Chapter 7

Explicative Factors Driving the Tomato Consumption in the Mediterranean Basin: A Panel Data Approach

Jaime de Pablo Valenciano,
José Ramos Pires Manso,
Miguel Ángel Giacinti Battistuzzi,
Juan Milan García and Juan Uribe Toril

Additional information is available at the end of the chapter

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Abstract

This chapter studies the consumer behavior of the tomato market in six Mediterranean countries, four of them belong to the European Union, EU—Spain, France, Italy, and Portugal, one to North Africa—Morocco, a highly competitive market with a major trade agreement with the EU since 2004, and another in Asia—Turkey. The main objective of the chapter is to analyze which are the most important explanatory factors, of a series of 13, that explain tomato consumption in the Mediterranean Basin. These factors, which are assumed as significant, are analyzed with an approach that uses panel data (fixed effects) models, a type of models that has clear advantages over the traditional methodologies. The results show significant differences between countries, that there are empirical evidence between consumption of tomatoes and price, imports and exports, production, growth area, technological developments and euro-dollar exchange rate; some importance lies on the EU-Morocco trade agreement; less empirical evidence was found between consumption and the exchange rates of the Turkish and Morocco currencies (Turkish pound and the Morocco dirham).

Keywords: panel data, fixed effects, key factors, demand, trends, explicative factors

1. Introduction

The agricultural sector in the European Union passes by a process of structural changes due to the progressive world trade liberalization or globalization, the enlargement of the number of EU Member States, the technological change, the EU political reforms and the emergence of new demands for quality and food safety for consumers, among other things.

Various trade agreements are joining the European Union and other non-EU competitive countries (like Morocco and Turkey), and these agreements are affecting consumer markets (**Figure 1**).

Tomatoes are a sensitive product for many EU countries. This is especially true in the case of Spain, which is observing as non-European Union countries (Morocco and Turkey) are increasing their tomato exports in countries such as France.

It is essential to be aware of the consumer's behavior with respect to this product in consumer countries such as Spain, France, Italy and Portugal. It is also interesting to know how this product behaves in Morocco and Turkey. A panel data approach is used in order to study the tomato market consumption from 1960 to 2010.

These countries are currently competing and will be more intense in the future due to preferential agreements, and this may affect consumers in a significant way.

There are several fruit- and vegetable-related jobs that have employed demand-side systems such as the Near Ideal Demand-System (AIDS) [1–4] and the Rotterdam model [4, 5] that only take into account a single data dimension (transverse or temporal).

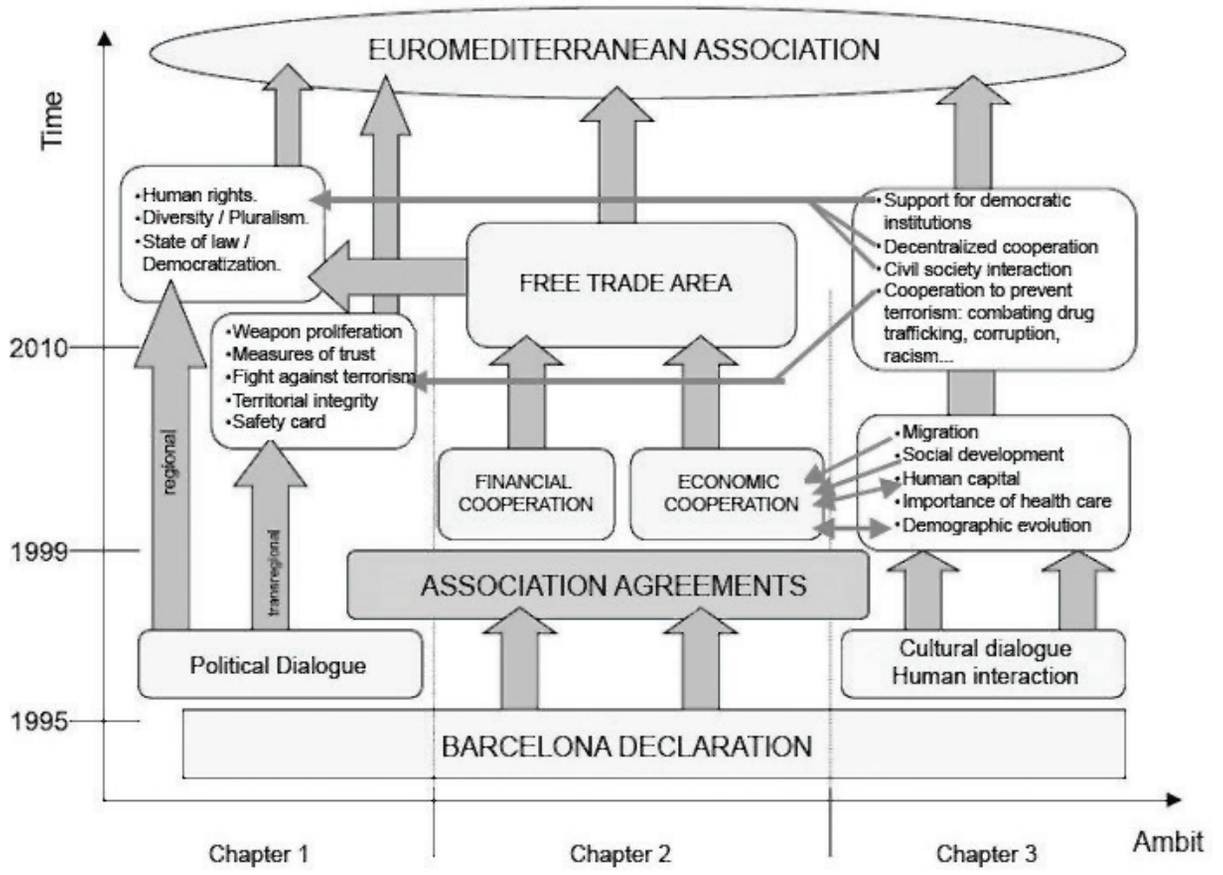

Figure 1. Ideal scheme of the Mediterranean Association.

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This is why it is important to combine these two dimensions and thus to improve the pressures of the model parameters by means of panel data. These are basically regression models for the estimation of the parameters that we are interested in studying as well as their variation in time and their transversality.

The main objective of this chapter is thus to analyze which are the most important explanatory factors in the tomato consumption market of these countries; the idea is to set up the basis for a better understanding of these markets and, therefore, their quotas. The use of panel data (fixed effects) models has obvious advantages over the traditional general linear or non-linear models.

This analysis and results are innovative in this field, fill a gap in this literature and are complementary to the results of the studies mentioned.

The chapter is divided into five sections including the Introduction section. Section 2 presents a quick state of the art with references to the most recent studies covering the theme of the paper. Section 3 describes the current situation of the countries in the Mediterranean Basin. Section 4 presents the data, methods and results. Section 5 presents the main conclusions and the policy implications for the tomato markets.

2. The state of the art

The tomato sector has been approached from many points of view: international trade [6–8]; farming contracts [9]; distribution channel strategies [10, 11]; quality [12] or pricing analysis [13, 14].

Regarding consumer preference, Johnecheck et al. [15] used a static partial equilibrium model of two countries to simulate the ex ante market and welfare performance of the US country of origin for the fresh tomato trade between the United States and Mexico. Brumfield et al. [16] conducted interviews with agricultural consumers at the Kings Super Markets in New Jersey to obtain data on consumer tastes and preferences, quantities purchased and prices paid for fresh tomatoes. As a conclusion, the authors state that tomato prices and consumer incomes were important determinants of the quantity of tomatoes purchased from both New Jersey and other states.

The tomato market has been studied by several authors using different methodologies. Some of them have asked about the power wielded by retailers in the market for fresh fruits and vegetables [17], p. 2 noting that the EU countries with uncompetitive behavior can have a significant impact on consumption, surplus and welfare. These authors used a structural model consisting of a system of equations covering the demand, supply and price.

With regard to tomato price, the study has focused on the uncertainty of the time lag between supply and demand planning in the agricultural sector; in many cases, these studies led to the development of hypotheses about price formation. Among them, we can refer to Galdeano Gómez [18] who performed different explanatory models. Richards et al. [19] used a neural

network and a radial basis network model compared with other econometric determination of the margin (retail price—price at the farm) for the US fresh tomato. Huang and Lin [20] used a hedonic analysis of fresh tomato prices among regional markets.

De Pablo Valenciano and Pérez Mesa [21] used an Engle and Granger methodology to estimate an export function for the tomato social economy enterprises in Almeria (Spain).

In line with this one, a very interesting study is the analysis through a vector auto-regression by Cioffi et al. [22] on the effects of stabilization of the import regime for EU fruits and vegetables based on the entry price system. The analysis was performed taking into account the EU prices and the imports from Morocco, the main foreign competitor in the EU domestic markets. Previously, Cioffi and Dell Aquila [23] studied the problem of prices and subsidies of horticultural products, including tomato products in the European Union.

In order to analyze consumer preferences on the tomato market, Alfness and Guttormsen [24], p. 17 used the Becker-DeGroot-Marschak mechanism and 20 types of tomatoes to obtain an assessment of consumer preferences. They concluded that they are willing to pay much more for tomatoes of their choice, an important fact to assess the elasticity of demand of this product.

This chapter also takes into account the technical efficiency factor that Iraizoz et al. [25] identified as the main determinant factor of economic growth and productivity gains. They concluded that technical efficiency is positively related to partial productivity indices and is negatively related to unit cultivation costs (hectare).

3. Model specification, data and results

In this chapter, we use a panel data model, namely a fixed effects panel data model. A panel of data is a sectional group of units (N) that vary over time (T).

In this case, the number of countries (N) is 6: Spain, France, Italy, Portugal, Morocco, and Turkey. The time period is from 1960 to 2010 (T = 50).

The use of panel data models allows for taking in account both the differences among countries and the heterogeneity of the group. Moreover, panel data methodology is increasingly important for studying the dynamic factors of the markets.

The explicative factors of the tomato market that we are going to consider are: imports (mt), exports (xt), consumption (kt), technical progress (pt), cropped area (h), price (pc), per capita GDP in PPP (gc), and the exchange rates of the euro currency against the Moroccan dirham (tdm), the Turkish lira (tlt) and the USA dollar (TDU). There is also a dummy variable to be taken into account, that is, the EU-Morocco trade agreement established in 2004 (d1).

Another interesting issue related to the panel data is the estimation of econometric models that describe either the behavior of individuals over time or the technological changes.

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For each type of data, one should take into account not only the assumptions that affect the random errors of the model but also the assumptions about whether, how and when to change settings between individuals and between different periods [26].

According to Hsiao [27] and Klevmarken [28], the panel data: (i) allow for the control of heterogeneity and differences among countries, (ii) allow the processing of much information, more variability, less collinearity among variables, more degrees of freedom and greater efficiency, (iii) allow to study the dynamic adjustment over time, (iv) have a greater ability to identify and measure the purely sectional or purely chronological undetected, (v) allow to build and test more complicated behavioral models than the cross-section or pure time series ones, and (vii) reduce or eliminate the bias resulting from the aggregation of data.

According to these authors, the limitations and disadvantages of panel data are: (i) the limits resulting from the design for collecting data, (ii) the measurement of the bias error, (iii) the problems of selectivity, (iv) the temporal dimensions that sometimes are short and (v) the section dependency (the countries).

The fixed effects model intends to monitor or control the effect of omitted variables that vary between individuals or countries, and that are constant over time. Intersections are assumed to vary from country to country but are constant over time. Following Stock and Watson [29], we suggest the following model to eliminate the multicollinearity between countries:

$$y_{it} = \alpha_i + \beta_1 x_{1it} + \beta_2 x_{2it} + \cdots + \beta_k x_{kit} + u_{it} \quad (1)$$

In this model, i (i = 1, 2 … 6) identifies the six different countries and t identifies the year (t = 1960…2009), y_{it} is the dependent variable, x_{jit} (j = 1,2,…,k) is the k independent variables or explicative factors and u_{it} is the random errors of the models that are supposed to have zero mean, constant variance and not correlated over time.

In our application, y_{it} (the dependent variable) is the consumption of tomatoes, k_{it}, of the six countries; the explicative factors (x_{ijt}) are: imports (m_{it}), exports (x_{it}), yields (es_{it}), the cropped area (h_{it}), the price per tone (pc_{it}), the per capita GDP at constant prices in PPC (in power parities) (gc_{it}), all these variables related to the six countries, and the three types of exchange rates [Moroccan dirham, the Turkish lira and the US dollar always with the euro (tdm, tlt, tdu)], t is the trend associated with technological change (1960 = 1, 1962 = 2,…) and a dummy variable to control for the trade EU-Morocco in 2004 (d1 = 1 in 2004 and d1 = 0 in the other); C is the common intersection of the model.

The errors of this model are subject to the following assumptions: (i) zero mean value, $E(u_{it}) = 0$; (ii) homoscedasticity of the variances; and (iii) no correlation of errors over time, $E(u_{it}u_{jt+s}) = 0$ ($t,s = 1,2,\ldots$).

The fixed effects model estimates a coefficient for each country; this estimate gives the deviation of each country in relation to the common intersection C.

The hypothesis that the values of the fixed effects do not vary from one country to another (the effect is constant) can be tested using the Chow test.

In our empirical application, we tested several models with 16 panel data estimations (fixed effects). All of them show highly significant results in statistical terms (based on the overall F test). **Table 1** shows the results for the 16 estimates.

After estimating the 16 different fixed effects models, we analyzed each one of the parameters associated to the variables that integrate the models to see their statistical significance, their sign and their importance in the tomato market.

Prices (pc): In 7 of the 16 models considered, the tomato price showed a significant coefficient with a positive correlation to the tomato level of consumption. This factor has been the subject of several studies that showed that the internal prices influenced the perceived quality of the markets and failed to explain 41% of the variance in purchase intents and 85% of the variation in the perceived value [30]; p. 349. So a price drop is related to a decline in quality and therefore results in a fall in consumption.

Ladd and Suvannunt [31] also reached a similar result through the analysis of Lancaster and consumer goods characteristics model, CGCM. The authors concluded that for each product consumed, the price paid for the product is equal to the sum of money marginal values of the characteristics of the product.

Trend—Technical Progress (t): In 12 of the 16 models considered between the tomato consumption and trend (t), there are empirical and positive evidence in five of the models and empirical and negative evidence in seven of the other models; in the other four, the trend coefficients are not significant in statistical terms. As the inclusion of this trend is often used as a proxy to study technical progress, this shows the importance of technological change or advances in the growing and marketing of tomatoes.

Exports (x_t): There is evidence of positive correlation between the tomato consumption and tomato imports in six models (imports encourage or stimulate consumption, but one of them is negative and significant which is more difficult to understand).

Cropped area (h): There is an evidence of positive correlation with tomato consumption and cropped area (more space for more production and more consumption; eight of the models confirm this evidence).

EU-Morocco trade agreement (d1): The coefficient associated to the trade agreement between the EU and Morocco was signed in 2004 and was tested by the introduction of a dummy variable, d1, which was significant and positive in one of the models considered; therefore, the influence of this commercial agreement plays an important role in the EU tomato market.

Exchange rates (tdm, tlt, tdu): The exchange rate of the dirham against the euro Morocco (tdm) has a significant and negative sign in a model. The sign of the exchange rate of the Turkish lira (tlt) is positive; its influence is also significant in one of the models considered, but in all the other 13, it is considered not significant (the influence of Turkish tomatoes is negligible in all six countries considered). Six estimated models confirm that there is empirical evidence between tomato consumption and the exchange rate of US dollar against the euro (tdu).

	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5	Mod 6	Mod 7	Mod 8
Dep. var.	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
mt						1.009472*	1.040.719*	−4.22438*
xt	−1.00427*	−1.00433*	−1.00488*	−1.00488*	−1.01421*		0.901394*	ns
pt	0.986182*	0.986235*	0.986202*	0.986202*	0.992308*	0.985651*		
h					ns		3742874*	38.49103*
pc							55834.20**	ns
gc								207523.9*
d1		19264.73**	ns	ns	ns		ns	ns
tdm	−728819**	ns	ns	ns	ns		ns	ns
tlt	79395.64***	ns	ns	ns	ns		ns	ns
tdu	ns		ns	ns	ns			−226951***
t	3279.236*	3183.352*	3169.268*	3169.268*	2987.154*	−6250.79*	−3317022**	ns
c.	ns	41,428,97***		ns	ns		ns	−1,206,423*
Fra-C	211107.2	211206.1	211084.6	211084.6	208039.4	65873.24	88214.45	−287,103
Ita-C	6055.709	5915.618	5946.083	5946.083	4194.898	128971.1	126185.3	−908,245
Mar-C	−87272.9	−87167.3	−87236.3	−87236.3	−87684.4	−17578.7	3,912,876	1,323,173
Por-C	−76,311	−76221.1	−76361.2	−76361.2	−78260.3	114275.6	126213.4	32251.56
Tur-C	−17076.3	−17240.5	−17159.2	−17159.2	−11693.6	89473.83	7,997,240	498363.5
AdjR²	0.999806	0.999807	0.999806	0.999806	0.999806	0.998136	0.998387	0.980833
Obs F	109059.3*	120453.6*	99862.74*	99862.74*	92304.79*	10399.68*	11092.94*	795.8867*
Cr-sct-obsF	383.4834*	385.0701*						15.23321
Cr-Sct Qui-Squared	530.153*	530.0764*						70.11794

	Mod 9	Mod 10	Mod 11	Mod 12	Mod 13	Mod 14	Mod 15	Mod 16
Dep. var.	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
mt	1.236805*	1.237023*	−4.22438*	1.239805*	1.250483*	1.20129*		
xt			ns				−0.94811*	−1.0134*
pt	0.911383*	0.911765*		0.911383*	0.912221*	0.911937*	0.999364*	0.991794*
h	3.265319*	3.242632*	38.49103*	3.265319*	3.224813*	3.217566*	ns	
pc	75000.3*	74962.39*	ns	75000.3*	73686.25*	75058.11*	63558.72*	ns
gc	ns	ns	207523.9*	ns	ns	ns		13155.42*
d1	ns	ns	ns	ns	ns			
tdm	ns	ns	ns	ns				
tlt	ns	ns	ns	ns				
tdu	ns	−63088***	−226951***	−59915.3***	−57360.6***	−76344.5*		
t	−4228.66**	−4348.34**	ns	−4228.66**	−4293.07**	−5342.91*		
c	ns	ns	−1206423*	ns	ns	168982.4**	ns	−33428.6*
Esp-C	−330,550	−330,369	−658,440	−330,550	−329,598	−332,986	−55118.2	−49203.4
Fra-C	118373.8	119453.7	−287,103	118373.8	118420.5	121487.7	199,392	100025.3
Ita-C	190596.4	192039.2	−908,245	190596.4	193900.4	188167.7	−18707.2	−73492.4
Mar-C	−71375.5	−73321.1	1,323,173	−71385.5	−74692.8	−70,842	−55621.9	28296.22
Por-C	117,764	117,228	32251.56	117,764	117836.2	115367.8	−57493.3	−41801.8
Tur-C	−24798.6	−25030.8	498363.5	−24798.6	−25866.8	−21195.4	−12451.3	36176.01
AdjR²	0.998405	0.998411	0.980823	0.998405	0.998417	0.998415		0.999464

	Mod 9	Mod 10	Mod 11	Mod 12	Mod 13	Mod 14	Mod 15	Mod 16
Dep. var.	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
Obs F	9723.391	10460.53*	795.8867*	9723.391*	11307.45*	12231.21*		133797.3*
Cr-sct-obs F	116.7837*	117.369*	15.23321*	116.7837*	117.9539*	117.8567*		
Cr-Sct Qui-Squared	304.7878*	304.859*	70.11794*	304.7878*	304.9306*	304.0178*	0.629963 ns	63.89267*

*Significant at 1%.
**Significant at 5%.
***Significant at 10%.
ns: Not significant.

Table 1. Results of the estimation of the panel data model—fixed effects.

Intersection (C): The constant or intercept of the models is significant in five models, but there is no significant evidence in 11 cases.

GDP per capita (gc): Three of the models had shown positive correlation and significant evidence between tomato consumption and per capita GDP in PPC of the countries.

Statistical tests: The redundancy test showed that there are significant differences from one country to another; for example, the fixed effect is always negative in Spain; in Portugal, it is mostly positive (positive in 9 of 13 models, but negative in four models); the effect is negative especially in Turkey, with four exceptions; the fixed effect of Morocco is mostly negative, but with three exceptions; the fixed effects for Italy and France are mostly positive, with two exceptions perhaps because they are really big tomato consumers. The results encountered for the tests performed confirm the suitability of the fixed effects model to explain the tomato consumption of the six countries in the Mediterranean basin, once it always rejected the null hypothesis of redundancy of the coefficients.

4. Conclusions and policy implications

Technological advances are a point of reference for the development and marketing of tomato market and to encourage consumption in the countries. Crop improvement has been related by several authors as seed and production structures, especially greenhouses. Marketing, logistics and transport activities have improved substantially, but there is still room for improvement.

The estimated panel data models identified technical progress as one of the main factors for this industry, since it has the highest correlation with the level of consumption to positively influence the production and quality.

Others factors are positively associated with consumption as is the case of the cropped area, the EU trade agreement with Morocco (in 2004), the gross domestic product, and exports. The more criticized significant factor is the international trade agreements, especially the EU-Morocco free trade treaty (the Euro-Mediterranean Partnership) and its extension to other EU countries (namely Turkey); this criticism is related to the EU markets' openness and to the possibility of power loss of some countries. But these agreements allow for important social effects, namely the creation of peaceful and stable areas, areas of shared prosperity and of better mutual understanding and civil development between countries.

The other aspect to consider is the possible impact of the euro/dollar exchange rate. This has increased the exchange of Morocco, especially with Southeast Asian countries whose currencies are US dollar indexed. However, the import costs' reduction is less sensitive for the purchase of agricultural raw materials and energy, especially oil. This location is also beneficial for Moroccan exports to the eurozone. However, it is far from being a criterion for the promotion of exports. The impact of exchange rate on foreign trade will only be structural if there is a long run trend.

The exchange rate of the dirham (Moroccan currency) indexing (up to 80% euro and 20% for dollars) is one of the main factors for this situation. It allowed the Moroccan currency to retain

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a competitive position against the dollar. In the case of a liberalization of foreign exchange, no one could predict the position of the dirham against the dollar or the euro.

The results found also show a direct and positive relationship between price and consumption. The explanation is probably related to the perceived quality of product; a price cut can be seen by consumers as a reduction of quality, thereby discouraging consumption. For this reason, retailers should consider the choice of pricing strategies as they play an essential role in the consumer's perception of value.

Author details

Jaime de Pablo Valenciano[1]*, José Ramos Pires Manso[2], Miguel Ángel Giacinti Battistuzzi[3], Juan Milan García[1] and Juan Uribe Toril[1]

*Address all correspondence to: jdepablo@ual.es

1 Applied Economic Department, University of Almeria, Spain

2 Economic Department, University of Beira Interior, Portugal

3 MAG Consulting, Argentina

References

[1] Amaza PS, Fregene T. Determinants of food demand among rural households in borno state, Nigeria. Empirical Economics Letters. 2008;**7**(6):607-613

[2] Bertail P, Caillavet F. Fruit and vegetable consumption patterns: A segmentation approach. American Journal of Agricultural Economics. 2008;**90**(3):827-842

[3] Musunuru N. Economic analysis of export potential for U.S. fruits. International Journal of Economic Research. 2009;**6**(2):259-268

[4] Paudel L, Adhikari M, Houston J, Paudel KP. Low carbohydrate information, consumer health preferences and market demand of fruits in the United States. Applied Economics Letters. 2010;**17**(4-6):411-415

[5] Feleke ST, Kilmer RL. The Japanese market for imported fruit juices. International Food and Agribusiness Management Review. 2009;**12**(4):1-28

[6] Baylis K, Perloff JM. Trade diversion from tomato suspension agreements. Canadian Journal of Economics. 2010;**43**(1):127-151

[7] Padilla Bernal LE, Rumayor-Rodriguez A, Perez-Veynac O, Reyes-Rivasd E. Competitiveness of Zacatecas (Mexico) protected agriculture: The fresh tomato industry. International Food and Agribusiness Management Review. 2010;**13**(1):45-64

[8] Padilla Bernal LE, Lara-Herrera A, Reyes-Rivas E, Perez-Veynad O. Competitiveness, efficiency and environmental impact of protected agriculture in Zacatecas, Mexico. International Food and Agribusiness Management Review. 2012;**15**(4):49-64

[9] Dileep BK, Grover RK, Rai KN. Contract farming in tomato: An economic analysis. Indian Journal of Agricultural Economics. Apr 2002;**57**(2):197-210

[10] Aramyan LH, Oude Lansink A, Van der Vorst J, Van Kooten O. Performance measurement in agri-food supply chains. Supply Chain Management: An International Journal. 2007;**12/4**:304-315

[11] Hingley M, Sodano V, Lindgreen A. Differentiation strategies in vertical channels: A case study from the market for fresh produce. British Food Journal. 2008;**110**(1):42-61

[12] Martínez-Carrasco L, Brugarolas M, Martínez-Poveda A, Ruiz JJ, García-Martínez J. Modelling perceived quality of tomato by structural equation analysis. British Food Journal. 2012;**114**(10):1414-1431

[13] De Pablo Valenciano J, Pérez Mesa JC, Lévy Mangin JP. The spanish tomato export sector of the Almeria region: An econometric approach. International Advances in Economic Research. 2008;**14**(3):316-328

[14] Goetz L, Grethe H. The EU entry price system for fresh fruits and vegetables – paper tiger or powerful market barrier? Food Policy. 2009;**34**(1):81-93

[15] Johnecheck WA, Wilde PE, Caswell JA. Market and welfare impacts of COOL on the U.S.-Mexican tomato trade. Journal of Agricultural and Resource Economics. 2010; **35**(3):503-521

[16] Brumfield RG, Adelaja AO, Lininger K. Consumer tastes, preferences, and behavior in purchasing fresh tomatoes. Journal of the American Society for Horticultural Science. 1993;**118**(3):433-438

[17] Réquillart V, Simioni M, Varela-Irimia XL. Imperfect competition in the fresh fruit and vegetable industry. Paper prepared for presentation at the 113th EAAE Seminar "A resilient European food industry and food chain in a challenging world", Chania, Crete, Greece. September 3-6, 2009

[18] Galdeano-Gómez E. Composite price expectations: an empirical analysis for the Spanish horticultural sector. Agribusiness. 2007;**23**(1):57-83

[19] Richards T, Patterson P, Van Ispelen P. Modeling fresh tomato marketing margins: Econometrics and neural networks. Agricultural and Resource Economics. Cambridge: University Press. 1998;**27**(2):104-125.

[20] Huang CHL, Lin BH. A hedonic analysis of fresh tomato prices among regional markets. Review of Agricultural Economics. 2007;**29**(4):783-800

[21] De Pablo Valenciano J, Pérez Mesa JC. The competitiveness of Spanish tomato exports in the European Union. Spanish Journal of Agricultural Research. 2004;**2**(2):167-180

[22] Cioffi A, Santeramo F, Vitale C. The price stabilization effects of the EU import regime of fruit and vegetables: The case of tomatoes. Munich Personal RePEc Archive, No. 25718, Available from: http://mpra.ub.uni-muenchen.de/25718/. 2009 [Accessed: Oct 7, 2010]

[23] Cioffi A, Dell'Aquila C. The effects of trade policies for fresh fruit and vegetables of the European Union. Food Policy. 2004;**29**:169-185

[24] Alfnes F, Rickertsen K. Non-market valuation: Experimental methods. In: Lusk J, Roosen J, Shogren J, editors. Oxford Handbook on the Economics of Food Consumption and Policy. Oxford, UK: Oxford University Press. 2010

[25] Iraizoz B, Rampun M, Zabaleta I. Assessing the technical efficiency of horticultural production in Navarra, Spain. Agricultural Systems. 2003;**78**:387-403

[26] Hill GL. Principles of Econometrics. 4th ed. Wiley; 2012

[27] Hsiao C. Analysis of Panel Data. Segunda edición ed. Cambridge: University Press; 2003

[28] Klevmarken NA. Introduction. European Economic Review, Elsevier. Mar 1989;**33** (2-3):523-529

[29] Stock JH, Watson MW. Introduction to Econometrics. 2nd ed. New York: Prentice Hall; 2007

[30] Grewal D, Krishnan R, Baker J, Borin N. The effect of store name, brand name and price discounts on consumers' evaluations and purchase intentions. Journal of Retailing. 1998;**74**(3):331-352

[31] Ladd GW, Suvannunt V. A model of consumer goods characteristics. American Journal of Agricultural Economics. 1976;**58**(3):504-510

Other Sources Visited

- EUROSTAT. Statistics. Available from: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database
- INTERFEL. Available from: http://www.interfel.com/
- MARM – Ministerio de Medio Ambiente, Medio Rural y Marino. Agricultura. Estadísticas. Available from: http://www.marm.es/es/agricultura/estadisticas/
- OMAIAA – Observatório dos Mercados Agrícolas e Importações Agro-Alimentares. Available from: http://www.observatorioagricola.pt/
- Kantar WORLDPANEL. Available from: http://www.kantarworldpanel.com/
- ICEX. Available from: http://www.oficinascomerciales.es/icex/cda/controller/pageOfecomes/0,5310,5280449_5296126_5296234_0_MA,00.html
- FAOSTAT. Available from: http://faostat.fao.org/

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