Almería's fruit and vegetable competitive advantage and the growth of GDP per capita

La ventaja competitiva de la horticultura almeriense y el crecimiento del PIB per cápita

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Abstract

Almeria's horticulture has experienced extensive growth that is sustained by the main macroeconomic variables: an acceleration of the agricultural income, broadly-speaking, a positive commercial balance throughout the first quindenium of the century and a GDP that on the whole represents the 16.69% of that accounted by all the province, without taking the agricultural auxiliary industry into account. This trend leads to an asymmetric process of deagrarianization which registers the whole of the Spanish economy and acts as a source of competitive plus point in comparative terms with the development of the social welfare of its territory. A linear regression analysis crosses two variables to assess the degree of coincidence that exists between the growth registered by Almeria's horticulture industry and the quality of life of its citizens. On the one hand, the productivity of the sector is used (average in tonnes of production per hectare) whilst, on the other hand, per capita GDP -because economic growth theories go against GDP as an indicator of social welfare. There is evidence that GDP per capita follows a parallel or symmetrical pattern to the citizens' perception of happiness. It has been categorically confirmed that the horticulture industry of Almería intervenes as a competitive advantage through its productivity, as it stands above all as a long-term determinant of the standard of living of any territory

Keywords: innovation; horticulture; competitive advantage; social welfare; greenhouse
JEL Classification: I31; O47; Q16; Q17

Resumen

La horticultura almeriense ha experimentado un importante crecimiento que viene sustentado por las principales variables macroeconómicas: una aceleración de la renta agraria, un saldo comercial positivo durante todo el primer quindenio del siglo y un PIB que llega a representar el 16,69% del contabilizado por toda la provincia, excluida la industria auxiliar agraria. Este comportamiento sigue un proceso asimétrico a la desagrarización que registra el conjunto de la economía española y actúa como fuente de ventaja competitiva en términos comparativos con el desarrollo del bienestar social de su territorio. Un análisis de regresión lineal cruza dos variables para valorar el grado de causalidad existente entre el crecimiento que registra la horticultura de Almería y la calidad de vida de sus ciudadanos. Por un lado, se utiliza la productividad del sector (media en toneladas de producción por hectárea) y, por otro, el PIB per cápita –pese a que las teorías de crecimiento económico rechazan el PIB como indicador de bienestar social, existe evidencia de que el PIB per cápita sigue un comportamiento paralelo o simétrico a la percepción de felicidad de los ciudadanos–. Se confirma con un alto grado de relación que la horticultura de Almería interviene como ventaja competitiva por medio de la productividad, entendida como determinante a largo plazo del nivel de vida de un territorio

Palabras clave: innovación; horticultura; ventaja competitiva; bienestar social; invernadero
**Clasificación JEL:** I31; O47; Q16; Q17

1. Introduction

The model of intensive agriculture in Almeria has meant that in half a century the income per capita of the province has rocketed from last position on a national scale to currently trending at intermediate levels (89% of the average income). Protected crops (greenhouses) inject a total of 13% towards the value of the GDP in the province of Almeria (COEXPHAL, 2017), quintupling the average that agriculture contributes to the economic aggregates of Spain as a whole (2.5%) and doubling that of Andalusia (5.2%). This sector is used to competitive market pressure which requires innovations to consolidate long-term sustainability and productivity. There are vague records on the innovation factors of this sector, which requires a guide to useful innovation indicators that measure the growth of development in the level of productivity and competitiveness.

This sector also sets centre stage in a technological revolution and establishes links between research and innovation as the foundation of a new horticulture (Monteiro, 2017). Needless to say, there is no standardized guide that establishes innovation indicators for the horticulture industry. Literature based on innovation in Almeria horticulture is scarce. Authors such as Garcia Torrente and Perez Mesa (2012) address specific studies that take productivity as a factor of innovation, as a result from improvements in wintering structures, greenhouse management and environmental management.

The innovation manuals and reference guides set out basic and fundamental guidelines for measuring innovation, which are, by and large, suited to sectors such as manufacturing; However, the agricultural sector requires adaptations to contextualize the specifics of this industry (Anlló, Bisang, Berardi, Erbes, & Stubrin, 2010) and lacks the appropriate tools to measure innovation (RAET, 2014). The Food and Agriculture Organisation of the United Nations (FAO) has established indicators for the outcome and impact of rural innovation which are limited to the agricultural field through a series of general criteria: R&D, technical assistance and extension, agricultural education and training, coordination and collective action, dissemination and knowledge management, enabling environment and incentives for agricultural innovation and access to markets.

Figure 1. Annual variation in% of exports. Evolutionary and comparative cycle between 2000 and 2017 in Almeria, Andalusia and Spain
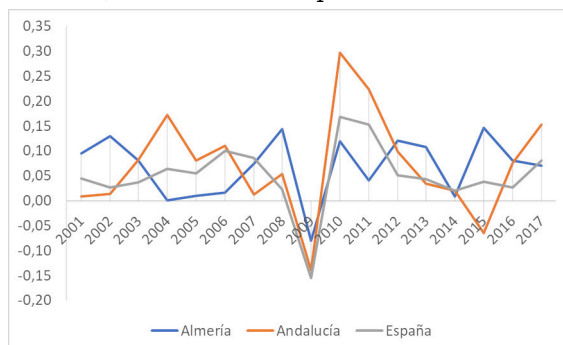
Source: Own elaboration based on data extracted from the ICEX website (Institute of Foreign Trade of Spain)[1]

At the outset of this past century, Spain failed to claim any top position, as in many other parameters, in world classifications in terms of investment in knowledge. If you consult the Global Innovation Index 2018[2], an indicator that recognizes innovation as an engine of growth, economic prosperity and broad horizontal vision within the realms of innovation, Spain is ranked 28th in a ranking that is led by countries such as Switzerland, the Netherlands and Sweden. Torrent Sellens (2010) explains it exceedingly well by resorting to economic theory:

> "economic growth has two main sources: investment in productive factors of production (FPP: physical, human, technological and organizational capital) and innovation (intentional application of knowledge). An efficient and competitive economy has stronger, more intensive sources for growth" (Torrent Sellens, 2010).

These FPPs must be adequately combined with innovation. This will depend on the engine of sustainable growth, the well-being of a nation and that of prosperity are indicators which are subject to productivity and competitiveness.

Analyzing this combination of factors within a specific industrial cluster, such as the Almería fruit and vegetable industry, it would be an understatement to say that it deserves the attention of this research, which in turn focuses its aims on the following parameters:

- Identify the main innovation milestones developed by Almeria's fruit and vegetable industry.
- By combining the FPP and innovation, we must determine the productivity of Almería's fresh produce sector.
- Link the productivity ratio in its historical series with an indicator of social welfare that helps determine if this variation represents a competitive advantage.

The scope of this work is based on an exploratory research on innovation in Almeria's fruit and vegetable sector. The innovation guides (Oslo Manual, for instance (OCDE Y EUROSTAT, 2005) are aimed at manufacturing sectors, without reference research for specific industries such as agriculture and, more specifically, for horticulture which is a very dynamic and thriving sector in the southeast corner of the Iberian peninsular.

Specifically, based on the analysis of the relationship between the productivity of the sector - about which there are multiple research of its factors - and the social development of the territory, this research considers whether horticulture in Almería really has competitive advantages. This research does not focus on distinguishing between absolute and competitive advantage, but rather if, through productivity, Almeria horticulture achieves a competitive advantage by improving the social welfare of the territory.

The analysis carried out for this is based on a historical series of the productivity of the fruit and vegetable sector, from 1975 to 2015, identifying the key innovation milestones applied to the greenhouse industry. Productivity, measured in tonnes per hectare, will reflect the level of innovation introduced in the combination of FPPs. If productivity is increasing, levels of innovation will be recorded; If productivity is on the downturn, it will mean that innovation fails to be present or its application has failed altogether. The drawing up of this index will be correlated with another that measures the evolution with regards to the social welfare of the province to determine the cause-effect relationship between productivity and social welfare.

2. Almería's hortofrutícola industrial district. Economic variables.

2.1. Competitiveness

The different economic current tendencies have regarded technology as a primary source of economic growth and development, a factor that takes on a special level of importance within the theory of competitive advantage, whose meaning can be best understood through means of productivity. In this context, competitiveness can be upheld as the long-term capacity of an economy to improve the welfare of its society. The economist Sala-i-Martin (2010) outlines this in the following way:

> "Competitiveness can be defined as the set of institutions, policies and factors that determine the level of productivity of a country. Productivity, in turn, represents the level of sustainable prosperity that an economy can attain. In other words, the most competitive economies tend to generate higher levels of income for their citizens. The level of productivity also determines the rates of return obtained by the investment of an economy. Since return rates are a main foundation of aggregate economic growth, a more competitive economy, with a higher productivity, has a greater tendency to flourish with higher rates in both the medium and long term. Furthermore, given that productivity has static and dynamic implications with regards to the standard of living of a country, we can also look upon competitiveness as the set of institutions, policies and factors that determine the current and medium-term levels of prosperity of an economy" (Sala-i-Martin, 2010).

Figure 2. Agro-industrial cluster of Almeria intensive horticulture

Source: Aznar-Sánchez and Galdeano-Gómez (2011)

A distinction is therefore made between absolute advantage (Adam Smith) and comparative advantage (David Ricardo). The absolute advantage is upheld by the situation in which a country can produce a good or service at a lower price than another. The comparative advantage offers a scenario in which the same good or service can be produced at a lower opportunity cost than others. Almeria's fresh produce industry (Aznar Sánchez, 2011) has gone from demonstrating absolute advantages to competitive systemic and dynamic advantages within an agribusiness cluster context.

2.2. Almería's fruit and vegetable productivity

Porter (1991) stressed that productivity is the leading long-term determinant of a nation's standard of living since it is:

> "the root cause of national income per capita. The productivity of human resources determines wages, while the productivity of capital determines the return on investment. The only significant concept of competitiveness on a national level is national productivity. A growth in the standard of living of its citizens depends on the ability of companies in a nation to reach high levels of productivity and to increase it over a matter of time" (Porter, 1991).

The convergence between the different currents of thought about economic growth that value technological innovation admits that the progress of economic activity is based on two pillars: in the accumulation of productive factors (capital and labour) plus, innovation within economic activity (technological progress). Another line of thinking which was developed by Robert M. Solow, shows that productivity progress is based on the rate of technological progress, as understood to be an exogenous factor to productive factors.

In accordance with these economic theory trends, it is confirmed that the increase in productivity will be driven by both elements of technological progress and innovation. Figure 3 shows a historical series (between 1975 and 2015) that measures the level of productivity of the Almeria fruit and vegetable sector in terms of yield (tonnes in terms of production) per wintering hectare. It goes hand in hand with the main technological milestones that the sector has implemented from the stance of innovation.

From the introduction of hybrid seeds in 1975 until the biological revolution of 2007, the sector has undergone a series of innovations that have considerably contributed to almost tripling its productivity, measured in tonnes of wintering production per hectare. If in 1975 an average of 2.8 kilograms per m^2 was achieved, in 2015 the sector produced an average of 7.3 kilograms per m^2 (the highest peak was recorded in 2012 with an average of 7.3 kilograms per m^2).

Figure 3. Historical productivity of the fruit and vegetable sector of Almería (1975-2015) with the key innovation milestones introduced. Tonnes of production per hectare.
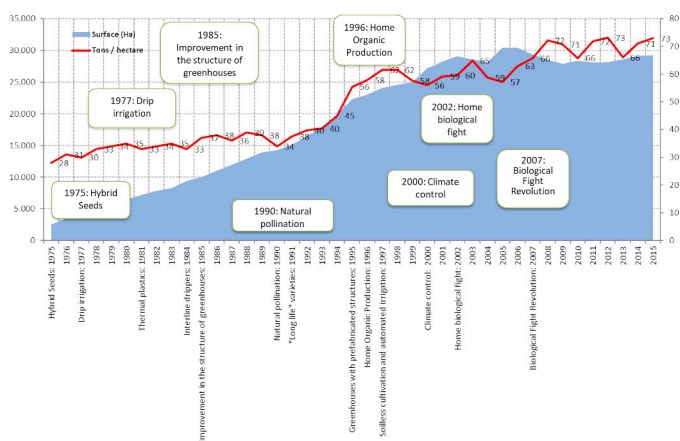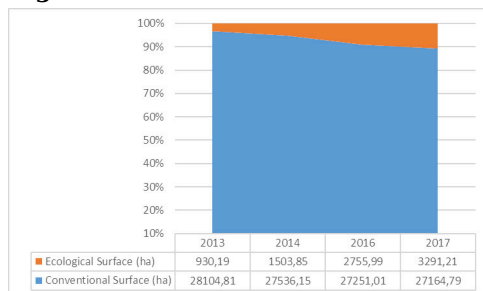

Source: COEXPHAL (2017)

The varieties of fresh produce included in the study are namely watermelon, melon, courgette (zucchini), cucumber, aubergine (eggplant), tomato, pepper and green beans. The last decade of the last century was witness to the most vigorous growth, going from 39 tonnes per hectare in 1990 to a total of 56 in 2000. The introduction of "long life" varieties and natural pollination were the precursors of this powerful growth in productivity levels. Upon studying the last decade (2005-2015), we observe an important upward trend (the sector goes from producing 5.7 kg / m^2 to registering an average of 7.3 kg / m^2 in 2015). This cycle includes the challenging biological revolution (2007), which has been a turning point in terms of production methods: a significant reconversion of traditional to organic farming is developed, driven by the demand for healthier products along with greater environmental awareness. Figure 4 shows the reduction of the traditional

cultivation area compared to the advance for the soil set aside for organic cultivation, whose extension already now exceeds 10% of all the production which is used for the cultivation of vegetables.

Socio-economic changes and new demanding patterns in terms of pressure lead the producer to make significant changes in production methods. Socially responsible business activities tend to generate greater economic performance than conventional ones (Gil Salmerón, 2016). There is substantial evidence that production costs are slightly higher in organic production when compared to traditional farming; Notwithstanding, the sale price of vegetables (in contrast with references such as Almeria cucumber or California pepper) are significantly higher than conventional ones. This organic farming revolution has clearly shown the huge adaptation and change of Almería's fruit and vegetable sector.

The productivity of the fruit and vegetable sector has undergone several cycles of high importance in the series that was analyzed. Its first quindenium (1975-1990) shows some stability, as the key innovations that have been developed incur more delayed effects on production (hybrid seeds, drip irrigation, thermal plastics, inter-line drippers along with a vast improvement in the building structures of greenhouses themselves, among others) yet they scarcely do they increase the productivity ratio by 10 tonnes per hectare (1 kg / m^2).

Figure 4. Evolution of the surface for organic vs. traditional cultivation.

|	2013	2014	2016	2017
Ecological Surface (ha)	930,19	1503,85	2755,99	3291,21
Conventional Surface (ha)	28104,81	27536,15	27251,01	27164,79

Source: Own elaboration based on data from the Ministry of Agriculture, Fisheries and Rural Development of the Junta de Andalucía

The accumulation of experience, the technical improvement of these new inputs together with the introduction of new technological processes arouse a certain vigor in production plus they almost double the levels of productivity during these years (1990-2015): natural pollination, the introduction of other varieties "Long life", the use of prefabricated structures, the initiative towards organic farming, the use of landless crops, automated irrigation, climate control and the start of biological control, among others, mark some milestones that result in higher yield and productivity, since it goes from producing 3.9 kgr / m^2 in 1990 to 5.7 kgr / m^2 in 2005 (registered in the previous years up to 6.4 kgr / m^2). The following decade (2005-2015), characterized by the challenging biological revolution along with a growing interest in organic farming in its final phase, reach heights of up to 7.3 kgr / m^2.

2.3. Almeria GDP per capita

The measurement of the social welfare of a country or a territory has sparked multiple debates and controversies. The economic literature has shown that it is not logical to measure the well-being of a nation solely based on its economic activity , since it depends on "subjective" factors that weigh up differently according to the citizens of any given territory. International organizations have developed alternative indices to GDP to measure the social welfare of a country. The OECD, for instance, takes aspects such as housing, income, employment, community, education, environment, civic engagement, health, satisfaction, safety and life-work balance into account. The United Nations, through the Human Development Index (HDI), takes life expectancy, education and income level as a reference; Needless to say, it has been empirically proven (Gutiérrez-Domènech, 2014) that GDP (per capita) reasonably reflects the progress of a society, since it is concluded that, once the wealth threshold meets the basic needs of the population and is comfortably attained, other aspects of welfare come to the forefront. Moreover, the perceptions of citizens intervene in a different manner. On the other hand, it has been observed that the trajectory of GDP growth (as in the case of Spain) symmetrically evolves to the personal satisfaction of its citizens, so it can be confirmed that levels of happiness are directly linked to the economic cycle.

To determine the level of Almería's social welfare, the GDP per capita will be adopted as valid, according to the previous finding and in the absence of (historical) indicators of citizen perception that measure the degree of "happiness" this territory experiences. From 1980 to 2015 we can establish that in the province of Almería the level of wealth per citizen has increased tenfold. At the very outset of this historical series, GDP per capita represented 75.55% of the Spanish average, while in 2015 it was 79.63 %. After a hefty level of convergence at the outset of this century with the Spanish index - in 2000 it reached 95.03% of the national average - this indicator has suffered a gradual distancing from the Spanish GDP per capita that has been much more pronounced during the recessive phase of the economic cycle (2007-2013).

Figure 5. Evolution of GDP per capita in euros of Almeria, Andalusia and Spain. 1980-2015 series
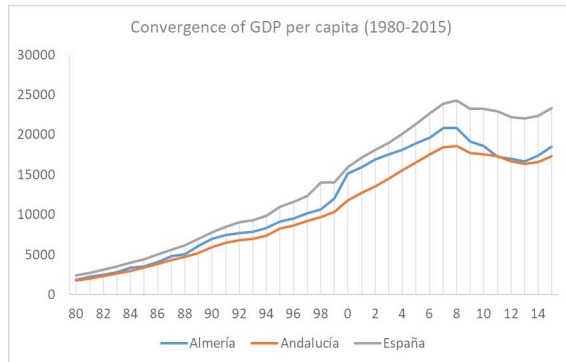
Source: Own elaboration based on data from the National Statistics Institute[3]

The distribution of Almeria GDP is mainly composed of the services sector (including the agricultural auxiliary industry), followed by agriculture, industry and, posterior to the recession, by construction. The sector weight is different for national economic aggregates, except for services, which also represent the majority of national GDP, followed by industry, construction and services. On an agricultural level, Almería contributes 16.69% to the provincial GDP with this sector (2015 data) while, on a national level, agriculture injects 2.60% of the income. Spain as a whole follows a phase of deagrarianization (sector GDP falls from 3.74% in 2000 to 2.60% in 2015). Almeria, however, supports the weight of its main industry, the agrarian industry (including the auxiliary one), with an upward trend, since in 2015 it surpassed the barrier of 13% of the GDP registered in previous years and contributed 16.69% to the economic aggregates.

Figure 6. GDP weighting by sectors. Years 2000 to 2015. Comparative data of the province of Almeria with that of Spain.
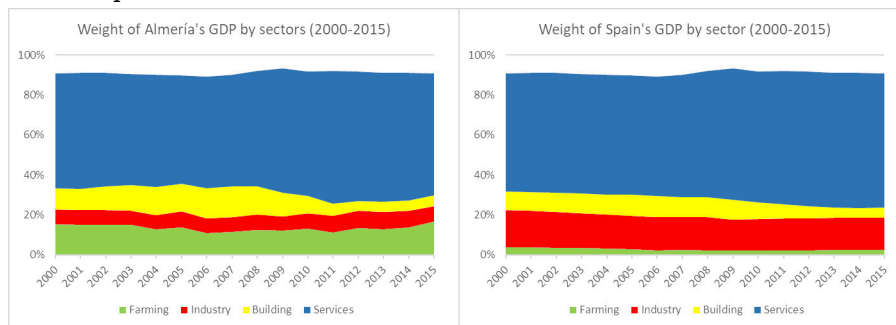
Source: Own elaboration based on data from the National Statistics Institute[4]

2.4. Exports

The evolution of Almería's export market does not follow a symmetrical pattern nor is in line with the national one. Analyzing the cycle set between the years 2000 and 2015, it is observed that Almería has attained an export quota to the national group, going from representing 0.97% of all goods exported by Spain from the outset of the century to closing 2015 with a weight in foreign sales of 1.25%. This data is supported by a trade surplus in the whole consulted-upon series, despite records of a significant increase in imports.

Table 1. Export balance in thousands of euros broken down by sector

Exports by sectors in Euros	2013		2014		2015	
	Value	% Total	Value	% Total	Value	% Total
Agrifood	1.983.877,14	81,33%	2.199.910,77	81,40%	2.413.363,11	77,21%
Drinks	711,62	0,03%	3.656,15	0,14%	6.305,76	0,20%
Consumer goods	29.409,06	1,21%	30.906,14	1,14%	57.675,56	1,85%
Industrial products and technology	425.287,65	17,43%	468.119,78	17,32%	648.464,84	20,75%
TOTAL	**2.439.285,48**		**2.702.592,85**		**3.125.809,27**	

Source: Institute of Foreign Trade (ICEX)

**Figure 7.** Variation of trade balance and Domestic export quota
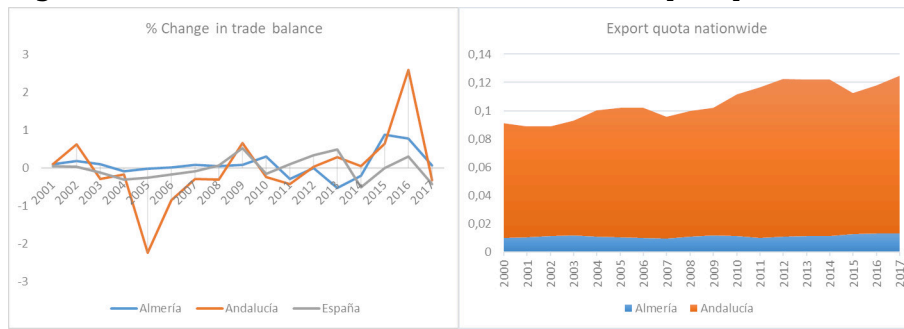
Source: Own elaboration based on ICEX data.

3. Results

The main aim of this research focuses on the behaviour of a specific industrial cluster, such as Almeria's fruit and vegetable industry aswell as on competitiveness through productivity. Theories such as competitive advantage have given productivity the key to achieving an improvement in the standard of living of citizens. Productivity itself is attained by means of two components: the accumulation of productive factors (capital and labour) and innovation in economic activity (technological progress). Great economists (Marx and Schumpeter) attribute long-term economic growth and, consequently, the material progress of society, to technological innovation. In this context, the competitiveness option would not fit if it were attained by means of a wage reduction of its work-force or via the devaluation of the currency (this would incur a reduction in the purchasing power of citizens within the territory), as it would lead to a confrontation with the pertaining of material well-being of the economy; Notwithstanding, if that economy increases its participation in the foreign market thanks to improvements in its productivity, it will become highly competitive, since it contributes to the improvement in the living standards of its citizens.

Figure 8. Horticultural productivity of Almeria measured in tons of production per hectare. Data expressed every five years from 1975 to 2015.
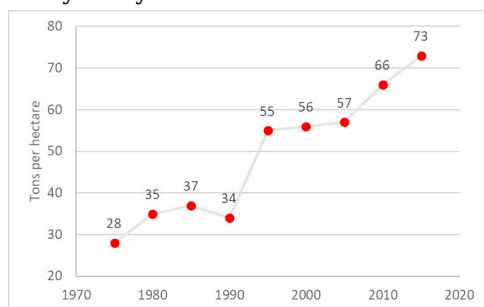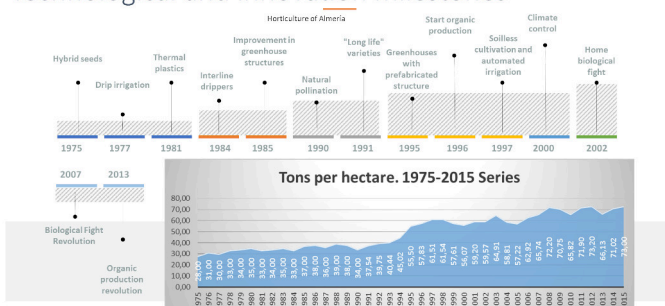

Source: Own elaboration based on data provided by COEXPHAL (2017).

To determine the productivity of Almería's fruit and vegetable sector, an objective variable that expresses the level of performance and its evolution over time has been used. The production of vegetables (in tonnes) per cultivated area (in hectares) is a clear example to measure such productivity aswell as establishing whether it involves a technological progress by means of innovation. An increase in productivity can be put down to an efficient combination of productive resources and technology.

Figure 9. Infogram that includes the historical series of productivity with the main innovation milestones and technological developments applied to horticulture in Almeria between 1975 and 2015.

Source: Own elaboration based on data provided by COEXPHAL (2017)

It is verified, according to Figure 9, that Almeria horticulture has developed technological and innovative processes in their crops, since productivity levels have increased from 28 tons per hectare in 1975 to 73 tons per hectare in 2015. The last decade of the Last century it consolidates a technological deployment due to a spectacular improvement in production: it goes from an average of 34 tons per hectare in the 1975-1989 cycle to an average of 53 tons per hectare between 1990 and 2004 to close the last 11 years (from 2005 to 2015) with an average of 68 tons per hectare.

This variable records the annual production level of a series of certain vegetables: watermelon, melon, courgette (zucchini), cucumber, aubergine (eggplant), tomato, pepper and green beans. The annual production is divided by the number of cultivated hectares- data obtained from COEXPHAL and the mapping report published on a yearly basis by the regional government known as the Junta de Andalucía. In this way, the productivity of the sector is calculated without the involvement of external variables that could distort the results since, to quote an example, price volatility would distort the results.

The productivity index intervenes as an independent variable (X) to apply an analysis of linear regression. The dependent variable (Y) is composed of GDP per capita, an index that measures the level of citizen wealth which reflects the evolution of the social welfare within the territory. Hence, one seeks to measure the level of coincidence that exists between both parameters and to verify if Almeria's fruit and vegetable industry, which has been increasing its external sales in a progressive manner, represents a competitive advantage via productivity, in other words, if it does so in a sustained way over time and with an improvement in social welfare.

Although the economic and financial crisis has plagued the province of Almería with more virulence than the nation as a whole, and despite the fact that the demographic evolution doubles that of the Spanish growth rate, Almería has experienced a growth of its GDP per capita throughout the cycle analyzed (1980-2015). It has gone from registering 75.55% of the national per capita GDP in 1980 to reaching 79.63% in 2015 with a maximum of 95.03% in the year 2000. The linear adjustment of both variables (productivity and GDP per capita) determine the degree of correlation between the two and with what strength of force innovation intervenes in the development of social welfare in the province.

The scatter plot (Figure 10), represented by red points, shows, a priori, that there is some kind of relationship between the two variables. The level of dependence is linear, since, as the value "x" (Productivity) increases, the value of "y" (GDP per capita) also increases. Although the points are not in a straight line, they do address and anticipate that there may be a strong linear relationship.

The regression model is defined by the line $y = 409.73x - 10.066$. This data helps to interpret the result. The value of the ordinate at source (B_0) indicates that, for a level of zero productivity, a negative GDP per capita of 10,066 euros would be obtained, thus meaning that the minimum level of productivity which would have to be reached to start earning income (per person) would be a total of 24.57 tonnes per hectare. At this level of productivity, a GDP per capita of 0 euros would be attained. Furthermore, from there, it would go into increasing returns.

Figure 10. Linear regression line. Horticultural productivity and GDP per capita of Almería
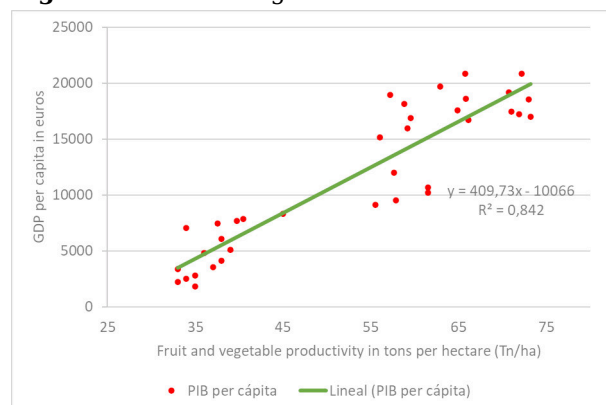
Source: Own elaboration based on data from COEXPHAL and INE.

The slope of the regression line (B_1) is positive and confirms that there is a relationship between both variables aswell as determining at what level the dependent variable varies when the explanatory or independent variable does. These parameters show that the GDP per citizen increases at a rate of 409.73 euros for each ton of vegetables produced in a hectare exploited with greenhouses. Extrapolating data, you can determine the level of productivity required to match the average income of a person from Almeria with that of a person in the rest of Spain. Spain's GDP per capita in 2015 was 23,296 euros. According to the regression line, a

production of 81.42 tonnes per hectare would make Almería's GDP per capita the same as that accounted for by the national group in 2015. The coefficient of determination (R^2) helps to assess the degree of association that exists between the linear regression model used for the set of applied observations and the variations that occur in the dependent or endogenous variable. The health of adequacy assigns a coefficient of determination 0.8420, which means that the linear regression model represents 84.20% of the variance of the observations. The sample correlation coefficient (r) is positive given the relationship between the values of both variables: large values of "x" are paired with large values of "y" and vice versa. By means of the sample covariance between both variables, it can be numerically measured. The sample correlation coefficient is 0.91761, which indicates that the degree of relationship between the analyzed variables is strong, meaning that, as the level of productivity grows, so does GDP per capita. Both the determination coefficient and the sample correlation coefficient are high, which explain both the proportion of GDP per capita variation shown by the level of fresh produce productivity and the degree of association between the two variables.

4. Conclusions

The initial aim of this research was sought to contextualize with quantitative data innovation in Almeria's fruit and vegetable sector set in multiple variables and to what degree they interrelate among them; Needless to say, there are no records to date, at least public ones, that historically quantify various parameters that help measure the Almeria fruit and vegetable model as an innovation system and its socio-economic contribution within its territory, given the understanding as an agribusiness cluster. In this context, it is a requirement to develop a standardized and specific guide for the sector that measures its innovation, not only from an intrinsic perspective, but also valid for cross-sector comparison. The manuals and guides that exist on this subject (Oslo Manual, for instance) have been designed with a greater orientation towards the manufacturing sector, as noted above. Others more linked to the primary sector, such as the guide developed by FAO, focus their recommendations on the agricultural sector. Protected fruit and vegetable farming, given its specificity, dynamism, particularity and peculiar form of production, clearly distinguishes itself from normal agricultural activity.

The difficulty of obtaining an index of historical social welfare in the province of Almeria to demonstrate whether Almeria's fruit and vegetable industry represents a competitive advantage has not been an obstacle to develop a study that analyzes whether the level of productivity of this sector is attained by means of an advance in welfare territory material. Economic literature has failed to measure social welfare via financial activity parameters due to the subjectivity in which the factors that value, in a different manner, the citizens of each territory intervene. Social welfare surveys are carried out by weighing up the level of importance granted by citizens and the factors that come into play for their judgement. There are alternative indices to economic variables with which to measure the social welfare of a country or region, such as those published by the OECD or the United Nations Human Development Index; Notwithstanding, its extension - both geography and temporality - is very limited, since it fails to allocate a historical series of Almería and its province which is the object of this study; Nevertheless, it has been established (Gutiérrez-Domènech, 2014) that the GDP per capita reasonably reflects the progress of any given society, since, once the wealth threshold has been exceeded aswell as it comfortably meeting the basic needs of the population, the level of importance (over those factors of need) and citizen perception intervene in a different manner. It has been observed, in the case of Spain, that the trajectory of GDP per capita evolves symmetrically to the personal satisfaction of citizens, so there is evidence that levels of happiness are closely linked to the economic cycle.

The different economic currents tend to regard technology as a source of economic growth and development, a factor that is a particularly key factor in the theory of competitive advantage, the meaning of which can be understood by means of productivity. The endowment of productive factors and the efficiency with which they are combined support the attainment of competitive advantage, level and productivity dynamics of an economy. Porter (1991) stressed that productivity is the main long-term determinant of a nation's standard of living as it is "the root cause of national per capita income". The convergence between the different currents of thought concerning economic growth that value technological innovation recognises that the progress of economic activity is based on two pillars: in the accumulation of productive factors (capital and labour) and innovation in economic activity (technological progress).

Almeria fruit and vegetable productivity, measured in tonnes of produce per hectare in the historical series from 1980 to 2015, confirms a progressive evolution in terms of production per square metre in the last thirty-five years. These increases are backed by a series of technological milestones (drip irrigation, natural pollination, biological control and ecological crops among others) and macroeconomic variables (such as GDP and the trade balance with positive growth) that confirm a significant development of the sector on the whole. Fresh produce productivity has gone from 28 tonnes per hectare in 1975 to 73 tonnes per hectare in 2015, while GDP per capita has risen sharply from 1,836 euros in 1980 to 18,550 euros in 2015. The central analysis of this Research seeks to ascertain whether this growth is accompanied by an improvement in the social well-being of its citizens, plus verifying whether there is a reduction in the purchasing power of its citizens. A linear regression analysis, which correlates that productivity with the GDP per capita of the province, shows with a high level of adjustment (84.20%) that the relationship between both variables is positive and its level of

dependence is linear: since the independent variable "x" (productivity) increases, the value of the dependent variable "y" (GDP per capita) also increases.
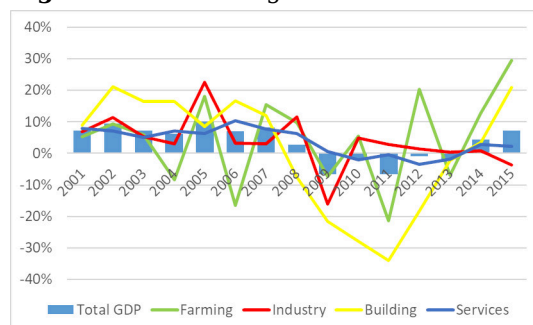
Therefore, the proposed hypothesis 1 is verified, since Almeria's fruit and vegetable industry intervenes as a competitive advantage, since the increasing productivity yields result, in 84.20% of the cases, thus increasing the level of citizen wealth (GDP per capita) This improved development, both of absolute income and of exports - with a trade surplus in the balance of payments in all the years consulted from 2000 to 2015 - is explained by productivity and competitiveness factors, as the average income of its citizens has also witnessed an increase in the analyzed cycle.

5. Challenges of the sector

The agricultural sector in Almería follows an asymmetric process to that of the rest of Spain: while the national group follows a process of disgrarization, the agricultural industry in Almeria shows a resilience that leads to a upward trend of growth, despite registering, in the first quindenium of the century, a recessive phase during the bullish phase of the economic cycle. The great vigor that the construction sector registered played a huge role in the sector, par excellence, within the province, which regained its prominence in 2009. At the beginning of the century, the weight of the fruit and vegetable industry in the GDP of the province of Almeria was 15.40 % and in 2015 it rose slightly to 16.69% - in the case of Spain it was 3.74% and 2.60%, respectively.

The economic and financial crisis unleashed in 2008 was a huge burden on the economy of Almeria and its province as it was hit more strongly than the national group, with special attention to the construction sector. The economic recession caused this industry to drop twice as much as the national group. On the per capita income side of things, Almería registered 75.55% of Spain's GDP per capita in 1980, reaching its highest level in 2000 with a total of 95.04% of the national then 2015 came to a close with 79.63 %. Two other variables to take into account are the demographic growth of the province, which in the first fifteen years of the century doubles that registered by the rest of Spain and Andalusia, and the level of exports (77-80% derive from the agricultural sector) together with foreign sales (in 2015) in excess of 3,126 million euros and a balance in the commercial balance of 803 million euros.

Figure 11. Percentage variation of GDP at the sector level of the province of Almería

Source: Own elaboration based on INE data

FootNotes

[1] https://www.icex.es/icex/es/index.html

[2] http://www.wipo.int/publications/es/details.jsp?id=4330

[3] Amounts in euros at market prices (current prices). The 1980-1999 cycle is constructed based on two series with the population census on July 1 of each year: the 1980-1994 range is made with the 1980-1996 series with the 1986 base year and the 1995-1999 range is calculated with the 1995-2004 series with base year 1995. The 2000-2015 cycle is carried out with the 2000-2017 series and base year 2010.

[4] Gross Domestic Product at market prices (current prices) and gross value added at basic prices by branches of activity. Series 2000-2016 with base year 2010.

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