On the effect of EU trade preferences: evidence for monthly exports of fruit and vegetables from Morocco

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Jel codes: C51, F14, Q17

Abstract

This paper analyzes the effect of monthly trade preferences granted to Morocco by the EU in fruit and vegetables. We apply a gravity framework that takes into account the potential endogeneity of preferences in the estimation, as factors like the historical relationships can be behind both trade preferences and trade flows. Overall, our results show that preferences determine positively the trade flows from Morocco to the EU, being the preferential entry price more effective than the ad valorem reduction in tariffs. Interestingly, our results find sectoral differences, as the reduced entry price is still export-restrictive for vegetables. Finally, we find that the fostering effect of trade preferences differs by EU destination country. Hence, our results have policy implications both in future revisions of the Euro-Mediterranean Agreements and in the deepening of the trade liberalization policy undertaken by Morocco.

Keywords: *EU trade preferences, fruit and vegetables, gravity model, Morocco.*

Résumé

Dans ce travail, nous allons analyser l'effet des préférences commerciales mensuelles accordées au Maroc par l'UE dans le secteur des fruits et légumes. Nous allons appliquer un modèle de gravité qui intègre l'endogénéité potentielle des préférences dans l'estimation, car des facteurs comme les relations historiques peuvent être à l'origine aussi bien des préférences commerciales que des flux commerciaux. Dans l'ensemble, nos résultats indiquent que le système des préférences détermine positivement les flux commerciaux du Maroc vers l'UE dans la mesure où le prix d'entrée préférentiel est plus efficace que la réduction tarifaire ad valorem. Il est à noter qu'il existe des différences sectorielles étant donné que le prix d'entrée réduit est toujours restrictif pour l'exportation des légumes. En plus,l'effet positif des préférences commerciales diffère selon le pays européen de destination. En conclusion, nous estimons que nos résultats ont des implications politiques en vue des futures révisions des accords euro-méditerranéens et du renforcement de la politique de libéralisation du commerce entreprise par le Maroc.

Mots-clés: préférences commerciales de l'UE, fruits et légumes, modèle de gravité, Maroc.

1. Introduction

Agricultural trade liberalization between the EU and the Southern and Eastern Mediterranean countries (SEMCs) is a controversial issue in the political arena. On the European side, the coincidence in the seasonal productive patterns between SEMCs and EU-Mediterranean regions provokes a fierce market competition, especially in fruits and vegetables (F&V). Indeed, stakeholders in Mediterranean EU regions affirm that every revision of the Euro-Mediterranean agreements is an undermining of the Community preference (see discussion in the last sections of Garcia-Alvarez-Coque *et al*., 2012). On the other side of the Mediterranean Sea, some argue that the Association Agreements do not contribute to mitigating food dependency in SEMCs, and contribute to dismantling the protection to key agricultural sectors (Akesbi, 2011).

In the trade literature, the examples considering agro-food trade between these two areas are less frequent than trade in other sectors. Bensassi *et al*. (2012) state that part of this relative scarcity stems from the initial exclusion of agricultural products from the tariff liberalization agreed in the Barcelona process. In addition, the analysis of agro-food trade liberalization in F&V between the EU and SEMCs is a challenging task. One challenge stems from the commercial policies with which the EU protects its domestic production for a set of F&V of main interest to the SEMCs. It applies the Entry Price (EP) system, together with tariff-rate and EP quotas, all of them with seasonal variations. Besides, a second challenge emerges from the trade preferences mutually granted among the EU and each SEMC in the framework of Euro-Med Agreements. These preferences and the variety of trade instruments provoke the existence of a wide array of different situations regarding the tariffs and other barriers to trade levied. Finally, a third challenge is the importance of the heterogeneity among importer countries if trade is considered between SEMCs and several EU countries, rather than the EU as a whole.

Nonetheless, several papers deal with the agro-food trade liberalization between the EU and the SEMCs. For instance, when performing simulations to quantify the impact of the potential inclusion of agricultural goods in the 1996 Customs Union between the EU and Turkey, Nowak-Lehmann *et al*. (2007) find that Turkish vegetable exports would increase by 21%, while Turkish fruit exports would increase by 18.7%.

Garcia-Alvarez-Coque *et al*. (2009) simulate multilateral

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trade liberalization processes in the EU fresh tomato market, considering different options ranging from a tariff reduction to the elimination of the EP system. Their results have implications on the two shores of the Mediterranean Sea: as for the EU producers, they would suffer a certain - although not dramatic- impact in terms of reduced prices and intra-EU sales. Conversely, most of the gains stemming from the liberalization are accrued by Moroccan exporters, as volumes exported and export prices would rise substantially.

Garcia-Alvarez-Coque *et al*. (2010) simulate the phasing out of the EP system for several F&V, considering all the particular trade policies applied. For the different products considered, the phasing out of the EP would affect mainly the vegetables considered rather than the fruits, showing results for tomatoes that are in line with those indicated in the previous paper. Besides, these authors particularly highlight that eliminating the EP system would affect markets differently according to the season considered.

With this background, this paper aims to shed light on the effects on Moroccan exports of the trade preferences granted by the EU in F&V, considered both jointly and separately. In particular, we consider the different border treatments including the trade preferences, the EP system, seasonality and quotas, and taking into account the importance of heterogeneity between importing countries.

Methodologically speaking, we use a gravity model of trade that considers both sectoral and monthly variability of trade preferences: the reduced EP and the preferential tariffs, as well as quantitative limits for these preferences. We contribute to the existing literature in that we construct new indicators for trade preferences in F&V and we introduce them into gravity models. Furthermore, they are estimated by following the most recent economic literature that deals with the problem of endogeneity (Baier and Bergstrand, 2007; Baier *et al*., 2014)[1].

The rest of this article is divided into six sections: after this introduction, section 2 describes the trade policy and preferences applied to F&V by the EU. Section 3 critically discusses the contrasting results of the gravity literature on trade policy and preferences analysis in F&V. Section 4 describes the data used in the empirical analysis. The empirical analysis is presented in section 5, which includes methodological choices, main results and a sensitivity analysis distinguishing the effect of trade preferences on fruits *vs.* vegetables, and for specific EU importers. Finally, the last section concludes with a discussion of policy implications.

2. F&V trade policy in the EU

Since the conclusion of the Uruguay Round, the EU protects some of its F&V through the EP system, which consists of a two-tiered tariff[2]. When the border price of exports to the EU is above the EP level – also called trigger EP, which is set in EU regulations – the consignment is levied by an *ad valorem* tariff; exports priced below the trigger EP are levied with a supplementary specific tariff after being levied with the *ad valorem* tariff. The amount of the specific tariff depends on the relationship between the trigger EP and the border price for the shipment: the cheaper is the product, the higher is the specific tariff applied, the aim being to prevent the entry of cheap products that may undermine market competitiveness of EU production. Thus, when the rate [border price to trigger EP] ranges between 92% and 100%, the specific tariff equals the difference between them (rounded in 2% steps). If the rate is lesser than 92%, the tariff is the maximum tariff equivalent (MTE) for the product according to WTO commitments. Finally, it must be taken under consideration that the trigger EP varies seasonally for every product, as the preferences linked to it do.

The EP system may be understood as a *de facto* minimum import price which reduces market instability. Empirical analyses of the trade flows for products affected by the system appear in several papers (see some recent discussions in Agrosynergie, 2008; Goetz and Grethe, 2009, 2010; Cioffi *et al*., 2011; Santeramo and Cioffi, 2012; Santeramo *et al*., 2014), which generally coincide in that the system is more relevant for vegetables than for fruits. Besides, it also affects differently the EU trade partners, with their limitative effects falling mostly on SEMCs' exports. A review of the implementation of the system has been approved in May 2014, aiming at better accounting for qualitative differences across goods, and also aiming at preventing opportunistic behavior of some operators to circumvent the payment of the specific tariff.

Regarding trade preferences granted by the EU to the SEMCs, they are negotiated under a bilateral basis and thus are not identical across SEMCs. As Emlinger *et al*. (2010, p. 600) point out: "Although the process is known as the Euro-Mediterranean process, the tariff preferences are negotiated bilaterally between the EU and each of its Mediterranean partners on a product-by-product basis". These same authors find that SEMCs have significant preferences compared to other countries exporting to the EU, the magnitude of the preferences differs among countries; Morocco being the country with the highest preferences[3]. In any event,

[1] A standard problem in empirical work is the potential endogeneity of right-hand side (RHS) variables. If any of the RHS variables in a regression is correlated with the error term, that variable is considered econometrically endogenous and ordinary least squares (OLS) may yield biased and inconsistent coefficient estimates.

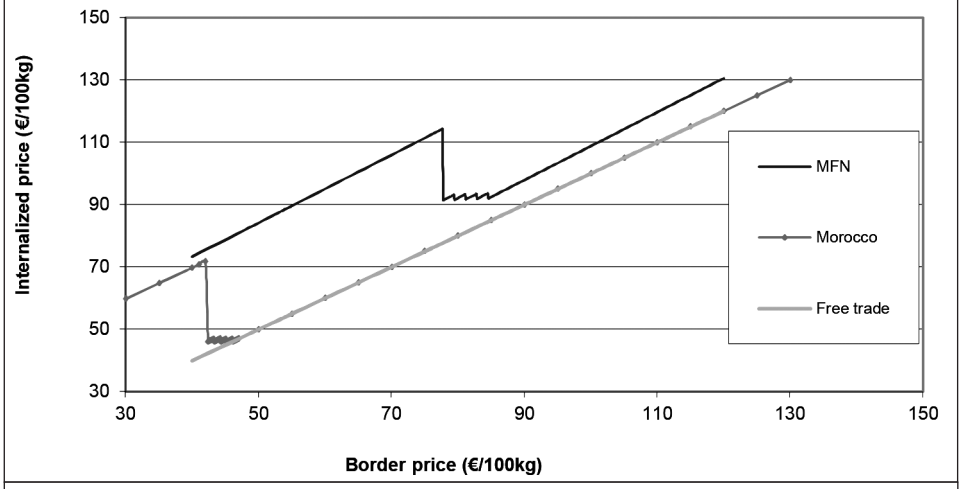
[2] The fresh F&V for which the EP applies are tomatoes, cucumbers, globe artichokes, courgettes, oranges, clementines, lemons, table grapes, apples, pears, apricots, cherries, peaches and plums. Besides, wine and fruit juices also are protected with this system. To implement the system, the border price of imports can be proxied by the Standard Import Value (SIV).

[3] At the end of 2009, the EU and Morocco concluded a revision of the agricultural protocol, which supposed a further liberalization of trade in agricultural products. As explained in the main text, such revision entered into force in 2012.

preferential concessions to SEMCs follow a similar pattern. For a set of goods, free access is granted without quantitative restraints. For other goods, the free access is limited to a specified quantity, over which a tariff reduction usually applies. For some other products, when the EP is of application, the EU has agreed a reduced EP, commonly together with a quantitative limit also known as the EP quota.

As a graphical instance of the effect of trade preferences on prices of imported goods, Figure 1 plots the effect of the trade preferences for tomatoes originated in Morocco compared to the MFN conditions and to the no duty (free trade) conditions, corresponding to March[4]. The effect of preferences can be observed comparing the differences in internalized prices for goods from different origins with the same border price, i.e. the vertical gap at the same abscissa. As shown in Figure 1, Morocco enjoys substantial price advantage compared to MFN countries in all the border price ranges. On the left side of the diagram, relatively cheap imports are not constrained by the MFN trigger EP, as long as they fall between the preferential trigger EP and the MFN trigger EP. Below the preferential trigger EP, Moroccan exports still face a lower *ad valorem* tariff. On the right side of the diagram, the preference consisting on the elimination of the *ad valorem* tariff allows keeping a certain advantage to Morocco, since they enter under duty free conditions[5]. In other words, two products with the same border price may have a substantial difference in terms of after-duties price depending on their origin.

Figure 1 - *Effect on imports' prices of the different border treatment. Morocco vs. NMF countries vs. free trade (Fresh tomatoes, March conditions).*



Source: authors' calculations based on EU regulation on entry prices and EU-Morocco Euro-Mediterranean Agreement.

Emlinger *et al*. (2010) simulate and discuss the impact of a multilateral agreement on the preferential margins of the SEMCs, finding that multilateral liberalization would lead to a reduction in the heterogeneity of access to the EU market among SEMCs. Otherwise, we focus in other major concern for SEMCs: regional trade liberalization. Multilateral *versus* regional trade liberalization differ in that regional trade liberalization grants specific preferences to regional trading partners[6], and then, in our specific case, SEMCs have an advantage in comparison to extra-EU competitors not involved, or that do not include agricultural preferences in trade agreements with the EU.

3. Gravity analysis of F&V trade flows in the Euro-Mediterranean Area

The analysis of the trade flows in the context of specific trade policies for F&V, preferences and seasonality can be made following different lines of research. One approach is using the gravity model, which, in its basic form, assumes that trade between countries can be compared to the gravitational force between two objects: it is directly related to countries' size and inversely related to the distance between them. Exports from country i to country j are explained by their economic sizes, their populations, geographical distances and a set of dummies incorporating some characteristics common to specific flows.

Theoretical support for the research in this field was originally very poor but since the second half of the 1970s several theoretical developments have appeared in support of the gravity model (Anderson, 1979). Anderson and van Wincoop (2003) support the idea that the key aspect of the gravity model is the dependence of trade on a bilateral and multilateral resistance factor. These authors refer to price indices as "multilateral resistance" (MR)[7] variables, since they depend on all bilateral resistances, including those not directly involving the exporting country.

The gravity equation has a very high empirical explanatory power. For this reason, it has been established as a basic tool in the analysis of international trade. Within the gravity framework, we can analyze the effect of, for example, the *ex-ante* and *ex-post* effect of a free trade

[4] The preferential EP and tariff reduction agreed for March has remained unchanged since the first Euro-Mediterranean Agreement. Only the EP quota has been altered after the revisions carried out.
[5] Only for the volumes below the EP quota.
[6] Recall the static effects of the formation of a bilateral trade agreement: trade creation and trade diversion. Note that Emlinger et al. (2010) assume that the structure of Mediterranean exports will remain constant under multilateral liberalization. For example, these authors find that Algeria and Tunisia would lose more than they would gain from multilateral liberalization due to increasing extra-EU competition.
[7] The type of remoteness variable included in traditional gravity equations to proxy average trade barriers relies solely on distance and does not capture other factors impeding bilateral trade flows. To overcome this problem, Anderson and van Wincoop (2003) proposed to include MR, defined as country specific price indices associated to trade among countries having in common a geographical remoteness with respect to the rest of the world.

agreement, the use of a common currency, etc. In this paper, we focus on the *ex-post* analysis of trade preferences granted to Morocco, and then this effect is reflected in the marginal effect, i.e. the marginal effect of X on Y is the change in Y when X changes by one unit, which can be estimated with econometric techniques.

In this aspect, by using a gravity framework, several papers have dealt with the specificities of Euro-Med F&V trade. They are Cardamone (2011), Emlinger *et al*. (2008), and Martí-Selva and Garcia-Alvarez-Coque (2007). There are a number of differences between them.

Martí-Selva and Garcia-Alvarez-Coque (2007) analyze F&V import flows to the EU-15 from eight SEMCs over the period 1995-2004. In their paper, the coefficient of the dummy variable for Algeria, Morocco and Tunisia is found to be negative and significant, thus these countries tend to export less F&V than other countries in their sample. According to their results, although the Euro-Med Agreements are important to boost F&V exports (the estimated coefficient for the dummy variable that equals 1 if the exporting country has an agreement in force is positive and significant from 2000), they fail to compensate for the disadvantage of belonging to this region. Nonetheless, it is important to note that these authors neither control for MR nor use panel techniques to deal with the endogeneity of the trade policy variable and hence, obtained coefficients might be biased.

Emlinger *et al*. (2008) evaluate the role of tariffs faced by Mediterranean countries that export F&V to the EU, taking into account tariff seasonality. To do so, tariff protection measures are taken into account in their model through *ad valorem* equivalents calculated at the product level. These authors include country- and product-fixed effects to proxy for the 'remaining trade resistance'. Their results show that the impact of tariffs varies by country, and they state that this result can be explained by country's product specialization. Specifically, the obtained Morocco's tariff elasticity suggests that tariffs remain an important barrier for its exports. However, another result is that tariff barriers are not the only obstacles to trade and, as the impact of tariffs and non-tariff barriers on trade varies considerably from one exporting country to another and then, the impact of EU-SEMCs liberalization must be discussed country by country and on a product-by-product basis. This conclusion is more recently confirmed by Márquez-Ramos *et al*. (2012), who run regressions for different exporters and different sectors, including tariffs and non-tariff barriers. In fact, Márquez-Ramos *et al*. (2012) find that trade facilitation variables are more important than tariffs and, more specifically, their results show that tariff barriers are non-significant for food products in a sample of 13 exporting countries, while trade facilitation procedures are highly significant. Therefore, additional trade liberalization measures, aside of tariffs, should be considered in a gravity specification that aims to analyze the effect of trade preferences granted to a particular country in a number of agro-food products.

Cardamone (2011) uses monthly data disaggregated at product level, as we do in the present research, to assess the effect of preferential trade agreements on monthly exports of a number of F&V (fresh grapes, pears, apples, oranges and mandarins) to the EU during 2001-2004. This author analyses the effect of all EU preferential schemes operating during this time period and takes not only tariffs into account but also the EU entry price system and quotas. According to her results, regional trade agreements appear effective in expanding EU-bound exports from developing countries for all fruits except oranges. Nonetheless, Cardamone (2011) does not isolate the effect of trade preferences granted to SEMCs on exports addressed to the EU, as she uses 191 exporters for which trade statistics were available.

Regarding the seasonality, to our knowledge Cardamone (2011) is the first study to assess the effect of preferential trade agreements on monthly exports of F&V to the EU by using a gravity model. Interestingly, this author considers whether the quotas are exceeded. Emlinger *et al*. (2008) used three four-month periods within the year, and Martí-Selva and Garcia-Alvarez-Coque (2007) considered annual data. As trade and preferential policies vary throughout the year, decomposing in shorter periods allows for better capturing the differential effects arisen.

4. Data and descriptive analysis

In this research, Morocco has been chosen as it is an interesting case of study. First, among SEMCs it has been granted by the EU the highest number of products with preferential EP; second, quantitative restraints limit such concession and, over those levels, additional tariff reductions apply as well. Third, those restraints are binding in some goods. In addition, the EU is the main destination market for Moroccan F&V. Finally, Morocco was among the most affected countries by the EP system (Goetz and Grethe, 2009; Cioffi *et al*., 2011).

As for the products considered, two fruits were selected (CN 080510 sweet oranges, fresh, and CN 080520 clementines, fresh) as were two vegetables (CN 070200 tomatoes, fresh or chilled, and CN 070700 cucumbers, fresh or chilled). All of them are relevant products in the agro-food exports from Morocco to the EU, and also considering Moroccan market share in extra-EU imports. Some aggregate data on trade figures for the period are shown in Table 1 below. Besides, for the four products Morocco benefits from a preferential EP and, in almost all the period considered, that concession is limited to certain quotas. Only in the case of oranges, the last revision of the agreement eliminated the EP quota. In the period considered, the quotas were filled only in the case of tomatoes. In the periods when the EP is not into force or no preferential EP is granted, Morocco benefits from an *ad valorem* tariff reduction for the four products.

As destinations within the EU, we have selected nine

[8] Belgium and Luxemburg are reported together in Comext statistics and hence treated here as a single destination market. The other countries selected are Germany, Spain, France, the United Kingdom, Hungary, Italy, the Netherlands and Slovakia.

Table 1 - *Trade data for the selected Moroccan F&V at EU markets (in value). 2005/2012.*

	EU-27 share of total Moroccan exports (%)	Moroccan share of total extra-EU imports (%)	Aggregate share in extra-EU imports of the selected EU countries (%)
CN 070200 tomatoes	91.53	64.74	78.79
CN 070700 cucumbers and gherkins	80.73	13.13	49.55
CN 080510 oranges	49.39	11.49	86.35
CN 080520 mandarins	34.64	25.87	81.79

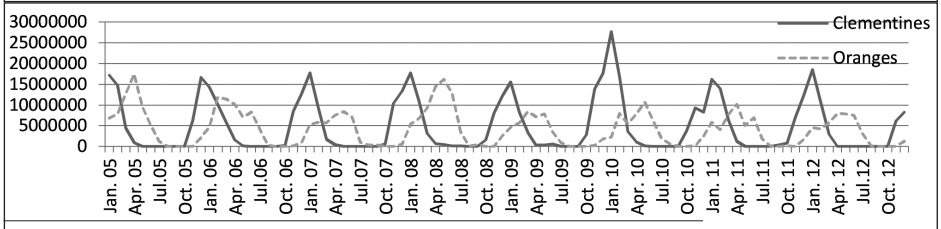
Source: authors' calculations from Comtrade and Comext databases.

countries[8], rather than the EU itself. We proceed this way for theoretical reasons and because of adequate monthly data availability. Among the countries selected we aimed to include different instances regarding their own features and relations with Morocco. France has traditional political, social and commercial links with Morocco, illustrated by the relevance of their bilateral trade flows. Other countries such as Germany and the United Kingdom are large net importers of F&V; Italy and Spain are also big importers and show a noticeable domestic F&V production as may be the case as well of Belgium and the Netherlands, which have a smaller domestic market. In the other two cases, both Hungary and Slovakia belong to the Eastern EU members, whose accession took place in 2004. In three of the four products, the aggregated market share of the countries selected is close to or greater than 80 per cent of total extra-EU imports (see Table 1).

Our analysis extends from 2005 to 2012, so that all the countries considered were EU members at that time. The preferential agreement with Morocco was modified to enlarge the quotas because of the EU enlargement in May 2004. Its subsequent revision entered into force in October 2012, hence affecting the end of the period covered in the analysis[9]. Table 1 summarizes some trade data for the product and periods considered, in value terms.

Exports from Morocco to the EU (i.e. imports originated in Morocco) are considered on a monthly basis, due to the different seasonal border treatment applied to them –in some cases, the EP level varies even within a month, and also due to the marked seasonality of trade flows for the goods considered. The monthly trade flows have been collected from Eurostat-Comext Database. Figure 2 shows the evolution of the trade value for the imports originated in Morocco of the two citrus fruits that we consider (clementines and oranges) along January 2005-December 2012. It is noticeable that the imports take place almost only from October to May in clementines and November to June in oranges[10].

Figure 2 - V*alue of the imports originated in Morocco to the selected EU countries, 2005-2012. Oranges and clementines.*



Source: Authors' calculations based on Comext database.

5. Empirical analysis

5.1. Methodological issues

The present article is based on the model specification provided in Baier and Bergstrand (2007) and Baier *et al*. (2014) for total bilateral exports, which we adapt to measure the effects of sectoral trade preferences on monthly exports. They begin with the following gravity model:

$$ln\left(\frac{X_{ijt}}{Y_{it}Y_{jt}}\right) = \beta_0 + \beta_1\left(lnDIST_{ij}\right) + \beta_2\left(CONTIG_{ij}\right) + \beta_3\left(COMLANG_{ij}\right) + \beta_4\left(EIA_{ijt}\right) - ln\Pi_{it}^{1-\delta} - lnP_{jt}^{1-\delta} + \varepsilon_{ijt} \quad (1)$$

Where ln denotes natural logarithms; X_{ijt} is the value of the aggregate export flow from country i to country j in year t; Y_{it} (Y_{it}) is GDP in country i (j) in year t; $DIST_{ij}$ is the bilateral distance between the economic centres of i and j; $CONTING_{ij}$ is a dummy variable assuming a value of 1 if the two countries share a common land border (and 0 otherwise); $COMLANG_{ij}$ is a dummy variable that takes a value of 1 if the two countries share a common language; EIA_{ijt} is a variable indicating the level of integration between the two countries in year t, and $ln\Pi_{jt}^{1-\delta}$($lnP_{jt}^{1-\delta}$) is exporter i´s (importer j´s) non-linear and unobservable MR price term.

When estimating the effects of the economic integration agreements, or EIA (β_4), if this variable is correlated with the error term, it is econometrically endogenous and OLS can lead to biased and inconsistent coefficient estimates for β_4. In order to eliminate endogeneity bias from the variable EIA, Baier and Bergstrand (2007) propose using panel techniques and estimation by FE of the following equation:

$$lnX_{ijt} = \beta_0 + \beta_1 EIA_{ijt} + \eta_{ij} + \delta_{it} + \psi_{jt} + \varepsilon_{ijt} \quad (2)$$

[9] Regarding the goods considered in this paper, the last revision eliminated the quota for oranges (CN 080510), and enlarged the quotas for tomatoes (CN 070200), cucumbers (CN 070700) and mandarins (CN 080520). Otherwise, the value and periods of the preferential EP were not changed.

[10] A similar seasonal pattern is observed for the two vegetables. It is not depicted for space reasons.

Where η_{ij} is a country-pair fixed effect to capture all time-invariant bilateral factors influencing nominal trade flows[11]; δ_{it} and ψ_{it} are exporter-time and importer-time fixed effects, respectively, to capture time-varying exporter and importer GDP, as well as all other time-varying country-specific effects that are unobservable in i and j and influence trade, including the exporter´s and importer´s MR terms.

Furthermore, Baier and Bergstrand (2007) and Baier *et al*. (2014) proposed using first differences (FD) techniques to avoid the problems stemming from potential serially correlated errors and unit-root processes for RHS variables in equation (2). Although the FD transformation eliminates the unobservable pair-specific changes over time (η_{ij}), the unobservable ij might be still playing a role. Therefore, Baier *et al*. (2014) suggest introducing pair-specific fixed effects after FD transformation of equation (2):

$$\Delta lnX_{ijt} = \beta_0 + \beta_1 \Delta(EIA_{ij\,t}) + \eta_{ij} + \delta_{it} + \psi_{jt} + \Delta\varepsilon_{ijt} \quad (3)$$

In the empirical analysis, we deal with the abovementioned problem of endogeneity by using panel techniques. We estimate two different specifications. First, equation (4) (by FE) and, second, equation (5) (by FD):

$$lnX_{jks} = \beta_0 + \beta_1 var_{ks} + \psi_{jt} + \pi_{kt} + \mu_{jk} + \sigma_m + \varepsilon_{jks} \quad (4)$$

$$\Delta_{12} lnX_{jks} = \beta_0 + \beta_1 \Delta_{12}(var_{ks}) + \psi_{jt} + \pi_{kt} + \sigma_m + \Delta_{12}\varepsilon_{jks} \quad (5)$$

Where j is the importing EU country; k is the traded sector; s refers to each month Jan-Dec during the period 2005-2012; m refers to monthly (Jan-Dec) variability and t to yearly (2005-2012) variability; Δ_{12} is twelve-month (annual) FD; var_{ks} are var1, var2, and var3; ψ_{it}, π_{kt} and σ_m denote importer-year, sector-year and monthly fixed effects, respectively. By including dummies with importer-year (ψ_{it}) and product-year (π_{kt}) variability, we are controlling for factors not included in the regression but that may have affected exports of Morocco. As an example, we might cite the problem of *E.coli* that occurred in the cucumber campaign in May 2011[12]. Finally, μ_{jk} is the unobservable heterogeneity that does not vary over time but might vary depending on importers and products. This term is dropped from the equation in FD, ε_{jks} while is the error term.

With regard to the analysis of trade preferences in the related gravity literature, Martí-Selva and Garcia-Alvarez-Coque (2007) add a dummy variable to capture the effect of the Euro-Med agreements, as is typical in the analysis of trade integration (Bensassi *et al*., 2012; Baier and Bergstrand, 2007). This type of variables has been recently questioned, as it might be argued that the reality of a trade integration agreement is poorly represented (Florensa *et al*., 2015). This is specially the case for F&V, due to the complexities in the trade policies that have been discussed above. Hence, Emlinger *et al*. (2008) introduced in the gravity equation the applied tariff and Cardamone (2011) captured preferences in the EP as a dummy variable, and the preferences in tariffs applied were measured as the difference between most favored nation (MFN) and preferential tariffs.

In addition to considering more accurate variables than previous research to capture the sectoral and monthly variability of trade preferences, and in line with the most recent gravity literature (Baier and Bergstrand, 2007; Baier *et al*., 2014; Florensa *et al*., 2015), we suggest an approach that implies a more precise estimation procedure in the case of F&V, taking into account the methodological developments to consider the econometric problem of endogeneity of trade liberalization measures. In fact, there are at least two reasons to believe that trade preferences are endogenous in econometric terms, and that this endogeneity should be corrected in order to obtain unbiased coefficients. One of them is the non-linear and unobservable multilateral price/resistance term (Anderson and Van Wincoop, 2003). A second reason is that trade preferences reflect specific interests and historical trade relationships. In this vein, results obtained in Emlinger *et al*. (2010) illustrated the heterogeneity of the current preferences of each Mediterranean country. They state that the factors behind this heterogeneity are the vulnerability of European producers, the reciprocity in the preferences, and the anteriority in the trade position of some traditional F&V exporters to the EU, as is the case of Morocco. As these factors might significantly impact F&V exports from SEMCs to the EU and they are correlated with trade preferences, a gravity equation estimated for F&V sectors should control for endogeneity bias. To do so, we estimate two different specifications, firstly, by using fixed effects (FE) and, secondly, by using first-differences (FD).

Additionally, in our sample, the frequency of not available values that might be (or might be not) representing exports equal to zero is 1,998 observations, i.e. 57.8% of a total of 3,456 observations (4 sectors*8 years*12 months* 9 destinations). Previous literature has used Poisson Pseudo Maximum Likelihood (PPML) to deal with heteroskedasticity and to take into account those observations of the dependent variable that are equal to zero (Santos-Silva and Tenreyro, 2006, Martínez-Zarzoso and Márquez-Ramos, 2008; Burguer *et al*., 2009; Martínez-Zarzoso, 2013). Martínez-Zarzoso and Márquez-Ramos (2008) used a sample of

[11] Note that the fixed effect terms absorb all effects that are country-pair specific, namely distance, common border and language. Thus, these country-pair-specific variables do not appear in equation (2).

[12] According to the data available, Germany imported Moroccan cucumbers per value of 15,685 euros in May 2011, while it did not import cucumbers from Morocco in the rest of months along the period considered. Recall that the E. coli outbreak began on 2 May 2011 and initially Spanish vegetables were identified as the source of contamination. As a first panic response, a substitution for vegetables from other origins, including Morocco, took place. A detailed description of the events can be found at http://en.wikipedia.org/wiki/2011_Germany_E._coli_O104:H4_outbreak. At http://www.efsa.europa.eu/en/press/news/120711.htm a press release summarizing the EU sanitary response can be found.

data with sectoral variation, as we do in the present research. Nonetheless, there is a lack of studies on the related literature that compare the performance of different specifications of the gravity model when the seasonal variation of F&V is taken into account (i.e. using monthly trade flows of specific sectors).

In favor of the methodology proposed in the present research, it can be argued that although those records that equal zero are not taken into account when taking logarithms in the estimated regressions, when we take first differences (our preferred specification) to control for the endogeneity of our variables of interest we might have either positive or negative values. If in a particular month, say in 2007, Morocco does export the sector k to country j, but in the same month of the previous year (2006) it exported less; it results in a positive value of the dependent variable when using the FD methodology. We can also have negative values of the dependent variable in FD if, for instance, in a particular month in 2007 sector k was exported to j, and in the same month of 2006 exports were higher, and hence the dependent variable takes a negative value. PPML is used with count variables and is suitable when the dependent variable takes non-negative integer values. It is especially suitable when excluding zeroes leads to a very low number of observations reducing the efficiency of the estimator, but as we have monthly and sectoral data, this is not the case.

Turning now to the specification of regional preferences, as we aim to capture the relevance of trade preferences for Morocco, we construct three variables that consider different perspectives of trade preferences stemming from the application of the agreements[13]. The first variable (var1) indicates the EP reduction granted to Morocco in the four products, calculated as the agreed reduction of the MFN EP. When no preferential EP or no EP are applied, this variable equals 0. In regressions that include this first variable (var1) we use a relative measure instead of the absolute difference between the MFN EP and the reduced EP, i.e. the granted percentage reduction in the MFN EP [1-(EP Pref/ EP MFN)]. However, the absolute difference is the variable taken into account to compute a synthetic indicator of the preferences reflected by means of var1 and var2.

The preferences are limited in two ways: on the one hand, a preferential EP often applies only to a certain quantity; over this quantity, a tariff reduction is usually applied. On the other hand, in periods with no EP in force or no preferential EP agreed, there is an *ad valorem* tariff reduction that may also be limited to a certain quota or reference quantity. Therefore, we define a second variable (var2), which corresponds to the *ad valorem* tariff reduction and captures the effects of the quantitative constraints. The variable is calculated as the percentage of reduction in regard to the MFN *ad valorem* tariff.

Finally, we develop a third indicator (var3) to be included in a unique model specification that encompasses the impact of the two abovementioned trade policy instruments, i.e. it focuses on both the preferential EP and the tariff reduction. Specifically, var3 is constructed as the sum of the standardized[14] value of var1 and the standardized value of var2. The effect of the three variables on Moroccan F&V exports is expected to be positive, as the higher the preferences granted to Morocco, the higher the Moroccan exports are expected to be. Table 2 summarizes the values of the three variables and the cases when they occur.

Table 2 - *Cases in the preference variables.*

Cases	**Var 1**	**Var 2**	**Var 3**
No EP in force or No preferential EP	0	Granted % reduction in the MFN *ad valorem* tariff	Granted % reduction in the MFN *ad valorem* (Standardized)
Preferential EP in force and no quota or quota not binding	1-(EP Pref/ EP MFN)	0	EP MFN- EP Pref (Standardized)
Preferential EP in force and quota binding	1-(EP Pref/ EP MFN)	Granted % reduction in the MFN *ad valorem* tariff	EP MFN- EP Pref (Standardized) + Granted % reduction in the MFN *ad valorem* (Standardized)
Expected sign	+	+	+

5.2. Main results

With regards to the obtained results, we first observe that the variable that measures the reduction in the EP, has positively affected monthly exports from Morocco (var1, see columns 1-2 in Table 3)[15]. Columns 2 and 4 in Table 3 show the results related to var2, which takes into account the tariff reduction linked to quotas. The results show that the estimated coefficient for var2 is positive and significant at 10% significance level in equation (4) (column 2), although it is positive and significant at 1% level when using FD. The var3 is positive and significant in both FE and FD specifications (see columns 3 and 5 in Table 2). The most conservative results obtained for the synthetic indicator, i.e. var3, show that *ceteris paribus* a one-unit increase in the index of preferences granted to Morocco is estimated to in-

[13] Note that because the tariffs applied in preferential agreements are generally defined as percentages of MFN tariffs, a multilateral trade liberalization agreement would imply the same reduction for preferential tariffs as for MFN tariffs. It allows (partially) guarding against preferences erosion (Tangermann, 2002; Emlinger et al., 2010).

[14] Mean equal to 0 and standard deviation equal to 1.

[15] This variable does not vary enough to estimate β by FD. When we run FE regressions, var1 is introduced alone in the regressions (column 1) and with var2 (column 2).

crease monthly exports of F&V by about 12% (column 5). Finally, as each variable is measured in different units, we calculate beta coefficients to be able to compare the magnitude of the effects in terms of standard deviations in the model presented in column (2): for var1, the beta coefficient equals 0.26, while it is equal to 0.05 for var2. According to these results, an increase in var1 increases Moroccan exports to a higher extent than a similar increase in var2.

These results indicate that preferences matter and that the two types of trade preferences granted to Morocco by the EU have a positive and significant effect on Moroccan monthly exports of F&V when considering the four goods altogether. Furthermore, the type of preferences applied is also relevant and, in particular, we have found that the preferential EP granted to Morocco is a more effective strategy to increase Moroccan exports than the reduction in the MFN *ad valorem* tariff.

Table 3 - *Main results.*

Model	FE1	FE2	FE3	FD2	FD3
(column)	(1)	(2)	(3)	(4)	(5)
var1	3.301***	3.462***			
	(9.036)	(9.233)			
	[0.250]	[0.262]			
var2		0.613*			
		(1.873)			
		[0.049]			
var3			0.227***		
			(4.923)		
			[0.136]		
Δ_{11} (1 1 1 2)				0.676**	
				(2.246)	
Δ_{11} (1 1 1 3)					0.120**
					(2.218)
Observations	1458	1458	1458	1254	1072
R2	0.3360264	0.3377683	0.3079569	0.2051651	0.1640389
RMSE	1.283504	1.2823	1.310353	1.129407	1.145855

Notes: ***, ** and * indicate significance at 1, 5% and 10%, respectively. T-statistics are provided in brackets. FE1, FE2 and FE3 show results of the effect of var1, var2 and var3, respectively, on Moroccan monthly exports when using equation (4). FD2 and FD3 show results of the effect of var2 and var3, respectively, on Moroccan monthly exports when using equation (5). Beta coefficients are presented for FE in square brackets below t-statistics.

5.3. Sensitivity analysis

After the main results, an additional analysis is carried out aiming at showing whether the previous results are different considering fruits *vs.* vegetables and also by destination country. As mentioned above, there are noticeable differences among the importing EU countries selected regarding the historical trade flows with Morocco, the size of the domestic market, the productive pattern and the likely competition with Moroccan products. Regarding the differences between fruits and vegetables, only the quotas for tomatoes are binding, which could imply differences in the significance of variables by increasing the significance of var2 for vegetables. Therefore, we check if country and sectoral heterogeneity, i.e. heterogeneity among importers and of fruits *vs.* vegetables, imply differences in the effect of the trade preferences and so, we run separate regressions to seek for different behaviors between F&V, and between importing EU countries.

In a first sensitivity test, we run regressions separately for fruits and vegetables. Specifically, we re-estimate equation (4) including var1 in a regression for fruits (oranges and mandarins) and both var1 and var2 in a regression for vegetables (tomatoes and cucumbers), as tomatoes are the only F&V where we observe that the quotas were filled in the period taken into account. The first two columns of Table 4 show the results obtained. They highlight the differences in the influence on exports of the two variables, as in vegetables the reduced EP is not significant to increase exports.

As a second sensitivity test, we re-run equation (4) by introducing into the model the interaction of var1, which we have found to be overall the more effective strategy to increase Moroccan exports to the EU, and a dummy variable for every importer (France is the base group). Then, we modify equation (4) as follows:

$$lnX_{jks} = \beta_0 + \beta_1 var1_{ks} + \beta_2(var1_{ks} \cdot UK) + \beta_3(var1_{ks} \cdot Germany) + \beta_4(var1_{ks} \cdot Spain) + \beta_5(var1_{ks} \cdot Italy) + \beta_6(var1_{ks} \cdot Slovakia) + \beta_7(var1_{ks} \cdot Hungary) + \beta_8(var1_{ks} \cdot Netherlands) + \beta_9(var1_{ks} \cdot Belgium) + \psi_{jt} + \pi_{kt} + \mu_{jk} + \sigma_n + \varepsilon_{jks} \quad (4a)$$

For the case of the UK, for example, the semi-elasticity of exports with respect to the preferential EP granted to Morocco is $100 \cdot (\beta_1 + \beta_2)$. Note that as 'UK' is a dichotomous variable that equals 1 when the importer is the UK (0 otherwise), if $\beta_1 > 0$ and $\beta_2 > 0$ the positive effect of var1 is higher for Moroccan exports to the United Kingdom than to France. Otherwise, if $\beta_1 > 0$ and $\beta_2 < 0$, then the positive effect of var1 is higher for Moroccan exports to France than to the United Kingdom.

Column 3 in Table 4 shows the obtained results for the four products taken into account. We find the highest positive effect of the EP system for France, Germany and Hungary (note that β_3 and β_7, although negative signed, are not statistically significant), and the lowest effect is found for Belgium and, to a lesser degree, Spain and the Slovak Republic. In these three cases, the semi-elasticities are between zero and one, while for the other destinations they are more than two.

Table 4 - *Sensitivity analysis*

	FE1- Fruits (1)	FE2- Vegetables (2)	FE1 with interactions- Fruits and vegetables (3)
var1	9.497*** (9.543)	-0.351 (-0.438)	5.968*** (11.329)
var2	-	1.655*** (5.039)	-
var1*UK	-	-	-3.862*** (-5.686)
var1*Germany	-	-	-0.955 (-1.065)
var1*Spain	-	-	-5.097*** (-7.818)
var1*Italy	-	-	-3.521*** (-2.759)
var1*Slovakia	-	-	-4.958*** (-5.744)
var1*Hungary	-	-	-3.431 (-1.157)
var1*Netherlands	-	-	-1.580** (-2.144)
var1*Belgium	-	-	-5.314*** (-4.269)
Observations	661	797	1458
R2	0.6291815	0.8580066	0.3786418
RMSE	1.388773	0.9884984	1.245372

Notes: ***, ** and * indicate significance at 1, 5% and 10%, respectively. T-statistics are provided in brackets.

6. Conclusion and policy implications

Moroccan authorities have undertaken an aggressive trade liberalization agenda, including bilateral trade agreements with main players such as the EU or the United States. In these agreements Morocco has pushed hard to obtain significant trade preferences in some sectors with comparative advantages such as F&V, allowing in turn market access concessions in other sectors such as sugar or cereals. These preferences may be relevant in economic terms due to the relative high level of custom duties for agro-food products, resulting from a trade liberalization process that is slower than in other goods.

With this panorama, this paper aims to quantify the effect of the different trade preferences granted to Morocco by the EU on F&V trade flows. For the empirical application, we focus on monthly exports of four F&V –cucumbers, tomatoes, oranges and clementines- from Morocco to a number of EU countries that account for the majority of Moroccan exports over the period 2005 to 2012. By using panel techniques (fixed effects and first differences) to deal with endogeneity problems that are inherent to trade policy variables, as is the case of Preferential and Free Trade Agreements, we analyze the effect of different measures of trade preferences granted to Morocco. Specifically, we have designed a set of variables to account for the wide array of different preferential concessions in a more detailed way than previous research. The paper shows that these variables can be included in a gravity approach to quantify and compare the effect that different types of preferences have on exports.

Our results indicate that trade preferences granted to Morocco by the EU have a positive and significant effect on Moroccan monthly exports of F&V. These results are in line with previous research based on the gravity framework to deal with the specificities of Euro-Med F&V trade. The preferential EP is significant and positive for Moroccan exports, as is the *ad valorem* reduction in tariffs over EP quota or when no preferential EP applies. Besides, such tariff reduction increases its relevance in vegetables, when the quota is filled, as is the case of tomatoes.

Additionally, the preferential EP granted to Morocco seems to increase Moroccan exports to a higher extent. This is in line with the results obtained by Emlinger *et al*. (2010) -with a different methodology, the preference margin- who find that preferential EP offers Morocco a considerable advantage, mainly for tomatoes, cucumbers and mandarins. Nevertheless, this fact needs to be qualified with the result that, when running separately the regressions for fruits and for vegetables, the reduced EP is not relevant to foster exports in the case of vegetables. This result can be explained by the restrictiveness of the EP for vegetables, even after been lowered by the preferences; on the other hand, for fruits, the lowering of the trigger EP to preferential level allows increasing exports, hence the preferential level is not restrictive.

These results are also in line with those of Goetz and Grethe (2009), who measure the "relevance" of the EP system with a very detailed empirical analysis. They find that Standard Import Values (SIVs) for Moroccan tomatoes and cucumbers tend to accumulate much closer to the preferential EP than SIVs for Moroccan oranges and clementines. It indicates that "exporters could supply at lower prices but do not do so in order to avoid triggering specific tariffs" (Goetz and Grethe, 2009, p. 85). In the same line, Garcia-Alvarez-Coque *et al*. (2010) consider that exporters can shift strategically upwards their supply curve for the cases with SIVs accumulated slightly above or below the trigger EP. In their analysis of the SIVs for tomatoes, cucumbers, clementines and table grapes in a given marketing year, they find pieces of evidence of such behavior taking place for Moroccan cucumbers and tomatoes in specific time periods.

Furthermore, we find that the effect of trade preferences on F&V to foster exports differs by importing country, since the effect is greater for France, Germany and Hungary than for the other countries. In the case of France, it could indicate that historical and consolidated trade relations matter when exploiting the preferences. On the other extreme, the export-fostering effect of preferences for Spain and Belgium as importers is of minor relevance. The result could be related to the presence of a strong domestic production competing with Moroccan production. Nevertheless, the competition issue remains open as a thorough analysis considering origins, qualities and prices could be more determinant.

These results contribute to the debate on the political approach chosen by the Moroccan Government to foster food security. Indeed, they indicate that the Moroccan policy option consisting on negotiating trade preferences in sectors with comparative advantages has been translated into export increases. According to Cardamone (2011, p. 565) "in the literature on the effect of PTAs [preferential trade agreements] on trade, trade preferences are more often represented by a dummy variable equal to 1 if the importer grants a preference to the exporter and 0 otherwise, which is used to estimate the trade creation effect of a PTA". Following this interpretation, and using more accurate variables to measure trade preferences, our analysis provides evidence of the existence of trade creation effects of the EU trade preferences granted to Morocco. Nonetheless, it does not take into account trade diversion effects. Further research could investigate whether the EU trade preferences granted have a trade diverting effect for those extra-EU partners that might be considered competitors for Morocco.

With regards to the increase of exports, previous research has proven that the value-added agriculture in SEMCs is lower than in other developing countries (Binswanger-Mkhize and McCalla, 2010) and hence more emphasis has to be given to non-price competitiveness strategies to add value. Instead, agricultural policies that only aim at lowering production costs irrespective of their impact on consumer value may harm the competitiveness of the value chain (Sausman *et al*., 2015); accordingly, these authors

propose a set of alternative actions to improve quality attributes as perceived by consumers in destination countries, both in production and in post-harvest operations. Therefore, to fully accrue the advantages in access to the EU market, Morocco could foster the dissemination of market information, incentivize the adoption of the adequate varieties, and can provide with quality control and certification facilities, among other actions in this line.

In this respect, literature identifies barriers to participate in international markets particularly burdening smallholders, such as the poor access to market information, lack of literacy and technical skills, poor organization and infrastructures, and onerous pre-requisites to engage into the private standards (see Fayet and Vermuelen, 2012; Vorley and Thorpe, 2014). Some of these barriers could be eased with extension and local research (King-Okumu and Aboukheira, 2015) carried out by national authorities, perhaps with the support of the EU funding through the European Neighbourhood Programme for Agriculture and Rural Development (ENPARD), as discussed below. The role of public-private investment in infrastructure has been recently demonstrated as an enhancer of agricultural exports in a set of developing countries, being Morocco among them (Soriano and Garrido, 2015).

Notwithstanding with that, the food price spikes occurred since 2007 have put into question the export-orientated approach in some SEMCs (Harrigan, 2012), including elements in the discussion about achieving food security other than fostering exports. As an instance, Lampietti *et al*. (2012) highlighted the high logistics costs for cereal imports in a number of countries in the region. In fact, most of the final cost of the cereals imported is due to transport and storage costs. These authors calculated that port logistics were a bottleneck for Moroccan imports, in terms of both costs and time. Hence, improving logistics services could lower the import bill and contribute to achieve food security at country level.

Another key element influencing food security in Morocco –and, in general, in all the SEMCs- is sustainability. In fact, Morocco adopted its Green Morocco Plan in 2008, as its new a strategy to foster development and tackle food insecurity. Apart from bolstering the agro-exporter sectors, the sustainable use of resources appears as a crucial element in the actions planned. In terms of deterioration of natural resources, soil erosion and the deterioration of the arable layer is a growing concern in Morocco, especially in remote and dry regions, where the local population is overusing this resource due to the population growth and does not have enough financial capacity and skills to manage it in a more prudent way. Similarly, the SEMCs region is well known for its limitations in water availability, due to its irregularity, scarcity and fragility (Blinda and Thivet, 2009). According to these authors, Morocco is currently under a water stress in terms of availability per inhabitant, although it is in a better position than other SEMCs under water shortage. Besides, their prospects indicate an increment in the exploitation index of this resource, with situation worsening for 2025. While the specific actions to be taken to enhance sustainability are beyond the scope of this paper, it can be argued that any long-term strategy for food security necessarily has to consider how to reduce pressures on natural resources.

Besides, some authors argue that the past emphasis put on trade liberalization has distracted attention from other issues crucial to agricultural and rural development in SEMCs (Petit, 2015; Petit *el al*., 2015). Particularly, they point out the need of bolstering civil society organizations and local institutions such as genuine farmer cooperatives, local microcredit institutions or water use associations. In this respect, the ENPARD initiative can be an opportunity to support local institutions through its funds and the European experience on enhancing local networks.

As a final policy implication, we turn now the attention to the EU side. In the past, EU producers of F&V have been reluctant to the market access concessions given to Morocco, being the debate on the last revision of the Euro-Mediterranean agreement the last acrimonious instance. In fact, overall volumes imported by the EU have not increased sharply as a result of subsequent agreements and revisions, with the biggest market share for intra-EU origins in F&V such as the four products studied in this paper. However, it is undeniable that for certain products, some specific days or weeks, EU prices have been affected by import surges from Morocco. Nevertheless, the issue of lack of profitability experienced by some EU F&V producers has more to do with the uneven distribution of market power along the value chain than with the Moroccan and SEMC competition (Garcia-Alvarez-Coque *et al*., 2012).

The EU is beginning to acknowledge the problem of the uneven distribution of market power and in the last 2014 Common Agricultural Policy (CAP) reform some steps are taken in this direction in the agricultural sector, while some Member States are exploring regulations in this same direction. Besides, the CAP is encouraging the collective action of producers of F&V through the Producers' Organizations (POs) as an instrument to overcome this unbalance since decades ago. According to the past performance of POs, the effects of this policy on concentrating the supply vary across EU countries and the level of concentration is smaller in Southern EU countries. But certainly this policy is encouraging market orientation with farmers planning their production and meeting demand requirements increasingly as time goes by. In our opinion, this policy is more adequate to face the EU producers' challenges, such as foreign competition, than non-targeted income transfers or an unlikely return to stricter border protection.

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Appendix

Table A.1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lx	1681	12.55804	2.461608	3.988984	19.21085
var1	3744	0.1632044	0.1852862	0	0.5936652
var2	3744	0.0546474	0.172656	0	0.6
var3	3456	0.0263759	1.332964	-1.04633	6.207061