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# A gravity assessment of Moroccan F&V monthly exports to EU countries: The effect of trade preferences revisited

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## Abstract

We analyze the effect of different trade preferences granted to Southern and Eastern Mediterranean Countries (SEMCs). Specifically, we focus on monthly exports of four fruits and vegetables from Morocco to EU countries. We construct three indicators that consider different types of preferences and trade policies, and we include them in a gravity model. Furthermore, quantitative limits for these preferences are modelled. Our main results are that trade preferences are significant in positively determining exports from Morocco to the EU. Therefore, the Moroccan policy option that consists on negotiating trade preferences in key competitive sectors is translated into export increases.

**Keywords:** Gravity; fruits and vegetables; trade preferences; EU countries; Southern and Eastern Mediterranean Countries.

## 1. Introduction

Moroccan authorities have undertaken an aggressive trade liberalization agenda, including bilateral trade agreements with main players such as the EU or the USA. In these agreements, Morocco has pushed hard to obtain significant trade preferences in certain competitive sectors, allowing in turn domestic market access concessions in other sectors such as sugar or cereals. In parallel, through the Green Morocco Plan, the government is encouraging investments in several sectors that benefit from comparative advantages, to be exploited in foreign markets.

With this panorama, this paper aims to assess whether the different trade preferences granted to Morocco by the EU foster Moroccan exports of these goods. For the empirical application, we focus on monthly exports of four fruits and vegetables (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.

Methodologically speaking, we use a gravity model of trade that considers both sectoral and monthly variability of trade preferences: the reduced entry price (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 and introduce them into gravity models. They are estimated by following the most recent literature that deals with the problem of endogeneity. Particularly, we estimate two different specifications, fixed effects and first-differences (FD).

This article is divided into four sections: after this introduction, section 2 describes the data and the model specification used in the empirical analysis. The main results are presented in section 3. Finally, the last section concludes with a discussion and policy implications.

## 2. Data, variables and method

Morocco was chosen as an interesting case of study for several reasons: its F&V are among the main agro-food exports from Morocco and the EU is their preferred destination market. In terms of access to the EU market, several Moroccan F&V benefit from a preferential EP below the Most-Favoured Nation (MFN) level. For some of these products, the concession is limited by a quota. Besides the quota, a reduction in the MFN tariff is an additional concession. Finally, the existing literature highlights that Morocco is among the countries most affected by the EP system (Goetz and Grethe, 2009; Cioffi et al., 2011).

Exports are considered on a monthly basis due to the different seasonal border treatments applied to them. These monthly trade flows were collected from the Eurostat-Comext Database. 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 which benefit from preferential access. [2]

As destinations within the EU, we have selected nine countries, rather than the EU itself. We proceed this way for theoretical reasons (Anderson and van Wincoop, 2003) and because of adequate monthly data availability. Among the countries selected, we aimed to include different instances regarding their own features and their relations with Morocco.[3] Our analysis extends from 2005 to 2012, so that all the countries considered were EU members at those times. The preferential agreement with Morocco was modified to enlarge the quotas because of the EU enlargement in May 2004. Its subsequent revision entered in force in October 2012, hence affecting the end of the period covered in the analysis.

Some of the studies cited in the literature incorporated dummy-type variables to include preferences; however, they might be considered poor specifications as they do not reflect the various concessions in trade 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.[6] The first variable (var1) indicates the EP reduction granted for Morocco in the four products, calculated as the absolute difference between the MFN EP and the reduced EP. So, when no preferential EP or no EP are applied, this variable equals 0.

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 above-mentioned 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[7] value of var1 and the standardized value of var2. The effect of the three variables on Moroccan F&V exports are expected to be positive, as the higher the preferences granted to Morocco, the higher the Moroccan exports are expected to be. Table 1 summarizes the values of the three variables and the cases when they occur.

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[2] 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.

[3] The countries selected are Belgium (incl. Luxembourg), France, Germany, Hungary, Italy, the Netherlands, Slovakia, Spain and the United Kingdom. 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.

[6] We consider the different trade policy instruments that "manage" trade flows of F&V between Morocco and the EU. Previous literature used alternative indicators that proved the role of trade preferences on F&V exports in a gravity framework. For example, Cardamone (2011) introduced preferences in EP with a dummy variable, and the preferences in tariffs applied were measured as the difference between MFN and preferential tariffs. Martí and Garcia-Alvarez-Coque (2007) added a dummy variable to capture the effect of the Association Agreements, while Emlinger et al (2008) introduced the applied tariff in the gravity equation. In such a context, it might be argued that it is worth developing a unique indicator that could encompass the impact of trade policy instruments and then estimate it econometrically using appropriate estimation procedures. This is what we aim to do with var3.

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

**Table 1. Cases in the preference variables.**

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

The present article is based on the model specification provided in Baier and Bergstrand (2007) for total bilateral exports. They begin with the following gravity model:

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

Where ln denotes natural logarithms; $X_{ijt}$ is the value of the aggregate export flow from country i to country j in year t; $Y_{it}$ ($Y_{jt}$ ) is the gross domestic product, or GDP, for country i (j) in year t; $DIST_{ij}$ is the bilateral distance between the economic centres of i and j; $CONTIG_{ij}$ 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 $lnP_{it}^{1-\delta}$ ($lnP_{ji}^{1-\delta}$) is exporter i´s (importer j´s) non-linear and unobservable multilateral resistance (MR) price term.

When estimating the effects of economic integration agreements, or EIA ($\beta_4$ ), if this variable is correlated with the error term, it is econometrically endogenous and ordinary least squares can lead to biased and inconsistent coefficient estimates for $\beta_4$. In order to eliminate endogeneity bias from the variable EIA, Baier and Bergstrand (2007) propose using panel techniques and estimation by fixed effects (FE) of the following equation:[8]

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

Where $\eta_{ij}$ is a country-pair fixed effect to capture all time-invariant bilateral factors influencing nominal trade flows; $\delta_{it}$ and $\psi_{jt}$ are exporter-time and importer-time fixed effects, respectively, which 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 (Anderson and van Wincoop, 2003).

[8] Note that Florensa et al (2013) estimate equation (2) by both fixed effects and random effects and use the Hausman test. Their results confirm that the fixed effects estimation is preferable to random effects, and thus, we rely on a fixed effects estimation.

Furthermore, Baier and Bergstrand (2007) proposed using first-differences (FD) 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 ($\eta_{ij}$), the unobservable ij might still be playing a role. Therefore, Baier et al (2014) suggest introducing pair-specific fixed effects after the first differences (FD) transformation of equation 2:

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

To include all these improvements suggested by the literature in the model, 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 (t) refers to monthly (Jan-Dec) variability and yearly (2005-2012) variability; $\Delta_{12}$ is twelve-month (annual) FD; $var_{ks}$ are var1, var2, and var3; $\psi_{jt}$ , $\pi_{kt}$ and $\sigma_m$ denote importer-year, sector-year and monthly fixed effects, respectively. Finally, $\mu_{jk}$is the unobservable heterogeneity that does not vary over time but might vary depending ons importers and products. This term is dropped from the equation in FD, while $\varepsilon_{jks}$ is the error term.

## 3. Results

Table 2 shows the main results obtained. 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 2). [10] Columns 2 and 4 in Table 2 show the results related to var2, which takes into account the tariff reduction linked to quotas. The results show that var2 is not significant in equation 4 (column 2), although it is positive and significant when using FD. The var3 is positive and significant in both FE and FD specifications (see columns 3 and 5 in Table 2). Finally, 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 increase monthly exports of F&V by about 12% (column 5).

**Table 2. Main results.**

| | FE1 (1) | FE2 (2) | FE3 (3) | FD2 (4) | FD3 (5) |
|---|---|---|---|---|---|
| var1 | 0.002*** | 0.002*** | | | |
| | (6.209) | (6.376) | | | |
| var2 | | 0.49 | | | |
| | | (1.459) | | | |
| var3 | | | 0.227*** | | |
| | | | (4.923) | | |
| $\Delta_{12}(var2)$ | | | | 0.676** | |
| | | | | (2.246) | |
| $\Delta_{12}(var3)$ | | | | | 0.120** |

[10] This variable does not vary enough to be estimated by FD. When we run FE regressions, var1 is introduced alone in the regressions (column1) and with var2 (column 2).

| | | | | | |
|---|---|---|---|---|---|
| | | | | | (2.218) |
| Observations | 1458 | 1458 | 1458 | 1254 | 1072 |
| R2 | 0.3151767 | 0.3162691 | 0.3079569 | 0.2051651 | 0.1640389 |
| RMSE | 1.3035 | 1.302948 | 1.310353 | 1.129407 | 1.145855 |

Notes: ***, ** indicate significance at 1and 5%, 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).

## 4. Conclusions and policy implications

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-Mediterranean F&V trade. Specifically, 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. Overall, this indicates that the Moroccan policy option consisting in negotiating trade preferences in key competitive sectors has been translated into export increases.

In the methodological field, with this exercise we have designed a set of variables to account for the wide array of different preferential concessions in a more detailed way than previous specifications. These variables can be included in gravity approaches, and in the future it would be possible to widen the scope of the analysis to include other countries and products.

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