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The entry price threshold in EU agriculture: deterrent or 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 European prices of tomatoes, lemons and apples for some of the main competing countries on the European 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 Standard Import Values above the trigger entry price. This paper contributes to clarify the role played by the Entry Price System in avoiding or deterring low priced imports from main European partner Countries.

Keywords: Trade policy, Non-tariff barrier, Entry price system, Fruits and vegetables, TVAR

JEL classification: F13, Q17, Q18.

INTRODUCTION

During the last decades the role and the evaluation of agricultural policies have animated scientists and policymakers' debates, and the agricultural policies implemented in the European Union have largely been in the spotlight (*cfr.* Cardamone, 2011; Kempen *et al.*, 2011; Sieber and Dominguez, 2011; Soregaroli *et al.* 2011; Viaggi *et al.*, 2011 as recent studies).

Among others, a rather complex system of agricultural policies implemented in the European Union is the import regime for fresh fruit and vegetables. There are several reasons explaining such complexity arising from the circumstance that the European Union is at the same time the largest importing country in the world and one of the most relevant producing countries. Such an import regime should help to attain different objectives that, in some situations, could be conflicting: the protection and the stabilization of revenues of domestic

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producers; the supply of large and differentiated provisions to domestic consumers at reasonable price; the integration of the import regime within the international relationships promoted by the European Union, particularly with developing and neighbouring countries.

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 Common Market Organization 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 widely analyzed 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), but a consensus on its effectiveness is still lacking. Furthermore, while «*entry prices for many products are probably not protective, and could readily be abolished*» (Swinbank, 2011), it is also likely they produce (still unclear) distortive effects deserving further investigations (Winchester, 2011; Li and Beghin, *forthcoming*). In 2008 the fruits and vegetable Common Agricultural Policy has been largely modified despite the entry price system has not been changed: further investigations on its effects would be very relevant for future policy decisions.

One feature of the EPS is the possibility given to importers to legally avoid the payments of the specific tariffs when the Standard Import Values (SIVs) are below the Trigger Entry Price (TEP). In order to circumvent the specific tariff, importers may delay imports until the SIVs are above the TEP, or may declare a final sale price of their lots higher than the entry price. Therefore it may happen that European imports of fruits and vegetables occur 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 still open issues on the EPS, there is the assessment of the effects played on the stabilization of European domestic prices, namely the main motivation of such import regime. As showed in Cioffi *et al.* (2011), 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 normal one, which occurs when SIVs are higher. Such a particular price behavior implies an isolation of the internal market from import prices. The effectiveness of the EPS in the EU price stabilization is clear in few cases because it depends 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 rather negligible.

Goetz and Grethe (2009), analyzing the distribution of SIVs around the entry price, conclude that for several products and exporting countries there is an accumulation of SIVs slightly above the TEP. Such feature is regarded 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[2]. Therefore it is worth to analyze if the main 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 the exogenous threshold of the 92% of the TEP in order to conclude on the presence of two different price determination processes, in this paper we address a twofold problem: for cases in which an isolation effect exists, we assess whether there is an endogenous threshold higher than the 92% of the entry price, in other terms whether the isolation is obtained at a level higher than the entry price. While for cases in which the entry price system seemed not effective, we test for the presence of an endogenous threshold at which a sheltering of the EU the domestic prices from low priced imports is shown.

The hypotheses we aim to test have clear and important policy implications. Firstly,

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

detecting a threshold able to isolate the EU market higher than the current TEP implies that while the current policy is effective, we cannot assert it is an efficient policy tool. Secondly, for cases in which the entry price threshold seems ineffective in isolating the EU market, we would conclude on the appropriateness of the import policy for market protection. 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. The proposed approach deepens previous analyzes distinguishing the isolation and deterrence effects of the entry price system: the former is due to a change in prices determination processes, the latter consists in an accumulation of SIVs above the 92% of the entry price.

Our paper aims to contribute to the debate as policy guidance for policymakers by clarifying the effects of entry price system on the prices of imported products and by showing the categories of fruits and vegetables categories for which the system is hardly able to ensure an efficient protection.

The remainder of the paper is as follows: section 2 presents a brief review of recent papers on entry price system and the relevance of the products analyzed 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 section.

RELEVANCE AND EFFECTIVENESS OF THE ENTRY PRICE SYSTEM: AN OPEN DEBATE

The external protection of European fruits and vegetables is modified by preferential trade agreements, contracted particularly with Southern Mediterranean countries. The original agreement introduced a zero tariff import quota, which has been subject to the fulfilment of the reference price system. The entry price system, introduced in 1995, was applied to the products already covered by the reference price, except a few products whose imports, after the enlargement of the EU to include Spain and Portugal Standard Import Values, had become negligible. The functioning of the EPS is based on the daily calculation of the of produce imported from a country. The SIV is an estimation of the *cif* import price through the weighted average of market prices of that product collected on the main European markets[3]. SIVs are published the working day following calculation. If the published SIV of a product imported from a country is lower than the entry price by less than 8%, besides the tariff, imports from that country are also charged of a specific duty that is roughly equal to the difference between the entry price and the SIV. If the SIV is below 92% of the entry price, the specific duty applied besides the tariff is the Maximum Tariff Equivalent. The amount of the MTE for the different products is generally so high that its charge would make imports unprofitable.

In last decade a growing number of papers and articles focused on several aspects of the entry price system, with main concern to its relevance and effectiveness for European market stabilization. Cioffi and dell'Aquila (2004) showed that EPS played a relevant role on the European imports of fruits and vegetables. 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 attention on Mediterranean countries showing their significant preferences compared to other countries 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 Trigger Entry Price would have moderate impact on prices of European domestic products.

[3] SIVs are a weighted sum of average representative prices collected on the import markets within the EU by member states with reference to the importer-wholesaler or wholesaler-retailer stage; in the latter case, they are reduced by 9% to account for wholesaler margin and by € 0,7245 per 100 Kg for handling and market taxes and charges. Representative prices are reduced by a percentage varying from 8 to 15% according to the different markets on which they are surveyed, in order to take account of distributive margins. The Commission reduces representative prices by a fixed amount of €5 per 100 Kg and of import duties.

Tomatoes, lemons and apples are relevant study cases either because of a large number of Standard Import Values 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 apples, China is an exporter to Europe, which is becoming more and more relevant (Table 1).

Spain is the chief European exporter of tomatoes, whilst 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 because of the similar production seasons and target markets, technologies and varieties.

Spain is also the main European producer of lemons (about 650.000 tons per year) and a net intra-EU exporter of lemons. 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, whilst Turkey is the second partner country with a share of 20% spanned from September to April.

China is a growing apple exporter 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.

Table 1 - Export flows towards European Union for selected Countries (.000 €)

	Tomatoes		Lemon		Apples
	Morocco	*Turkey*	*Turkey*	*Argentina*	*China*
2007	*240844*	*26462*	*45191*	*132379*	*33608*
January	*36452*	*1492*	*4340*	*334*	*6369*
February	*29509*	*758*	*1950*	-	*4230*
March	*35580*	*4908*	*1424*	-	*3365*
April	*36065*	*9560*	*497*	*171*	*5585*
May	*9274*	*2355*	*24*	*5366*	*5082*
June	*2320*	*1231*	-	*14779*	*2812*
July	*1415*	*66*	-	*36049*	*1691*
August	*1366*	*148*	-	*39782*	*259*
September	*987*	*352*	*2731*	*25258*	*39*
October	*12718*	*141*	*13248*	*9767*	*12*
November	*33416*	*553*	*10994*	*870*	*999*
December	*41738*	*4893*	*9980*	-	*3159*
2008	*217951*	*17341*	*46588*	*250684*	*29410*
2009	*249277*	*19760*	*54759*	*111454*	*13643*

Source: EUROSTAT

THEORETICAL AND METHODOLOGICAL FRAMEWORK

In order to investigate the effects of the entry price system on European domestic prices of fruits and vegetables, as well as to test for the aforementioned hypotheses, it is assumed that EU is a large country in fruits and vegetables world trade, and price of imported products depend on European markets equilibria. It is also assumed that the domestic and imported F&V products are imperfect substitute in the EU consumers demand, hence domestic and imported produce have similar price determination processes.

Moreover, if the entry price system is effective, the dynamics of European prices and Standard Import Values are influenced by the position of the SIVs with respect to the entry price, hence conditional to the application of the Maximum Tariff Equivalent. The empirical specification is a non-linear two-regimes Threshold Vector Auto-Regressive model (TVAR):

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

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

where I_t represents the switching variable determining when *regime I* (the "normal" regime) or *regime II* occur, P_t are daily prices of EU domestic F&V produce, SIV_t represent the daily Standard Import Values, and the error terms (ε) are assumed to be identically and independently distributed with mean 0 and variance σ^2. In our theoretical model the first regime is defined by the normal functioning of the price determination process. It differs from the second regime which occurs when the SIVs are below the entry price threshold[4]. We refined the model by estimating an endogenous threshold (details are provided in appendix).

As preliminary step we tested for the presence of two regimes versus one regime in the price determination process described in (1). The refuse of the null hypothesis may open the way for two interesting outcomes. The first case occurs when the European domestic price is influenced by the SIVs in the first regime, while the relationship is lost in the second regime (statement A)[5]: the entry price system determines an *isolation effect*. The second situation would be when the linearity test refuses the null hypothesis and the SIVs tend to accumulate above the 92% of the entry price. In such a situation we cannot conclude on the isolation effects of the EPS: it is likely to play a *deterrence effect* (statement B).

A further investigation is made by testing for the endogenous threshold that is able to produce the above mentioned isolation effect. Finally, we quantify the accumulation of SIVs above the entry price in order to explore the hypothesis advanced by Goetz and Grethe (2009). We propose a case-specific index, which takes into account the SIVs and EU price dynamics, by

[4] Similar approaches have been followed in several macroeconomic studies: Tsionas and Christopoulos (2003) analyzed the convergence of macroeconomic variables and inflation; Alba and Park (2005) investigated the relationships among the German Mark and the Turkish Lira; Chen and Lee (2005) deepen on the relationships among government size and economic growth.

[5] Formally, we detect an isolation effect if the following relationships are found:

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

elaborating 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 (1). The *AI* ranges from 0 to 1: the higher the index value, the larger the share of SIVs accumulating above the entry price[6].

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

Testing effectiveness

The first step of our analysis aims to assess whether European domestic prices and Standard Import Values relationships are affected by non-linearity. The non-linearity is a first evidence of possible effects played by the Entry Price System. In particular, if non-linearity in the relationships among EU prices and SIVs is detected we conclude that the entry price system plays an active role in the price determination process. The analysis is conducted by using the Sup-Wald testing procedure proposed by Lo and Zivot (2001). 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 effects.

Testing isolation and deterrence effects

The second step of the analysis consists in the estimation of the model described in (2). 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 TVAR model described by the following system:

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

[6] Values of zero indicates that the 92% of the TEP is the most fitting threshold capable to capture the different functioning of the two different prices regimes and that SIVs seem not to accumulate above the 92% of the TEP. Conversely, values equal to one are possible only when the SIVs never fall below the 92% of the TEP.

with $$I_t(\hat{\theta}) = \begin{cases} 1 & if \quad SIV_{t-1} \geq \hat{\theta} \geq 0.92 \cdot TEP \\ 0 & otherwise \end{cases}$$

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.

As far as tomato imported from Morocco is concerned, since they are imported under a preferential zero tariff quota with a reduced entry price, while such tariff rate quota are binding and change 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.

EMPIRICAL RESULTS

The daily prices were extracted from the *Agriview* database of the European Commission, which collect prices on European wholesale Fruits and Vegetables markets of different member countries. Data on daily Standard Import Values 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 European domestic tomatoes prices were collected on the Almeria (Spain) wholesale market, an important tomatoes producing area whose products directly compete with tomatoes imported from Morocco. The SIVs of tomatoes imported from Turkey have been compared with European prices collected from the French market of Chateau Renard. As regard the cases of lemons, we considered the SIVs of imports from Argentina and Turkey and the EU domestic prices collected on the Murcia (Spain) wholesale market, located in one of the main Spanish lemon producing area. Finally, the SIVs of apples from China have been related to EU prices of Geldermalsen, an important production market.

To sum up, the five study cases are as follows: series collected on the Almeria (Spain) market to analyze the effect of Moroccan tomatoes SIVs (case *a*); series from Chateau-Renard (France) to analyze the effect of Turkish tomatoes SIVs (case *b*); series of Murcia (Spain) prices to analyze the Turkish lemons SIVs (case *c*) and Argentinean lemons SIVs (case *d*); prices collected on Geldermalsen (Netherlands) market to analyze the effects of Chinese apples 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 as a possible low degree of integration between the markets we chose and the SIVs could hide the EPS effects.

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*).

Testing effectiveness

Our first step consisted in testing the hypothesis that the entry price system influences the dynamics of domestic and imported prices. The empirical validation of such a statement consists in testing for the presence of a non-linear relationships among prices.

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 the rejection, at 10% level, of the null hypothesis of a linear relationships between the European domestic prices and SIVs for all but case *d*. In four out of five cases, the Entry Price System induces a non-linear relationships among prices and SIVs.

Our results are coherent with other studies related to the relevance of the entry price system (*e.g.* Cioffi *et al.* , 2011; Goetz and Grethe,2009) and confirm the relevant role played by such a trade policy. Indeed, these preliminary outcomes need to be considered with caution, as the linearity tests may suffer from low statistical power: a deeper investigation is attained through the estimation of the threshold vector autoregressive model.

Moreover, whether the measure is effective for all products and import countries is a still unresolved issue: in particular the effectiveness, rather than the relevance, still cannot be inferred.

Testing isolation and deterrence effects

Besides the estimation of the econometric model (2), results are interpreted by computing an index for the accumulation of SIVs between θ_0 and $\hat{\theta}$:

$$AI = \frac{\widehat{n_2}_{|\hat{\vartheta}} - n_{2|\vartheta_0}}{\widehat{n_2}_{|\hat{\vartheta}}}.$$

where n_2 represents the share of SIVs pertaining to the second regime taking into account the 92% entry price threshold (ϑ_0) or the estimated threshold ($\hat{\vartheta}$). As aforementioned, the higher the *accumulation index*, the larger the accumulation of SIVs above the 92% of the TEP; conversely, the index will assume value equal to zero if no accumulation occurs.

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 entry price, the latter is a descriptive statistics of the accumulation of import values above the entry price, being used as indicator of the influence of the trade policy on the domestic 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 entry price system effects. The *accumulation index* proposed in this paper is case-specific, as it takes into account the SIVs and EU price dynamics: the share of observations "accumulating" above the TEP is function of the endogenous threshold and of prices dynamics[7]. For cases in which we confirmed the relevance of the Entry Price System through the non-linearity tests, the economic interpretation of the index is straightforward: index positive values suggest a possible deterrence effect of the import policy. In other terms, the accumulation of SIVs above the TEP is a necessary but not sufficient condition to conclude on the deterrence effect.

The results of the least squares estimations, summarized in table 3, allow to analyze the heterogeneous situations faced by European policymakers in dealing with different produce and import countries.

Tomatoes imports from Morocco and Turkey seem to be limited by the import regime. Indeed, Moroccan SIVs (case *a*) and domestic prices follow non-linear processes: the hypothesis of linearity is rejected. Moreover, the EPS successfully isolates the European domestic market[8] as SIVs influences EU domestic prices in the "normal" regime, while the relationships stop when the tariff withdrawal is applied. Furthermore, the deterrence effect played by the import regime leads SIVs to accumulate above the entry price[9].

[7] 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 slightly above 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*.

[8] 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.

[9] The estimated threshold is 8% higher than θ_0 with accumulation of SIVs above θ_0 (AI = 0.34).

Table 3 – Econometric results

	Tomatoes		***Lemons***		***Apples***
	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 products imported from Turkey is concerned (case *b*), we cannot conclude on the effectiveness of the import policy in isolating the internal market[10]: its main effect consists in forcing low priced imports to accumulate above the entry price.

The effectiveness of the import regime for lemons imported from Turkey and Argentina is even less clear. In the former case (*c*), while the non-tariff barrier achieves its isolation goal, the SIVs are not likely to accumulate above the threshold price[11], casting doubt on the efficacy of such a protective policy. Moreover, the latter case (*d*) highlights further weakness of the import regime. Indeed, no isolation effect is likely to be achieved, as the linear relationships among the prices is linear and no differences in prices behavior have been detected between the two regimes. Hence, we can also barely conclude on a possible "deterrence" effect. There is a consensus that the different production seasons in Spain and Argentina lead to an high competition in May, which decline more and more until October, when the new harvest season begins. Consistently, a large share of SIVs below the 92% of the TEP during periods of low competition (*e.g.* in October is 47% and in May only 15%) is observed.

Despite the linearity test suggests that prices and SIVs follow a non-linear process, we do not identify any reciprocal influence among SIVs and EU prices allowing to conclude on the isolation effect. Indeed, we observe a limited accumulation of SIVs above the entry price[12], which suggests that, also for apples, the main role of the Entry Price System is to deter low priced imports rather than isolate the European market.

To sum up, in four out of five cases the import regime seems to be effective, as prices follows a non-linear process. However, only in two cases - and with greater evidence for tomatoes imported from Morocco - the EPS seems able to isolate the EU domestic market.

[10] In this case the hypothesis of linearity test is rejected at 10% level but SIVs do not influence EU prices neither in the first nor in the second regime.

[11] SIVs influence domestic prices only in the normal regime. However, the endogenous threshold coincides with the 92% of the TEP and no accumulation of SIVs above the threshold is found (AI = 0).

[12] In particular, the endogenous threshold is identified 9.9% above θ_0 and the index AI equals 0.24.

Therefore, the main effect of the Entry Price Regime is likely to be the limitation of low priced imports.

CONCLUSIVE REMARKS

The paper deepens on the effects of the entry price system on the prices of European Union fruits and vegetables. The analysis has been focused on three selected products, namely tomatoes, lemons and apples, in order to explore the effectiveness and efficiency of the trade policy. On one hand, it has been tested the effectiveness of the import regime in actively influencing the price determination process. On the other hand, we explored the role played by the entry price system in isolating the European market rather than limiting low priced imports.

The analysis has been conducted through an econometric approach consisting in estimating a threshold vector autoregressive model. We tested for the existence of an endogenous price threshold able to provide an isolation effect. Our findings provide a further evidence of the relevance and effectiveness of the entry price regime.

Moreover, we found an empirical support for the hypothesis made by Goetz and Grethe (2009) on the behaviour of trader who tend to supply their products at the lowest possible price able to avoid the tariff payment, as well as for the fact that the effects of the entry price system on European prices is already played when Standard Import Values are below the entry price and the lower specific tariff is applied. Only in few cases, particularly the paradigmatic one of tomato imports from Morocco, we found that the Entry Price System 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 Trigger Entry Price while a change in the price determination process is shown.

If the EPS has effects on the Fruits and Vegetables domestic prices, the stabilization effects are small. From this perspective, the results of this analysis are coherent with those presented 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 European F&V markets. The price of imported products are always determined by the EU domestic prices of F&V products. Therefore, the Entry Price System does not have the effect of avoiding that abnormally low priced lots imported from third countries could interfere with the EU markets. Indeed, we found that when market conditions in the EU lead to a domestic prices plunge, prices of imported products quit to affect their determination process until the SIVs are again above the threshold. This is because EU domestic prices plunges cause low import prices and not vice-versa.

Finally, the conclusive remarks are mainly concerned with hardly perishable fruits and vegetables (*e.g.* lemons and apples), as the possibility to store those products and circumvent the payment of the tariff deprives the Entry Price System of its efficacy (Cioffi and dell'Aquila, 2004). For these products, it could be advisable to improve the Entry Price System by setting more stringent rules able to avoid that foreign products are stored within the European Union and sold on the domestic markets at a favourable import value.

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Methodological appendix

Linearity test

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*[13] (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 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):

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

where m represents the number of regimes and $\hat{\vartheta}$ the estimated threshold. Since the distribution of the sup-LR statistic is non-standard, a bootstrap procedure is adopted to compute *p-values*.

[13] 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.

The linearity tests have been conducted conditional to the trimming parameters[14] (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.

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.

Econometric estimation

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

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

where $\alpha_1$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, we are able to determine the optimal threshold level by minimizing the sum of squared residuals. The minimization problem to estimate equation (2) has been solved within a range of possible

[14] 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.

thresholds from the 92% of the TEP (θ_0) to 130% of θ_0: a larger range of values might lead to estimate the model with by assuming an unreasonable entry price level.

Given the optimal threshold level (θ^*) from the first step, the LS estimator[15] of $\widehat{\alpha} = (\widehat{\alpha}_1, \widehat{\alpha}_2)$ solves the minimization problem

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

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