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Competitiveness analysis of the Portuguese processed tomato sector and development strategies

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Abstract

This paper aims to examine the export competiveness of the Portuguese processed tomato sector through a set of indicators used to measure international competitiveness from 1981 to 2013. During the 2011-13 period, we observe a slight improvement in competitiveness indicators. The world price is an important variable for Portuguese tomato paste exports. For tomato paste, we observe inter-industry trade and for other tomato products, a horizontal intra-industry trade is observable. The anchoring of industrial development to agricultural growth will be a predominant factor for the strategy of reducing costs in processed tomato production.

Key Words: Tomato products; trade patterns; product differentiation; exports;

1. Introduction

Since the beginning of the Portuguese economic crisis in 2011, the Food and Beverage (F&B) sector has been considered strategic for the improvement of competitiveness and for the growth of the Portuguese economy (PortugalFoods, 2016). The F&B trade deficit increases if tomato products are omitted, showing the contribution of tomato products to reducing the overall trade deficit. Portuguese production of tomatoes for processing rose from 732,000 tons in 1993(95) to 1,285,000 tons in 2013-15, representing an average annual growth rate of 2.9%, higher than that of the European Union (1.6%) and higher than the growth in world production, which was 2.5%. In 2011-2013, Portugal was the 8th largest producer of tomatoes for processing, accounting for 3% of world production of tomatoes for processing (World Processing Tomato Council [WPTC] several years) and the 5th largest exporter of tomato paste, generating 7% of world tomato paste exports in value and in quantity (FAOSTAT, 2016). Other tomato products have a less significant impact on exports. Tomato paste exports represented on average 96% of the total value of tomato products in 2011-13, while peeled tomato represented 4%, an increase on the previous period (from 1992 to 2007 peeled tomato accounted for an average of around 2% of total tomato product exports). Tomato juice accounted for an average of 0.05% of total tomato product exports (FAOSTAT, 2016). Almost 95% of Portuguese tomato products (namely tomato paste) are exports. In 2011-13 (average values), the leading export destinations for Portuguese tomato products were United Kingdom (27%). Japan

(15%) and Spain (13%). In 2009, the three main trading partners, Netherlands, Spain and United Kingdom represented 59% of total exports. In 2013, these three countries accounted for only 46%, thus showing an increase in market diversification. In 2013, markets outside EU, such as Japan, Kuwait and Russia accounted for 25% of the Portuguese tomato paste market (AICEP, 2016). The recent development of markets alone does not explain the changes in prices and increase in exports. The Portuguese tomato industry has undergone structural changes in production as has the entire agri-food sector (Oliveira, 2008). This, together with the changes in the national export strategy are key factors in the sector.

2. Conceptual Framework and Organizing Concepts

Although research on competitiveness indicators has followed the evolution of economic theory itself, there is still no consensus on the most appropriate indicator of competitiveness. Buckley (1988) concluded that one variable does not capture all elements of the concept and Fischer and Schonberg (2007) provided an extensive review on the literature about the different methodologies to estimate competitiveness. The Revealed Comparative Advantage (RCA) index is a widely used indicator to study competitiveness in all sectors and countries. The concepts of competitiveness and comparative advantage tend to be ambiguous and it is important to understand the differences and similarities between the two concepts. As Buckley (1988) and Dunmore (1986) emphasize, competitiveness is difficult to define in terms of economic concept. Siggel (2012, p. 20) highlights that "the two concepts are closely related" and "can be measured by unit cost/price ratios". Despite the conceptual differences, competitiveness and comparative advantage are inextricably linked to international trade. Several works have focused on the RCA index as a measurement of competitiveness in the global market (Fertö and Hubbard, 2003; Utkulu, and Seymen, 2004; Siggel, 2006; Latruffe, 2010; Valenciano et al. 2012). The RCA index of country i for product j is often measured by the product's share in the country's exports in relation to its share in world trade (Equation I), ($RCA_{ij} = \frac{\frac{x_{ij}}{X_{it}}}{\frac{x_{wj}}{X_{wt}}}$),where xij and xwj are the values of country i's exports of product j and world exports of product j, Xit and Xwt refer to the country's total exports and world total exports. An RCA between zero and one indicates a comparative disadvantage and above one, a comparative advantage in the product. RCA Index has been criticized for its poor empirical distribution characteristics: distribution is unstable over time and it provides poor ordinal ranking property. Due to its asymmetric distribution, it yields an output which cannot be compared on both sides of its value (Leromain and Orefice, 2013; Laursen, 1998). Despite this weakness, the RCA index will be applied along with the Growth Rate of RCA, which reflects the export specialization level in a specific category of goods from a specific country (European Commission, 2007; Noéme and Oliveira, 2010). Several modifications have been suggested to overcome the empirical weakness of the pure RCA index. Laursen (1998) and Dalum et al. (1998) obtained the Revealed Symmetric Comparative Advantage (RSCA) (Equation II) ($RSCA_{ij} = \frac{RCA-1}{RCA+1}$), where if the RSCAij index of a country is above zero there is a comparative advantage and if it is below zero there is a comparative disadvantage for product j. With this transformation, the index becomes symmetrical, avoiding the zero problems when applying logarithm transformations of

the RCA index. Lauresen (2015) compared the RSCA to other measures of international trade specialization and concluded it is an indicator with good statistical proprieties.

Competitiveness and intra-industry trade are linked and the Grubel-Lloyd (GL) is, perhaps, the most commonly used statistical instrument for measuring intra-industry trade (Equation III). ($GL = 1 - \frac{|X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})}$), where Xij is the export of product j from country i and Mij is the import of product j from country i (Latruffe, 2010). The GL values range from zero to one, with zero indicating that all trade related to the product is inter-industry (either imports or exports of good i). The value of 1 indicates Intra-Industry Trade only (country simultaneously imports and exports within the same sector/industry).

Inter-industry trade has its source in comparative advantage but the source of intra-industry trade is different and may be due to product differencing or fragmentation. It is necessary to distinguish between two types of intra-industry trade (Reinert, 2012): Horizontal Intra-Industry Trade (HIT) and Vertical Intra-Industry Trade (VIT). HIT refers to the simultaneous export and import of goods classified in the same sector and at the same stage of processing associated with specialization in varieties. It includes the trade of different varieties of similar products. In HIT, goods differ because they have specific attributes but are similar in quality. The international trade literature has addressed VIT in different ways. Some authors, such as Greenaway and Milner (2003), consider VIT to be the simultaneous export and import of goods classified in the same sector but with specialization in different quality ranges. The source of VIT is in fragmentation or international production sharing, i.e. both exports and imports in a given sector at different stages of processing (Reinert, 2012; Turkcan and Ates, 2011).

In this paper, we consider that VIT is the export and import of goods distinguished by quality. Starting from the assumption that differences in quality are reflected in differences in price, the unit value of export price of a particular good is used to separate VIT and HIT (Greenaway et al, 1994; 1995; Greenaway and Milner, 2003). This assumption is only acceptable with highly detailed trade data and several factors lead to slight departures from a strict association of prices with quality (Fontagné et al, 2006). Stiglitz (1987, p.2) states that "prices serve as a signal or as a screening device", that is, even in a context of imperfect information, the quality will always reflect on the prices. Higher quality or quality differences increase costs and thus the price is higher (Stiglitz, 1987, Siggel, 2012). If the difference in unit values is below a given threshold, the goods are considered to have the same quality, otherwise they are considered to be differentiated vertically (Amador and Cabral, 2009). Trade flows are defined as horizontally differentiated where the spread (α) in the unit value of exports relative to the unit value of imports is less than 15% (Equation IV), ($\frac{1}{1+\alpha} \leq \frac{Px_{ij}}{Pm_{ij}} \leq 1 + \alpha$), where Pxij is the unit value for exports, Pmij the unit value of import of good i for or from trade partner j. If the relative unit values are outside this range, these goods are considered vertically differentiated.

The assumption for a =0.15 is that transport and freight costs alone yield a difference in the export and import unit values of no more than ±15%. Otherwise, quality differentiation will predominate and intra-industry trade will be vertical (Greenaway, 1994, 1995; Fontagné and Fredenberg, 1997). The GL index provides important information but has some limitations. Despite the ability to calculate the GL Index over time, it does not have the required dynamic properties. An increase or decrease in the GL Index is

not necessarily associated with a corresponding increase or decrease in intra-industry trade (Marrewijk, 2009). In order to avoid repetitiveness on indicators, we choose the RSCA, GL and the Growth rate of RCA to measure international competitiveness.

3. Material and Methods

In this paper, we investigate international competitiveness through indicators such as the RCA and its derived indicator GL. These indicators allow the analysis of intra- and inter-industry trade, which are the key to a better understanding of the competitiveness of exports. In order to identify the factors influencing tomato exports, we use a log linear type of demand function (Shende and Bhole, 1999; Kumar, 2004; Kumar and Rai, 2007). The data for analysis applied in this study are based on secondary data from the FAOSTAT trade database and the Portuguese National Statistics Institute (INE), from 1981 to 2013. Volume values are in metric tons and price values are in 1,000 US$/t. The unit values of Portuguese, European and world tomato exports were derived from the data on quantity and value of tomato paste export available on FAOSTAT (2016). The values for Portuguese and world processing tomato production were derived from the WPTC (2016).

To determine the factors affecting export demand for tomato products, a regression analysis was carried out for a time span of 24 years (1989-2013), using the OLS method in STATA10. The tomato paste export data will be used to determine exports of the tomato processing industry because this is the major product for exports and almost all processing tomato is used to produce tomato paste. The factors influencing the Portuguese exports of tomato paste were identified using the log-linear Cobb-Douglas type of demand function (Shende and Bhole, 1999; Shende et al., 2005; Kumar and Rai, 2007; Kumar et al., 2008; Rani et al., 2014). After a logarithmic transformation, Equation V can be expressed as:

$$\ln Y = \beta_1 + \beta_2 \ln Q_p + \beta_3 \ln Q_w + \beta_4 \ln M_w + \beta_5 \ln PR_w + \beta_6 \ln PR_{eu} + U_i,$$

where: Yexp=Portuguese exports of tomato paste in volume; Qp=Portuguese production of processing tomato for processing in volume (Mt); Qpw=world production of processing tomato for processing in volume; Mw=world imports of tomato paste in volume; PRw=ratio of Portuguese export price and world export price; PReu=ratio of Portuguese export price and European Union export price; β1=Intercept; βi =elasticities, and Ui=random error terms. We conducted the regression with all the parameters.

However, when the above procedure was followed, we found that the parameter estimates had large correlations, and the model presented heteroscedasticity problems. Heteroscedasticity can be highly problematic with OLS methods. The coefficient βi of the OLS model is the Best Linear Unbiased Estimator (BLUE), if the assumptions of the classic model, including homoscedasticity (Gujarati, 1995), are respected. The presence of heteroscedasticity did not result in biased parameter estimates. However, OLS estimates were no longer BLUE. If homoscedasticity is not tenable, we may be unable to rely on the interval estimates of the parameters, e.g., variance will no longer be so low; standard errors are biased and t-test and F-test are affected, resulting in inaccurate results. To avoid these problems, we deal with heteroscedasticity by omitting the variable of Portuguese processing tomato production. The final estimated regression was (Equation VI): $\ln Y = \beta_1 + \beta_2 \ln Q_w + \beta_3 \ln M_w + \beta_4 \ln PR_w + \beta_5 \ln PR_{eu} + U_i$

4. Results and discussion

To analyze the international competitiveness and export performance of Portuguese processed tomato products, the export performance ratios were estimated. We used export and import data provided by FAOSTAT (2016). The analysis was conducted considering average values of triennia from 1981 to 2013. To build the RCA, RSCA and GL indicators, the average value of imports and exports for each product for each time period was used (Tab. 1).

Tab. 1. *- Revealed Comparative Advantage (RCA), Revealed Symmetric Comparative Advantage (RSCA) and Grubel-Lloyd (GL) from 1981-84 to 2011-13*

Periods	1981-84	1987-89	1993-95	1999-01	2005-07	2011-13	1981(84)/ 1987(89)	1987(89)/ 1993(95)	1993(95)/ 1999(01)	1999(01)/ 2005(07)	2005(07)/ 2011(13)
Tomato Paste							Average Annual Growth Rate (centred average value)				
RCA	41.56	25.25	20.93	17.30	17.35	20.18	-8.0%	-3.1%	-3.1%	0.0%	2.6%
RSCA	0.95	0.92	0.91	0.89	0.89	0.91	-0.5%	-0.3%	-0.3%	0.0%	0.3%
GL	0.00	0.00	0.03	0.02	0.04	0.05	122.8%	63.1%	-4.9%	7.3%	3.8%
Peeled Tomato							Average Annual Growth Rate (centred average value)				
RCA	0,34	0,31	0,50	0,86	0,70	3,09	-1,9%	8,5%	9,3%	-3,2%	28,0%
RSCA	-0,49	-0,54	-0,37	-0,08	-0,18	0,42	1,6%	-6,1%	-23,3%	16,1%	
GL	0,00	0,63	0,74	0,75	0,52	0,90		2,7%	0,2%	-5,8%	9,4%
Tomato Juice							Average Annual Growth Rate (centred average value)				
RCA	0.41	0.15	0.08	4.13	0.46	0.49	-15.2%	-10.0%	92.4%	-30.7%	1.2%
RSCA	-0.41	-0.73	-0.85	0.61	-0.37	-0.34	10.0%	2.5%			-1.4%
GL	0.00	0.87	0.47	0.23	0.76	0.84		-9.7%	-11.2%	21.7%	1.7%
Tomato Products (all products)							Average Annual Growth Rate (centred average value)				
RCA	29.99	16.75	14.06	12.14	12.12	14.74	-9.2%	-2.9%	-2.4%	0.0%	3.3%
RSCA	0.94	0.89	0.87	0.85	0.85	0.87	-0.9%	-0.4%	-0.4%	0.0%	0.5%
GL	0.00	0.02	0.09	0.09	0.14	0.16	238.4%	27.8%	0.0%	8.6%	1.6%

Source: Compiled by the authors, based on FAOSTAT (2016)

The results indicate that RCA values for tomato paste and tomato products were higher than 1, and thus the country has a comparative advantage in tomato paste and tomato products (all tomato product exports). It is important to notice that the RCA value has decreased from 1981-82 to 2004-06 for tomato paste and for tomato products as a whole. The last three-year period (2011-13) shows an improvement on the international trade indicators, compared to the indicators observed in the periods 1999-01 and 2005-07 as we can see in Table 1. The RCAs for peeled tomato were much lower than 1 and hence there is a comparative disadvantage. The RSCAs for tomato paste and tomato products (as a whole) are close to 1, meaning that Portugal has a comparative advantage. For tomato juice, this value is negative and for peeled tomato, the value was negative until 2011-13. For tomato juice, the results show that Portugal has not been competitive in exports. This indicates that Portugal was competitive for tomato paste exports but was not competitive for peeled tomato and tomato juice, throughout the period of study. The GL index is almost 0 for tomato paste, but close to 1 for other tomato products. It appears that there was almost pure inter-industry trade for tomato paste and intra-industry trade for peeled tomato in 2011-13 (GL= 0.96). For tomato paste, this value indicates, for all trade in the product, i.e. only exports or only imports, that Portugal is a net exporter in the sector of tomato paste. It is important to

relate these results to Appendix A, indicating that the terms of trade have deteriorated from 1999-01 to 2011-13 with a slight improvement in the latter period. For tomato juice and peeled tomato, the GL index indicates that there is intra-industry trade, simultaneously for import and export of similar types of goods or services.

A large number of empirical studies divide the total flows in HIT and VIT, assuming that quality differences are reflected in price differences, information on unit values of exports and imports (Appendix A). HIT and VIT are empirically identified by these differences. Analysing the intra-industry trade for peeled tomato and tomato juice during the period 1987-89 to 2011-13, it can be seen in Appendix A that the terms of trade (Pxi/Pmi) from 1987-89 to 1999-01 for peeled tomato are higher than 1 and for tomato juice this value is higher than 1 in the last two periods. If we consider the value in all periods, they are within the interval defined above (15%). This means that the trade in peeled tomato and tomato juice is horizontally differentiated. Trade in these products is basically determined by consumer preferences for products with specific attributes. However, for tomato juice in the 2011-13 period, the trade is clearly vertically differentiated by quality preferences. Our results showed that four factors can explain about 92% of the variation in Portuguese tomato paste exports: the volume of international trade in tomato paste, the volume of world production of processing tomato, the ratio of Portuguese and world tomato paste export prices, and the ratio of Portuguese and European Union tomato paste export prices (Table 2).

Tab. 2. *- Estimation of export demand model for Portuguese tomato paste from 1989 to 2013.*

Regressor	Coefficient		Standard error	t-ratio	p-value
Inter (ln β)	β1	-0.784	1.624	-0.48	0.635
ln(Qw)	β2	-0.050	0.238	-0.21	0.854
ln (Mw)	β3	0.844	0.137	6.16	0.000
ln(PRw)	β4	-2.130	0.688	-3.10	0.006
ln(PReu)	β5	1.002	0.626	1.60	0.125
R^2 = 0.916			Adj R^2 = 0.900		
F(4, 20) = 54.79 ; Prob > F = 0.000			Root MSE= .1015		

Note: Heteroscedasticity tests apply for the estimation:
1) Which assumes that the regression disturbances are normally distributed: Breusch-Pagan/Cook-Weisberg test (BP/CW), $chi^2(1) = 5.19$; Prob > chi^2 = 0,023 (not reject heteroscedastic).
2) The $N*R^2$ version of the score test that drops the normality assumption: BP/CW test $N*R^2$, $chi^2(1) = 3.81$; Prob > chi^2 = 0.0511 (reject heteroscedastic); White's test for $chi^2(14) = 16.06$; Prob > chi^2 = 0.3100 (reject heteroscedastic).

The coefficient for world imports of tomato paste in volume and the ratio of Portuguese and world export prices of tomato paste are statistically significant. From Table 3, we see that the output elasticity of world processing tomato production and the ratio of Portuguese and world prices are 0.84 and -2.13, respectively. Portuguese exports were found to increase with an increase in international trade, i.e., 1% of increase in quantity of world tomato paste exports led, on average, to an increase of about 0.8% in Portuguese tomato paste exports. The increase in world demand of tomato products enhances Portuguese exports. The ratio of Portuguese export prices and world prices is also an important variable in Portuguese exports, affecting them negatively. The ratio of Portuguese and world export prices is negative, i.e., a 1% increase in this ratio led, on average, to a 2.13% decrease in Portuguese exports. However, the coefficient of the ratio of Portuguese price and European price has a

positive sign but is not statistically different from 0. The demand of Portuguese exports of tomato paste is negatively affected by world prices but not by European export prices. The Portuguese export price is closer to world price than to the European Price. Portugal exports almost all its production to more than 40 countries around the world. The availability of tomato paste in the world market and not only the EU market can explain the sensitivity to the world price and not the EU price, where Italy is the largest exporter, 56% of EU market, and the price maker in the European market.

5. Conclusions

This study describes a sector undergoing structural changes that impact on its competitiveness. The increase in the number of new processed tomato producers and the increase in consumption, but at a different rate, led to a price decline until 2007. In recent years, prices have been seen to increase but new competitors and new consumer markets have also emerged. This work finds that competitiveness in the export of processed tomato from 1980-82 to 2004-06 declined. However, in 2011-13, we can observe a slight improvement in the competitiveness indicators. Despite the increase in exports of peeled tomato and tomato juice, the weight of these products in total Portuguese exports of tomato products is minor across all the study period. The ratio of Portuguese export price and world price of tomato paste is an important variable in Portuguese exports. Price is currently an important variable for Portuguese trade. Improving product differentiation and being less price-dependent could improve the export competitiveness of Portuguese processed tomato products. With the new competitors, competiveness by price may be a dangerous path for the Portuguese tomato paste market. Despite the sector presenting a less positive development until 2004, the most important feature of the last three-year period is the recovery of certain indicators and the diversification of the export market.

Processed tomato products are currently going through significant changes, not only in the consumer market but also in the production market. The key to adapting the tomato processing industry to the new trend is the market. The international tomato product market is highly competitive and dynamic. Research and innovation are critical factors of success. Both the emerging and the traditional markets for Portuguese tomato products are particularly demanding in terms of quality and in best agricultural and environmental practices.

The results show quality and price are both important in international competitiveness. Know-how in agricultural productivity to reduce production costs, maintaining the quality of processing tomato linked to the efficient use of resources and their sustainability can improve productivity, reduce costs and achieve a market gain as a healthy and environmental friendly product. Best knowledge in process and product innovation and a new range of quality products created through market diversification can help the revival of the Portuguese tomato industry.

Innovation in the food chain and value creation, not only at product level but also in the efficient use of natural resources should be strategic goals for what is one of most the important sectors in the Portuguese food industry. These results are interesting but future studies are needed to analyse the relationship between markets in the EU.

References

AICEP, 2017. Portugal Global Available at: http://www.portugalglobal.pt/ (Accessed 30 January 2017).

Amador, J. and Cabral, S, 2009. O comércio intra-industrial na economia portuguesa: Produtos e Parceiros, Boletim Económico, Banco de Portugal. Verão, 109-125.

Buckley P., Christopher M. and Prescott K, 1988. Measures of International Competitiveness: A Critical Survey. Journal of Marketing Management, Vol. 4 (2), 175-200.

Dalum, B., Laursen, K. and Villumsen, G. 1998. Structural change in OCDE export specialisation patterns: de-specialisation and 'Stickiness'. International Review of Applied Economics, Vol. 12, 447-467.

Dunmore, J. 1986.·Competitiveness and Comparative Advantage of U.S. Agriculture." Paper presented at the 1986 National Public Policy Education Conference, Denver, Colorado, September 16.

European Commission, 2007. Competitiveness of the European Food Industry: An economic and legal assessment. In: J.H.M. Wijnands; B.M.J. van der Meulen; K.J. Poppe (eds), Luxembourg: Office for Official Publications of the EC, 320 pp.

Fertö, I. L.J. Hubbard, 2003. Revealed Comparative Advantage and Competitiveness in Hungarian Agri-Food Sectors, The World Economy, 26(2), 247-59.

Fischer, C. and Schornberg S, 2007. Assessing the Competitiveness Situation of EU Food and Drink Manufacturing Industries: An Index-Based Approach. Agribusiness, Vol. 23, 473–495.

Fontagné, L. and Freudenberg, M. 1997. IIT: Methodological Issues Reconsidered, CEPII, document de travail n° 97-01

Fontagné, L., Freudenberg, M. and Gaulier G. 2006. Systematic Decomposition of World Trade into Horizontal and Vertical IIT. Review of World Economics, Vol. 142 (3), 459-475.

Greenaway, D. and Milner, C. 2003. What have we learned from a generation's research on intra-industry trade? Research Paper Series 2003/44, Verhulme Centre for Research on Globalisation and Economic Policy (GEP)

Greenaway, D., Hine, R.C. and Milner, C.R. 1994. Country-Specific Factors and the Pattern of Horizontal and Vertical Intra-Industry Trade in the UK. Weltwirtschaftliches Archiv, Vol. 130, 77-100.

Greenaway, D., Hine, R.C. and Milner, C.R. 1995. Vertical and Horizontal Intra-Industry Trade: A Cross-Industry Analysis for the United Kingdom. Economic Journal, Vol. 105, 1505-1518

Gujarati, D. 1995. Basic Econometrics, 3 Ed, McGraw-Hill Books, 838 pp

Instituto Nacional de Estatistica (INE), 2016. Estatísticas Agricolas. Available at: https://www.ine.pt. (Accessed 20 January 2017)

Krugman, P. and Obstfekd M. 2007. Economia Internacional: Teoria e Politica, 6 Ed, Pearson Education, 558 pp.

Kumar, A. 2004. Export Performance of Indian Fisheries: Strengths and Challenges Ahead, Economic and Political Weekly, Vol. 39 (38), 4264-4270.

Kumar, N., and Rai M. 2007. Performance, Competitiveness and Determinants of Tomato Export from India. Agricultural Economics Research Review, Vol. 20, 551-562.

Kumar; N., Rai A.B. and Rai, M. 2008. Export of Cucumber and Gherkin from India: Performance. Agricultural Economics Research Review, Vol. 21, 130-138.

Latruffe, L. 2010. Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors. *Food, Agriculture and Fisheries Papers*, No. 30, OECD Publishing, Paris, 62 pp.

Laursen, K. 1998. Revealed Comparative Advantage and The Alternatives as Measures of International Specialization. Danish Research Unit for Industrial Dynamics (DRUID) Working Paper, No. 98-30.

Laursen, K., 2015. Revealed comparative advantage and the alternatives as measures of international specialization, Eurasian Business Review. June, Vol. 5:1, pp 99–115.

Leromain, E. and Orefice G. 2013. New Revealed Comparative Advantage Index: dataset and empirical distribution. CEPII Working Paper, June.

Marrewijk, C. Van. 2009, Intraindustry trade. In: K. Reinert and R. Rajan (eds.): Princeton encyclopedia of the world economy, Princeton University Press, Available at: http://www2.econ.uu.nl/users/marrewijk/pdf/marrewijk/Intra%20Industry%20Trade.pdf (Accessed 20 January 2017)

Noéme C. and Oliveira F. 2010. Dinâmicas e Indicadores de Competitividade da Indústria alimentar e de Bebibas: Uma análise de série longa. VI Congresso da APDEA.

Oliveira, M.F. 2006. The Evolution of the Portuguese Processed Tomato Sector: situation and prospects on the global market. New Medit, Vol. V (1), 38-46.

Oliveira, M.F. 2008. The Portuguese tomato processing sector: market structure, concentration and firm behavior. New Medit, Vol. VII (2), 23-30

PortugalFoods, 2016. Estratégia de Internacionalização do Setor Agroalimentar 2012-2017. Available at: http://213.30.17.29/GlobalAgriMar/estrategias/Docs/BOOKPortugalExcepcionalAgroAlimentarInternacional.pdf (Accessed 20 January 2017).

Rani P., Immanuel, S. and Kumar R. 2014. Ornamental Fish Exports from India: Performance, Competitiveness and Determinants. International Journal of Fisheries and Aquatic Studies, Vol. 1(4), 85-92.

Reinert, K. 2012. An Introduction to International Economics: New Perspectives on the World Economy, 2nd Cambridge University Press. 474 pp.

Rickard., B. and Sumner, D. 2006. EU support reductions would benefit California tomato growers and processors. *California Agriculture*, Vol. 60 (4), 207-210.

Serin, V. and Civan, A. 2008. Revealed Comparative Advantage and Competitiveness: A Case Study for Turkey towards the EU, Journal of Economic and Social Research 10(2), 25-41

Shende N. and Bhole B. 1999. Export potential for India's food grains. Economic Affairs Calcutta; Vol. 44 (1), 59-64.

Shende, N., Bhole B. and Korane, V. 2005. Production and potential export of tea coffee and tobacco in India. In: Jadish Prasad (Ed.), *Encyclopedia of Agricultural Marketing*, Vol. XI, 237-246.

Siggel E. 2012. The Irrelevance of Competitive Advantage for the Benefits of International Trade Open Economics Journal, 5, 15-20

Siggel, E. 2006, International Competitiveness and Comparative Advantage: A Survey and a Proposal for Measurement, Journal of Industry, Competition and Trade, June 2006, Vol 6(2): 137–159.

Stiglitz; J. 1987. The Causes and Consequences of the Dependence of Quality on Price, *Journal of Economic Literature*, Vol. 25(1), 1-48.

Turkcan K. and Ates A. 2011. Vertical intra-industry trade and fragmentation: an empirical examination of the US auto-parts industry, The World Economy, Vol. 34 (1), 154–172

Utkulu, U & Seymen, D. 2004. Revealed comparative advantage and competitiveness: evidence for Turkey vis-à-vis the EU-15. European Trade Study Group (ETSG). Paper presented at the ETSG annual conference-

Valenciano, J., Giancinti, M. and Uribe, J. 2012. Revealed Comparative Advantage and Competitiveness in Pear , International Food System Dynamics, 3 (1), 2012, 1-10

World Processing Tomato Council (WPTC), several years. World production estimate. Available at: http://www.wptc.to/pdf/releases (Accessed 20 January 2017).

APPENDIX.

Tab. A. *- Exports and imports of tomato products in value (1,000 US$) and quantity (tonnes). Unit price of exports and imports (1,000 US$/t) and terms of trade.*

		1981-1983	1987-1989	1993-1995	1999-2001	2005-2007	2011-2013	1981(83)-1987(89)	1987(88)/1993(95)	1993(95)/1999(01)	1999(01)/2005(07)	2005(07)/2011(13)
Tomato	Units							Average Growth Annual rate (centred average value)				
Paste	Export Price (1,000US$/t)	0.69	0.88	0.86	0.65	0.71	1.03	4.2%	-0.3%	-4.6%	1.4%	6.5%
Peeled		0.64	0.64	0.62	0.50	0.62	0.51	0.2%	-0.7%	-3.4%	3.7%	-3.2%
Juice		0.53	0.76	1.02	0.27	0.87	2.60	6.2%	5.2%	-19.7%	21.2%	20.0%
Paste	Import Price (1,000US$/t)	1.00	1.64	0.82	0.63	0.79	1.00	8.6%	-10.9%	-4.3%	3.8%	4.1%
Peeled		0.00	0.59	0.56	0.49	0.75	0.91		-0.8%	-2.2%	7.4%	3.2%
Juice			0.66	0.62	0.55	0.73	0.99		-1.0%	-2.1%	4.8%	5.4%
Paste	Terms of trade	0.69	0.54	1.05	1.04	0.90	1.03	-4.1%	11.9%	-0.3%	-2.3%	2.3%
Peeled			1.09	1.10	1.02	0.83	0.56		0.1%	-1.2%	-3.4%	-6.2%
Juice			1.15	1.65	0.50	1.20	2.61		6.2%	-18.1%	15.7%	13.9%
Paste	Export Value (1,000 US$)	45,471	81,699	94,286	78,633	119,634	217,940	10.3%	2.4%	-3.0%	7.2%	10.5%
Peeled		5,304	480	1,500	1,873	2,371	9,226	-33.0%	20.9%	3.8%	4.0%	25.4%
Juice		23	16	15	513	69	108	-5.3%	-1.0%	79.5%	-28.5%	7.8%
Paste	Export Quantity (t)	66,412	93,410	108,686	120,186	169,813	210,734	5.8%	2.6%	1.7%	5.9%	3.7%
Peeled		8,178	727	2,421	3,828	3,716	17,955	-33.2%	22.2%	7.9%	-0.5%	30.0%
Juice		43	26	18	1,891	80	46	-8.0%	-5.9%	117.2%	-40.9%	-9.0%
Paste	Impor Value (1,000 US$)		73	1,622	995	2,330	5,338		67.5%	-7.8%	15.2%	14.8%
Peeled			1,052	2576	3,145	6,701	11,375		16.1%	3.4%	13.4%	9.2%
Juice			13	49	68	113	150		25.4%	5.4%	8.9%	4.8%
Paste	Import Quantity (t)		56	1,867	1,610	2,967	5,366		79.2%	-2.4%	10.7%	10.4%
Peeled			1,656	4517	6,468	8,933	12,508		18.2%	6.2%	5.5%	5.8%
Juice			19	86	128	152	146		28.2%	6.9%	2.9%	-0.6%

Note: The terms of trade defined as the ratio Px/Pm where Px is Unit Export Price and Pm is the Unit Import Price (Krugman and Obstfeld, 2007).

Source: Compiled by the authors, based on WPTC (several years**)** and FAOSTAT (2016)