Centro Studi Sulle Politiche Economiche, Rurali e Ambientali

associazioneAlessandroBartola
studi e ricerche di economia e politica agraria

Paper prepared for the 122nd EAAE Seminar
"EVIDENCE-BASED AGRICULTURAL AND RURAL POLICY MAKING: METHODOLOGICAL AND EMPIRICAL CHALLENGES OF POLICY EVALUATION"
Ancona, February 17-18, 2011

The entry price threshold in EU F&V sector: deterrence or effective barrier?

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Abstract
The paper investigates the effects of the entry price scheme for fresh fruit and vegetables. The analysis is conducted on the EU prices of tomatoes, lemons and apples for some of the main competing countries on the EU domestic markets: Morocco, Argentina, Turkey and China. The econometric analysis is based on testing and estimating a switching vector autoregressive model with endogenous threshold entry price level. The model shows the isolation effects and the accumulation of SIVs above the trigger entry price. This paper contributes to clarify the role played by the EPS in avoid or deter low priced imports from main EU partner Countries.

Keywords: Fruits and vegetables, Entry price system, trade policy, TVAR

JEL classification: F13, Q17, Q18.

1. INTRODUCTION

The main instrument of the EU import regime for fresh fruit and vegetables (F&V) is certainly the Entry Price System (EPS). The rationale of this non tariff barrier, as it comes out from the previous reference price system introduced in the first CMO of F&V, is to allow imports of F&V assuring EU market supply while avoiding that "abnormally" low price imports could create "disturbances of Community markets". The working of the EPS is well known and has been widely analysed by several authors (*e.g.* Swimbank and Ritson, 1995; Cioffi and dell'Aquila, 2004; Emlinger, Jacquet and Lozza, 2008; Goetz and Grethe, 2009; Emingler, Lozza and Jacquet, 2010; Garcia, Gomez and Villanueva, 2010; Goetz and Grethe, 2010) and therefore it is redundant to recall it once again in this paper.

One feature of the EPS is the possibility given to importers of legally avoid the payments of the specific tariffs when the standard import values (SIVs) are below the TEP. To do this importers may delay imports until the SIVs are over the TEP or may show that the final sale price of their lots are higher than the TEP and therefore the specific tariff is not due. Therefore it may happen that imports of F&V in the EU are made also in periods in which the SIVs are below the TEP. This situation has created wider uncertainty on the effects played by the EPS on trade flows as well as on its restrictiveness.

Among the issues still open on the EPS, there is the assessment of the effects played on the stabilization of EU domestic prices, that is the main motivation of such import regime. Cioffi *et al.* (2011) showed that for some products and importing countries the EPS affects prices, because when the SIVs are below the 92% of the TEP and the maximum tariff equivalent (MTE) is applied the price determination process of EU products follows a pattern different from the one shown when SIVs are higher, insulating domestic prices from the SIVs. The effectiveness of the EPS in the EU price stabilization is clear in few cases because it is depending on trade volumes and on the origin of imported goods. However in these cases the resulting stabilization effects, as well as the support effects on EU domestic prices, are always rather small.

Goetz and Grethe (2009) in their analysis on the distribution of the SIVs showed that for several products and exporting countries there is an accumulation of SIVs slightly above the TEP. Such feature is seen as an indicator that «*exporters often supply their product at the lowest possible price while complying with the EP*» (Goetz and Grethe, 2009, *p.85*). Moreover, specific tariffs are also levied beside the MFN tariff when the SIVs are below the TEP but higher than the 92% of the TEP[1]. Therefore it is worth to analyze if the stabilization effects of the EPS are obtained at a level higher than the 92% of the TEP. While in Cioffi *et al.* (2011) the analysis was based on an exogenous threshold at 92% of the TEP distinguishing two different price determination processes, in this paper we address a twofold problem: for cases in which the isolation effect was already identified, we assess if there is an endogenous threshold higher than the 92% of the TEP; while for cases in which the EPS seemed not effective, we detect if there exist an endogenous threshold at which a sheltering of the EU the domestic prices from low priced imports is shown.

The analysis is carried out performing linearity tests to asses changes of the price determination processes. Subsequently, through an appropriate switching-regime autoregressive model the threshold variable is endogenously determined. Moreover the approach proposed deepens the previous analysis distinguishing the isolation and deterrence effects of the EPS: the former due to a change in prices determination processes, the latter consisting in an accumulation of SIVs above the 92% of the TEP.

The remainder of the paper is the following: paragraph 2 presents a brief review of recent papers on EPS and the importance of the products analysed in the paper; Section 3 is focused on the theoretical framework and the methodological approach; results are set out in Section 4 while Conclusions and final remarks are developed in the last paragraph.

2. RELEVANCE AND EFFECTIVENESS OF THE EPS: AN OPEN DEBATE

In last decade the debate on the functioning of the EPS has become more and more participated with a growing number of papers and articles focused on several aspects mainly concerning its relevance and effectiveness on EU market stabilization. Cioffi and dell'Aquila (2004) showed that EPS played a relevant role on the EU imports of F&V. More recently an evaluation report on the EPS casted doubt on previous results showing that for some F&V products covered by the import regime the import growth rate did not differ from that not covered by the EPS (Agrosynergie, 2008). Emlinger *et al.* (2010) focused the attention on Mediterranean countries showing their significant preferences compared to other countries

[1] In these circumstances the specific tariff is given by the difference between the TEP and SIVs within 2% brackets.

exporting to the EU. Goetz and Grethe (2009) by mean of a multivariate statistic analysis approach showed that the relevance of the EPS is not homogeneous among different products and origins, being wider for more perishable products and for neighbouring partner countries. Garcia Alvarez Coque *et al.* (2010) found that the removal of the EPS or reduction of the TEP would have moderate impact on prices of EU domestic products. Starting from Cioffi *et al.* (2011), the paper contributes in clarifying the effectiveness of the EPS.

Tomatoes, lemons and apples are relevant cases of study either because of a large number of SIVs are calculated and published by the EU Commission and because the EPS is applied all year long: in the case of tomato the two most relevant EU partner countries are Morocco and Turkey; for lemons the two major partner countries are Argentina and Turkey; as regard apple China is a growing exporter to EU becoming more and more relevant.

Spain is the chief exporter of tomatoes among EU members and Morocco is the main exporting country of tomatoes to the EU, with a share of about 80% on total exports. Turkey, the second partner for trading volume, accounts for a much smaller share (about 7-8%). However, Turkey exports tomatoes mainly during summer months, when imports from Morocco are almost zero. The competition between Spain and Morocco, at the highest from October to March, is very intense either for the similar production seasons and for target markets, technologies and varieties.

Spain is also the main EU producer of lemons (about 650.000 tons per year) and a net exporter of lemons to other EU countries. Globally, the EU is a net importer of lemons (around 400.000 tons per year): Argentina is the main partner country, supplying the 50-60% of total import mainly from May to October; Turkey is the second partner country with a share of 20% spanned from September to April.

China is a growing apple exporter in EU trading during the entire year. Netherlands, Spain and United Kingdom are the main partners importing, respectively, 43%, 22% and 17% of the total volume traded to EU.

3. THEORETICAL AND METHODOLOGICAL FRAMEWORK

To investigate the effects of the EPS on EU domestic prices of F&V we adopted the model described in Cioffi *et al.* (2011) that assumes a price determination model in which the EU is a large country in trade of F&V products and price of imported products depend on EU market equilibria. We also assume that the domestic and imported F&V products are imperfect substitute in the EU consumers demand, hence we would have a similar price determination models for the EU domestic prices and the SIVs. The reduced form representation of the price determination process in the EU market is the system of equations 1-2:

1) $P_t = f\,(P_{t-1}, SIV_{t-1}) + \varepsilon_{1t}$
2) $SIV_t = g\,(P_{t-1}, SIV_{t-1}) + \varepsilon_{2t}$

where P_t and P_{t-1} are the daily prices of an EU domestic F&V product, respectively at time t and $t-1$, SIV_t and SIV_{t-1} are the daily Standard Import Values, also at time t and $t-1$, f and g are two different functional forms, ε_{1t} and ε_{2t} are error terms assumed to be identically independently distributed with mean 0 and variance σ^2.

In order to take into account the working of the EPS, we assumed that the prices determination processes are different depending on the position of the SIVs respect to a threshold to be identified and linked to the conditions under which the MTE is applied. The resulting specification belongs to the class of non linear two-regimes Threshold Vector Autoregressive Models (TVAR):

$$(3)\quad \begin{cases} P_t & = I_t \cdot \{f_1(P_{t-1}, SIV_{t-1}) + \varepsilon_{1t}\} \ + (1-I_t)\cdot\{f_2(P_{t-1}, SIV_{t-1}) + \varepsilon_{2t}\} \\ SIV_t & = I_t \cdot \{g_1(P_{t-1}, SIV_{t-1}) + \varepsilon_{3t}\} \ + (1-I_t)\cdot\{g_2(P_{t-1}, SIV_{t-1}) + \varepsilon_{4t}\} \end{cases}$$

$$I_t = \begin{cases} 1 & \text{when regime I occurs} \\ 0 & \text{when regime II occurs} \end{cases}$$

where I_t represents the switching variable determining when *regime I* (the "normal" regime) or *regime II* occur. In our model the first regime is defined by the normal functioning of the price determination process, while in the second regime, that occurs when the SIVs is below the threshold because of the effects of the EPS, the price determination process changes.

A preliminary analysis aimed to detect the existence of two regimes in the price determination process, as described in (3), consists in performing linearity tests. The refuse of the null hypothesis may open the way for two possible situations. The fist one is the theoretical framework synthesized in equations (3) where an *isolation effect* occurs because the EU domestic price is influenced by SIVs in the first regime while the relationship is lost in the second regime (condition A):

$$\begin{aligned} P_t^I &= f(P_{t-i}^I, SIV_t^I) && \text{if} \quad SIV_{t-1} \geq \hat{\theta} \\ P_t^{II} &= f(P_{t-i}^{II}) && \text{if} \quad SIV_{t-1} < \hat{\theta} \end{aligned}$$

The second situation would be when the linearity test refuses the null hypothesis and we do not find any influence of the SIVs on the EU domestic prices, while detecting an accumulation of SIVs in the range between the 92% of the TEP and the estimated threshold. In such situation we cannot conclude on the isolation effects of the EPS but the latter seems to play a *deterrence effect* (condition B).

As far as the accumulation is concerned, we propose an index using the information derived by the TVAR econometric model. The *accumulation index* (*AI*) is the ratio of SIVs accumulating between the 92% of the TEP and the endogenous threshold estimated through specification (3). The *AI* ranges from 0 to 1 with highest values indicating an accumulation of SIVs. Values of zero indicate that the 92% of the TEP is the threshold that effectively distinguishes two different prices regimes. Conversely, values of one are possible only when the

SIVs never fall below the 92% of the TEP. Due to its nature, a value of *AI* greater than 0.5 would provide evidence of a large accumulation of SIVs.

To develop the econometric analysis we chose several EU domestic prices: the series collected on the Almeria (ES) market to analyze the effect of Moroccan tomato SIVs (case *a*); the series from Chateau-Renard (FR) to analyze the effect of Turkish tomato SIVs (case *b*); the series of Murcia (ES) prices to analyze the Turkish lemon SIVs (case *c*) and the Argentinean lemon SIVs (case *d*); prices collected on Geldermalsen (NL) market to analyze the effects of Chinese apple SIVs (case *e*). The choice of such series was constrained by the availability of data for the relevant periods. Certainly the strategy may have some weakness because it could be possible that no EPS effects are detected not because of its inefficacy but rather because of a low degree of integration between the market we chose and the SIVs.

Time series of daily prices and SIVs refer to weekdays from Monday to Friday and contain data for the season in which transactions are registered: November-March (a); April-October (b); October–May (c); May-October (d); January-December (e). Prices from different years are combined to obtain a unique sample and cover the periods 2000-2007 (case *a*), 2000-2004 (case *b*), 1998-2006 (cases *c* and *d*), 2004-2007 (case *e*).

The econometric methodology we used, through linearity tests and econometric estimation of a switching regime models, is described in the remaining paragraphs.

3.1. Linearity tests

The first step of our analysis aims to asses if EU domestic prices and SIVs relationships are affected by non-linearity. The non-linearity is a first evidence of possible effects played by the EPS.

Testing for non-linearity in TVAR presents many challenges: one of the main problem is the threshold identification under the alternative hypothesis. Tsay proposed a non-parametric test for univariate (Tsay, 1989) and multivariate (Tsay, 1998) cases based on an arranged autoregression and recursive least squares estimation. On one hand, Tsay's tests have the advantages of being independent by the form of threshold non-linearity, on the other hand, the tests are made difficult by the lack of identification of break dates under the null hypothesis of linearity.

Another method to test the null hypothesis of univariate linear model (H_0) versus the alternative of univariate TAR model with m regimes (H_A), has been proposed by Hansen (1997, 1999). The procedure uses a sup-*F* type (sup-Wald) test based on the comparison of the sum of squared residuals of the linear and non-linear models. Since the test suffers of the so-called *Davies problem*[2] (Davies, 1987), Hansen proposed a bootstrap procedure to compute *p-values.* In order to investigate the presence of non-linearity in the relationships between prices and

[2] Davies argues that the unidentification of the threshold parameters under the null hypothesis of linearity influences the sup-*F* asymptotic distributions. Hence, the testing procedure should include simulation techniques to evaluate the distributions case-by-case.

SIVs, we tested for non-linearity in threshold vector autoregressive models following the approach described in Lo and Zivot (2001) that extended the Hansen's test to the multivariate case. The statistic (LR_{1m}) used is a sup-LR statistic based on the determinants of the residual covariance matrix ($\hat{\Sigma}$) of the unrestricted (Ω, two-regimes model) for which the threshold is endogenously determined, and the restricted models (ω, linear model):

$$(4) \quad LR_{1m} = T\left[ln\left(\left|\hat{\Sigma}\right|\right) - ln\left(\left|\hat{\Sigma}_m(\hat{\theta})\right|\right)\right]$$

where *m* represents the number of regimes and $\hat{\theta}$ the estimated threshold. Since the distribution of the sup-LR statistic is non-standard, a bootstrap procedure is adopted to compute *p-values*. The rationale of the test is to assess whether or not the two regimes are statistically not different. A rejection of the null hypothesis casts doubt on the linear nature of the relationships among EU prices and SIVs and therefore opens the way for checking the EPS effect.

3.2. Econometric model

The second step of the analysis consists in the estimation of the model described in (3). In order to characterize the stabilization effects of the EPS we use an iterative procedure to estimate the model with different threshold levels. The methodology consists in the estimation of a two-regimes threshold TVAR model described by the following system:

$$(5) \quad \begin{cases} P_t &= I_t(\hat{\theta}) \cdot \{f_1(P_{t-i}, SIV_{t-i}) + \varepsilon_{1t}\} + (1 - I_t(\hat{\theta})) \cdot \{f_2(P_{t-i}, SIV_{t-i}) + \varepsilon_{2t}\} \\ SIV_t &= I_t(\hat{\theta}) \cdot \{g_1(P_{t-i}, SIV_{t-i}) + \varepsilon_{3t}\} + (1 - I_t(\hat{\theta})) \cdot \{g_2(P_{t-i}, SIV_{t-i}) + \varepsilon_{4t}\} \end{cases}$$

with

$$I_t(\hat{\theta}) = \begin{cases} 1 & if \quad SIV_{t-1} \geq \hat{\theta} \\ 0 & otherwise \end{cases}$$

where $i=1, \ldots, n$ and $\hat{\theta}$ represents an endogenous threshold higher than the threshold above which the MTE is applied (i.e. $\hat{\theta} \geq \theta_0 = 0.92 \cdot TEP$). The variable I_t allows to separate the data in two sub-samples according to the relative position of SIVs with respect to the threshold. The estimation can be seen as a two steps procedure: in the first step we search for the best threshold in a range of possible values; in a second step the coefficients are estimated conditionally to the optimal threshold detected in the first step.

Analytically, given the range Θ of possible values for the threshold and lag structure (*n*), the LS estimator of $\hat{\theta}$ solves the minimization problem

$$(6) \quad \hat{\theta} = \min_{\theta}(Y_t - \alpha_1' \textstyle\sum_{i=1}^{n} X_{t-i}\, I_1(\hat{\theta}) - \alpha_2' \sum_{i=1}^{n} X_{t-i}\, I_2(\hat{\theta}))^2$$

where α_1 and α_2 are the coefficients matrixes, Y_t and X_t represent data matrixes. Our approach allows to search the best thresholds (θ^*) imposing that $\hat{\theta} \geq 0.92 \cdot TEP$. In other terms, through specification (6) we are able to determine the optimal threshold level by minimizing the sum squared of residuals.

Given the optimal threshold level (θ^*) from the first step, the LS estimator[3] of $\hat{\alpha} = (\hat{\alpha}_1, \hat{\alpha}_2)$ solves the minimization problem

$$(7) \quad \hat{\alpha} = \min_{\alpha}(Y_t - \hat{\alpha}_1{}' \sum_{i=1}^{n} X_{t-i}\, I_1(\theta^*) - \hat{\alpha}_2{}' \sum_{i=1}^{n} X_{t-i}\, I_2(\theta^*))^2$$

As far as tomato imported from Morocco is concerned, since the binding TRQ changed during the periods under consideration, we introduced dummy variables to capture the effects of the quota expansion, from 150.676 to 175.00 tons, in 2003, and of the introduction of a further conditional quota (45.000 tons) by 2006.

4. Empirical results

The analysis is conducted on the dataset already adopted in Cioffi *et al.* (2011) with the addition of data on apple domestic prices and China SIVs. The daily prices were extracted from the *Agriview* database of the European Commission, which collect prices on EU wholesale F&V markets of different member countries. Data on daily SIVs are calculated by the EU Commission. All prices are reported in euro and expressed in current terms.

The analysis has been conducted on SIVs of selected countries and prices of relevant EU markets. The EU domestic tomato price were collected on the Almeria (ES) wholesale market, an important tomato producing area whose products directly compete with tomatoes imported from Morocco. The SIVs of tomato imported from Turkey have been compared with EU prices collected from the French market of Chateau Renard. As regard the cases of lemon, we considered the SIVs of imports from Argentina and Turkey and the EU domestic prices collected on the Murcia (ES) wholesale market, located in one of the main Spanish lemon producing area. Finally the SIVs of apple from China have been related to EU prices of Geldermalsen, an important production market.

4.1. Linearity tests

The linearity tests have been conducted conditional to the trimming parameters[4] (τ) and number of lags (n). The trimming parameter is 0.1 in all but cases *b* and *d* for which the share of observations below the 92% of the TEP is far larger than 10%, respectively, 22% and 35%. For these cases we adopted a trimming parameter equals to 0.2.

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[3] TVAR models are estimated by using the least squares method, shown to be consistent under regularity conditions (Tsay, 1989, 1998).

[4] In TAR models the trimming parameter (τ) indicates the minimum share of observations that need to pertain to each regime. Generally, τ ranges from 0.05 to 0.15 and only few indications help in choosing the "best" trimming value.

As far as lemons and apples series is concerned, starting from the VAR(1) specification, when the cross-correlogramms of residuals highlight the presence of autocorrelation, we choose a larger number of lags according to the Schwarz Information Criterion: 3 lags for cases *c* and *e*; 2 lags for case *d*. P-values are calculated based on 1000 bootstrap replications.

Table 2 - LR linearity tests

	a	b	c	d	e
τ	0.1	0.2	0.1	0.25	0.1
N	1	1	3	2	3
test statistic	22.060	19.184	33.571	20.378	43.055
p-value	0.063	0.061	0.062	0.162	0.004

Results presented in table 2 show that we reject at 10% level the null hypothesis of a linear relationships between the EU domestic prices and SIVs for *a, b, c* and *e* while we fail to reject the null only in *d*. The tests suggest that in 4 out of 5 cases the EPS induces the prices and SIVs relationships to follow a non-linear process. However, the results need to be considered with caution since the linearity tests may suffer from low statistical power, thus for all cases a deeper investigation is attained through the estimation of the TVAR.

4.1. Econometric results

The minimization problem presented in (6) has been solved within a range of possible thresholds from the 92% of the TEP (θ_0) to 130% of θ_0. The results of the OLS estimations are summarized in table 3. In order to provide a clearer interpretation of results, we computed an index for the accumulation of SIVs between θ_0 and $\hat{\theta}$:

$$AI = \frac{(\%\, obs.in\, regime\, II)|_{\hat{\theta}} - (\%\, obs.in\, regime\, II)|_{\theta_0}}{(\%\, obs.in\, regime\, II)|_{\hat{\theta}}}$$

The *accumulation index* (*AI*) ranges from 0 to 1 with the highest values indicating the largest accumulation of SIVs above the 92 of the TEP. Conversely, *AI* will assume value equal to zero if no accumulation takes place. The index presents some analogies with the "*neg. GAP"* index, constructed as ratio between the share of SIVs below the TEP and the total number of SIVs, and the $Q^*_{0.05}$ index proposed by Goetz and Grethe (2009). The former indicates the share of SIVs below the 92% of the TEP, the latter is a descriptive statistics of the accumulation of SIVs above the TEP and has been used to infer on the influence of the EPS on the EU import price. The importance of the phenomenon of accumulation of SIVs makes it worth to deepen its investigation trying to establish a link between the accumulation and isolation effects. The *accumulation index* proposed in this paper is case-specific taking into account the SIVs and EU price dynamics: the share of observations "accumulating" above the TEP is function of the endogenous threshold determined by the prices dynamics. The SIVs close to the TEP will be placed in the first or in the second regime according to their dynamics. The more the dynamics of SIVs close to the TEP resembles the dynamics prevalent in the second regime, the higher the estimated threshold, the share of observations between θ_0 and $\hat{\theta}$, hence the *AI*.

Table 3 – Econometric results

	a	B	c	d	e
	Almeria	Chateau Renard	Murcia	Murcia	Geldermalsen
α^{I}	2.723^{**}	8.524^{*}	0.224	4.523^{**}	0.686
P_{t-1}^{I}	0.896^{***}	0.921^{***}	0.963^{***}	0.910^{***}	0.561^{***}
P_{t-2}^{I}					0.422^{***}
P_{t-3}^{I}					
SIV_{t-1}^{I}	0.081^{***}		0.027^{***}		
SIV_{t-2}^{I}					
SIV_{t-3}^{I}					
α^{II}	6.336	20.536^{***}	2.202	3.073^{*}	3.881^{***}
P_{t-1}^{II}	0.952^{***}	0.825^{***}	0.969^{***}	0.932^{***}	0.876^{***}
P_{t-2}^{II}					
P_{t-3}^{II}					
SIV_{t-1}^{II}					
SIV_{t-2}^{II}					
SIV_{t-3}^{II}					
	Morocco	Turkey	Turkey	Argentina	China
α^{I}	1.335	21.181^{***}	3.736	23.166^{***}	10.645^{***}
P_{t-1}^{I}	0.107^{***}	0.158^{***}	0.093^{***}		
P_{t-2}^{I}					
P_{t-3}^{I}					
SIV_{t-1}^{I}	0.853^{***}	0.484^{***}	0.466^{***}	0.281^{***}	0.601^{***}
SIV_{t-2}^{I}			0.248^{***}	0.222^{***}	0.241^{***}
SIV_{t-3}^{I}			0.119^{***}		
α^{II}	8.726	15.583^{*}	4.801	14.063^{***}	5.051
P_{t-1}^{II}		0.318^{***}			
P_{t-2}^{II}					
P_{t-3}^{II}					
SIV_{t-1}^{II}	0.860^{***}		0.380^{***}	0.299^{***}	0.625^{***}
SIV_{t-2}^{II}			0.365^{***}	0.381^{***}	0.332^{***}
SIV_{t-3}^{II}			0.230^{***}		
$\frac{\hat{\theta}-\theta_0}{\theta_0}$	+ 8.0%	+ 14.0%	+ 0 %	+ 19.0%	+ 9.9%
(1) obs. in regime II with θ_0	13.0%	11.0%	17.0%	35.0%	11.0%
(2) obs. in regime II with $\hat{\theta}$	19.7%	31.7%	17.0%	73.4%	14.5%
(2) – (1)	6.7%	20.7%	0%	38.4%	3.5%
AI	0.34	0.65	0.0	0.52	0.24

The apexes I and II indicate, respectively, the first and second regime.
Significant: *** at <0.001 ; ** at 0.001 ; * at 0.01

As far as case *a* is concerned, the linearity test (table 2) indicates that the prices and SIVs relationships follows a non-linear process. Moreover, the coefficients related to the influence of

SIVs on EU domestic prices and *vice-versa* are, respectively, statistically significant in the first regime and not significant in the second, suggesting that the EPS isolates the EU domestic market[5] (condition A). The estimated threshold is 8% higher than θ_0 with accumulation of SIVs above θ_0 (*AI* = 0.34), hence EPS seems to play also a deterrence effect.

Differently, for case *b*, in which the linearity test is rejected at 10% level, we found that SIVs do not influence EU prices neither in the first nor in the second regime, hence we cannot conclude on the effectiveness of the EPS in isolating the EU market. However, the estimated threshold is 14% higher than θ_0, and the *accumulation index* is 0.65 indicating that SIVs tend to largely accumulate above the 92% of the TEP. In this case the effects of the EPS a deterrence effect which limits low priced imports.

As regard case *c*, despite we reject the null at 10% level, the SIVs influence the EU domestic price in the first regime, but not in the second: the EPS is effective in isolating the domestic market. The endogenous threshold coincides with the 92% of the TEP suggesting that there is no accumulation of SIVs above the threshold (*AI* = 0).

In case *d* we cannot reject the null of linearity and the coefficients are quite similar in the two regimes, suggesting a linear relationships between the two series. The estimated coefficients related to the influence of SIVs on EU prices are statistically not significant, thus the isolation is not likely to be achieved. The results might be due to the different production season in Spain and Argentina that lead to an high competition in May that decline more and more until October when the new harvest season begins. The share of SIVs below the 92% of the TEP is larger during periods of low competition (e.g. in October is 47% and in May only 15%). The threshold we estimated is 19% higher than the baseline and AI is larger than 0.5 (*AI* = 0.52). The results cast doubts on the efficacy of the EPS in isolating the EU domestic market, and we can barely conclude on a "deterrence" effect.

As far as the last case (*e*) is concerned, the linearity test suggests that prices and SIVs are linked by a non-linear relationships. However, we cannot identify neither an influence of SIVs on EU prices nor the opposite relationships. These results barely support the hypothesis of isolation effects due to the EPS. However the endogenous threshold is identified 9.9% above θ_0 with a limited accumulation of SIVs (*AI* = 0.24). Based on these results we conclude that the effectiveness of the EPS might mainly consist in deterrence effects.

5. CONCLUSIVE REMARKS

This paper presents an econometric analysis of the effects of the EPS on the prices of EU F&V. It was focused on three products: tomatoes, lemons and apples, with the objective to identify what is the level of the TEP under which the price determination process of the three

[5] The dummies introduced to take into account the changes in the quota are statistically different from zero showing that the larger TRQs induced a decrease in SIVs level. However, we do not include them in the estimations presented in table 1 for reasons of space.

products is modified isolating the EU domestic prices from prices of imported products. To this aim we tested for non linearity in relationships between domestic and imported prices and subsequently we specified a non linear threshold vector autoregressive model in which the threshold is endogenously determined.

The analyses we carried out show that the price determination process of domestic and imported products for the most part of cases we examined is non linear. Moreover the endogenous switching threshold that we estimated was found at a level higher than the 92% of the TEP at which the prohibitive specific tariff is applied. This confirms either the hypothesis made by Goetz and Grethe (2009) on the behaviour of trader, as well as the fact that the effects of the EPS on EU domestic prices begin when SIVs are below the TEP and the lower specific tariff is applied.

Only in few cases, particularly the paradigmatic one of tomato imports from Morocco, we found that the EPS plays an insulation effect when the SIVs drop below the estimated threshold. In other cases there is a deterrence effect given by an accumulation of SIVs between the estimated threshold and the 92% of the TEP while a change in the price determination process is shown.

If the EPS has effects on the F&V domestic prices, the stabilization effects are small. On this side, the results of this analysis are not dissimilar from those we obtained in Cioffi *et al* (2011), although the statistical properties are improved. Therefore, the considerations made in that paper on the limited stabilization effects of the EPS remain still valid.

One further issue arises from the circumstance that the econometric analysis confirmed the large country hypothesis we made about the EU F&V markets. The price of imported product are always determined by the EU domestic prices of F&V products. Therefore, the EPS does not have the effect of avoiding that abnormally low priced lots imported from third countries could create disturbance on the EU markets. Instead, the effect is that when market conditions in the EU lead to a domestic price plunge, price of imported products quit to affect their determination process until the SIV is again above the threshold. This is because EU domestic price plunges cause low import prices and not viceversa.

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