and Santana, J.A. (2002). Asymmetry in Farm to Retail Price Transmission: Evidence from Brazil. *Agribusiness* 18: 37-48.
- Appel V. (1992) Asymmetrie in der Preistransmission. *AgrarwirtschaftSonderheft*. 135: 178-213.
- Assefa, T.T., Kuiper, E. and Meuwissen, M. (2014) The Effect of Farmer Market Power on the Degree of Farm-Retail Price Transmission: A Simulation Model with an Application to the Dutch Ware Potato Supply Chain. *Agribusiness* 4: 424-437.
- Bakucs, L.Z., Ferto, I. and Szabo G.G. (2007). Price transmission in the Hungarian vegetable sector. *Studies in Agricultural Economics* 106: 23-40.
- Benson, T., Mugarura, S. and Wanda, K. (2008). Impacts in Uganda of rising global food prices: the role of diversified staples and limited price transmission. *Agricultural Economics* 39: 513-524.
- Bernard, J.C. and Willett, L.S. (1996). Asymmetric Price Relationships in the U.S. Broiler Industry. *Journal of Agricultural and Applied Economics* 28: 279-289.
- Bernard, J.C. and Willett, L.S. (1998). Broiler Price Transmission Results and Data Periodicity. *Applied Economics Letters* 5: 221-224.
- Boyd, M.S. and Brorsen, B.W. (1988). Price Asymmetry in the U.S. Pork Marketing Channel. *North Central Journal of Agricultural Economics* 10: 103-109.
- Brooker, J.R., Eastwood, D.B., Carver, B.T. and Gray, M.D. (1997). Fresh Vegetable Price Linkage between Grower Shippers Wholesalers, and Retailers. *Journal of Food Distribution Research* 28: 54-61.
- Bunte, F. and Peerlings, J. (2003). Asymmetric Price Transmission due to Market Power in the case of Supply Shocks. *Agribusiness*, 19(1): 19-28.
- Cioffi, A., Santeramo, F. G. and Vitale, C.D. (2011). The Price Stabilization Effects of the EU Entry Price Scheme for Fruit and Vegetables. *Agricultural Economics* 42: 405-418.
- Dal Bianco, A., Boatto, V.L., Caracciolo, F., and Santeramo, F. G. (2015). Tariffs and non-tariff frictions in the world wine trade. *European Review of Agricultural Economics* 43: 31-57.
- Dickey, D.A. and Fuller, W.A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica* 49: 1057-1072.
- García-Germán, S., Bardají, I. and Garrido, A.(2016).Evaluating Price Transmission between Global Agricultural Markets and Consumer Food Price Indices in the European Union. *Agricultural Economics* 47(1): 59-70.
- Gardner, B.L. (1975). The Farm-Retail Price Spread in a Competitive Food Industry. *American Journal of Agricultural Economics* 57: 399-409.
- Gervais J.P. (2011). Disentangling Nonlinearities in the Long- and Short-Run Price Relationships: An application to the US Hog/Pork Supply Chain. *Applied Economics* 43: 1497-1510.
- Girapunthong, N. and Van Sickle J.J., Renwick, A. (2003). Price Asymmetry in the United States Fresh Tomato Market. *Journal of Food Distribution Research* 34: 51-59.
- Griffith, G.R. and Piggott, N.E.(1994). Asymmetry in Beef, lamb and pork Farm-Retail Price Transmission in Australia. *Agricultural Economics* 10: 307-316.
- Hassan, D. and Simioni, M. (2004). Transmission des Prix dans la Filière des Fruits et Légumes: Une Application des Tests de Cointégration avec Seuils. *Économie Rurale* 283(1): 27-46.

- Karrenbrock, J.D. (1991). The Behaviour of Retail Gasoline Prices: Symmetric or Not? *Federal Reserve Bank of St. Louis Review* 73: 19-29.
- Kim, H. and Ward, R.W. (2013). Price Transmission across the US Food Distribution System. *Food Policy* 41: 226-236.
- Kinnucan, H.W. and Forker, O.D. (1987). Asymmetry in Farm-Retail Price Transmission for Major Dairy Products. *American Journal of Agricultural Economics* 69: 307-328.
- Kinnucan, H.W. and Zhang, D. (2015). Notes on Farm-Retail Price Transmission and Marketing Margin Behavior. *Agricultural Economics* 46(6): 729-737.
- Lloyd, T., McCorrison, S., Morgan, W. and Rayner, T.(2006). Food Scares, Market Power and Price transmission: the UK BSE Crisis. *European Review of Agricultural Economics* 33: 119-147.
- McCorrison, S., Morgan, C.W. and Rayner, A.J. (1998). Processing Technology, Market Power and Price Transmission. *Journal of Agricultural Economics* 49: 185-201.
- McCorrison, S., Morgan, C.W. and Rayner, A.J. (2001). Price Transmission: The Interaction between Market Power and Returns to Scale. *European Review of Agricultural Economics* 28: 143-159.
- McDonald, J. (2015). Trends in Agricultural Contracts. *Choices* 30(3): 1-6.
- Meyer, J. and von Cramon-Taubadel, S. (2004). Asymmetric Price Transmission: A Survey. *Journal of Agricultural Economics* 55: 581-611.
- Mohanty S., Peterson E.W.F. and Kruse N.C. (1995). Price Asymmetry in the International Wheat Market. *Canadian Journal of Agricultural Economics* 43: 355-366.
- Peltzman, S. (2000). Price Rise Faster than They Fall. *Journal of Political Economy* 108: 466-502.
- Perron, P. (1988). Trends and Random Walks in Macroeconomic Time Series. *Journal of Economic Dynamics and Control*. 12: 297-332.
- Pick, D.H., Karrenbrock, J.D. and Carman, H.F. (1990). Price Asymmetry and Marketing Margin Behavior: An Example for California—Arizona Citrus. *Agribusiness* 6: 75-84.
- Powers, N.J. (1995). Sticky Short-Run Prices and Vertical Pricing: Evidence from the Market for Iceberg Lettuce. *Agribusiness* 11: 57-75.
- Saghalian, S. H. (2007). Beef Safety Shocks and Dynamics of Vertical Price Adjustment: The case of BSE Discovery in the US Beef Sector. *Agribusiness* 23: 333-348.
- Santeramo, F. G. (2010). Market Integration in European Union's Fruits and Vegetables Sector. *Doctorate dissertation*.
- Santeramo, F.G. (2015). Price Transmission in the European Tomatoes and Cauliflowers Sectors. *Agribusiness* 3: 399-413.
- Santeramo, F.G. and Cioffi, A. (2012a). The Entry Price Threshold in EU Agriculture: Deterrent or Barrier? *Journal of Policy Modeling* 34: 691-704.
- Santeramo, F.G. and Cioffi, A. (2012b). Transmission of Market Crises in the European Vegetables Sector. *Politica Agricola Internazionale-International Agricultural Policy* 2: 37-46.
- Santeramo, F.G., Cioffi, A. and Vitale, C.D. (2014). A Threshold-Var Approach to Assess the Efficacy of the EU Import Regime. *International Journal of Food and Agricultural Economics* 2: 1-12.
- Schertz Willet, L., Hansmire, M.R. and Bernard, J.C. (1997). Asymmetric price response behavior of red Delicious apples. *Agribusiness* 13: 649-658.

- Seccia, A., Carlucci, D. and Santeramo, F.G. (2009). Exports of Italian high quality wine: new empirical evidence from a gravity-type model. In: Canavari, M., Cantore, N., Castellini, A., Pignatti, E. and Spadoni, R. (eds), *International Marketing and Trade of Quality Food Products*. Wageningen: Wageningen Academic Publishers, 15-29.
- Serra T. and Goodwin, B.K. (2003). Price Transmission and Asymmetric Adjustment in the Spanish Dairy Sector. *Applied Economics* 35: 1889-1899.
- Sexton, R.,M. Zhang M. and Chalfant, J. (2003). Grocery Retailer Behavior in the Procurement and Sale of Perishable Fresh Produce Commodities. USDA Economic Research Service. Report No 2 (September, 2003).
- Tappata, M. (2009). Rockets and Feathers: Understanding Asymmetry Pricing. *Rand Journal of Economics* 40: 673-687.
- Tekgüç, H. (2013). Oligopoly and Price Transmission in Turkey's Fluid Milk Market. *Agribusiness* 29: 293-305.
- USDA (2009), Supermarket Loss Estimates for Fresh Fruit, Vegetables, Meat, Poultry, and Seafood and their Use in the ERS Loss-Adjusted Food Availability Data. *Economic Information Bulletin* number 44.
- Vavra, P. and Goodwin, B.K. (2005). Analysis of Price Transmission Along the Food Chain. OECD Food, Agriculture and Fisheries Working Papers, No. 3, OECD Publishing.
- Von Cramon-Taubadel, S. (1998) Estimating Asymmetric Price Transmission with the Error Correction Representation: An Application to the German Pork Market. *European Review of Agricultural Economics* 25: 1-18.
- Ward, R.W. (1982). Asymmetry in Retail, Wholesale and Shipping Point Pricing for Fresh Vegetables. *American Journal of Agricultural Economics* 62: 205-212.
- Worth, T. (1999). The F.o.b. Retail Price Relationship for Selected Fresh Vegetables. Washington, DC: US Department of Agriculture, Economic Research Service—Vegetables and Specialties.
- Zivot, E. and Andrews, D.W.K. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal of Business and Economic Statistics* 10: 251-270.

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Katerina Kucerova

Centro de Estudios e Investigación para la Gestión de Riesgos Agrarios y Medioambientales (CEIGRAM)

Universidad Politécnica de Madrid – ETSI Agrónomos. Ciudad Universitaria – 28040 Madrid (Spain)

e-mail: secretaria_cem@ceagrayrma.com



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