

AGRICULTURE PRODUCTION IN TWO SPANISH REGIONS WITH INTENSIVE USE OF FOREIGN LABOUR FORCE: A CASE STUDY OF ALMERIA AND MURCIA

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Abstract

Almeria and Murcia are regions that represent a tiny part of Spain in terms of area and population, but they account for a significant share of the national production and export of vegetables, supplying a large part of the EU Member States. As production and exports have grown, so has the demand for labour, and an increasing proportion of this demand has been met by immigrants. Thus, Murcia and Almería became Spain's major centres of immigrant-based agriculture, where intensive production resembles an industrial process. The aim of this study is to show that the strong raise in production has attracted migrants and their presence in the agricultural sector has increased significantly. Data on production, exports, labour force and migration were collected from different Spanish institutions over a period of thirty-eight years and a multiple linear regression model was applied to test our hypothesis. The results obtained confirm this hypothesis and are consistent with theories explaining labour migration.

Key words: intensive agriculture, immigrants' workforce, labour migration, vegetable exports, production growth

INTRODUCTION

Migration is a multifaceted, constantly evolving process, and no single theory can fully explain its complexities. As a result, most empirical studies are analytical but fall short in one way or another.

Experts argue that the statistical methods used in these studies are often basic and lack sufficient tests (Massey et al., 1998) [16].

However, correlation-regression models have been successfully used by some authors. Glukhov et al. (2022) developed such a model explaining the migration flow of employed rural population in Saratov region, Russian Federation [8].

Also, regression models were used by White Andreea (2005) to study the influence of economic variables on net migration in Iowa counties [27].

The reasons for initiating migration can be traced to various factors, such as wage disparities between countries, dysfunctions in markets in the countries of origin, the demand for labour in industrialised nations, or the expansion of developed nations into

developing country markets (Portes and Böröcz, 1989) [25].

Migratory patterns are primarily driven by economic factors, such as income differences, changing disparities between countries, and the relative economic status and structural characteristics of both origin and destination countries, as affirmed various researchers.

Socio-economic structure and migration at international level and in the situation in Turkey was presented by Akdemir et al.(2024) [2].

Most migrants today originate from nations characterised by limited capital, low job creation, and an oversupply of labour. International migration helps balance labour supply and demographic shifts in both sending and receiving nations, influencing economic growth, trade patterns, income distribution, and political power within and between these countries (Chiswick and Hatton, 2002) [3].

Lee (1966, 1996) [13, 14] explains migration patterns by identifying the factors that compel individuals to leave their home country (push factors) and the factors that draw them to a new destination (pull factors) which is particularly

relevant to this study [13]. The neoclassical theory is also relevant to this research, as it suggests that migration decisions are largely made on an individual basis, with the individual weighing the costs and benefits of migrating.

Although migration decisions can sometimes be family-based (Taylor, 1999) [26], the primary motivation for migration in the case of European countries that have become receivers, including Spain, is wage and employment disparities.

This paper demonstrates that although there is significant demand for immigrant labour in some sectors, workers from low-income countries are often employed in the secondary labour market (Piore, 1979) [24].

According to Lewis (1954) [15], when the labour force increases in receiving countries, output should rise, while demographic and employment pressures in sending countries should decrease.

Furthermore, when there is complementarity between native and immigrant labour rather than substitution, unemployment in destination countries should not rise. This is the case in certain economic sectors in Spain, such as the agriculture.

The South-Eastern Spain is well known for an intensive agriculture and Almeria, a sub region of Andalusia, is a remarkable supplier of vegetables and fruits for the internal and external market (Chiurciu et al, 2021) [4]. This is the reason why in this region it is needed a huge labour force in agricultural production and migrants are welcome to help. Kostova (2008) emphasized the socio-economic effects of migration in Spain [12].

In this context, we focus our study on the Spanish regions Almeria and Murcia, which represent a small portion of Spain in terms of both area and population and provide a relevant share of the production and export of vegetables, supplying a big part of EU Member States.

Along with the strong increase of the production and exports, the demand for labour force raised and increasingly higher part of this demand has been covered progressively by immigrants since 1986 while the production of vegetables has increased by 250% and the

export by 700% in the case of Almeria and by 100% and by 400% respectively in the case of Murcia.

We suggest that the strong increase in production and exports generated a *call effect* on migrants and therefore their presence in the agriculture sector in both regions raised so significantly.

MATERIALS AND METHODS

The period analysed in this paper comprises the years 1986-2023. Data refer to national values, as well as regional values (Almería and Murcia). Data on registered foreign population and foreign labour force proceed respectively from the Municipal Register and Labour Force Survey, Spanish National Statistical Institute (INE) [10, 11], as well as from the statistics of the Ministry of Interior [18], National Institute for Social Insurance (from 2013 onwards: Ministry of Inclusion, Social Security and Migration) [23] and the Ministry of Labour and Social Economy (MTES) [19, 20, 21, 22]. Data on regional agriculture production come from the Statistical Yearbook of Andalusia/ Counselling of Agriculture and Fisheries, Provincial Delegation of Almería and Regional Agricultural Statistics, Department of Agriculture and Water, Region of Murcia [5, 6].

Finally, data on agriculture exports were collected from the Spanish National Tax Office and the Ministry of Economy, Trade and Enterprise (DataComex) [1, 7, 17].

The methodology used in this study is a multiple linear regression through which we explain that the strong expansion of the production and exports attracted migrant workers. As a result, their presence in the agricultural sector in both regions have increased substantially.

Among the sixty variables created and analysed for the study (with thirty-eight observations each) collected from Spanish Institutions, we selected several relevant independent variables (mostly calculated shares) and a dependent variable, immigrants in agriculture sector, then we performed an analysis for each region.

Thus, in the function:

$$y_j = b_0 + b_1x_{1j} + b_2x_{2j} + \dots + b_kx_{kj} + u_j, \dots (1)$$

where:

y (Immigrants with valid work permission in agriculture) is a variable that can be referred to as dependent and x are independent (Share Green Houses/Total Vegetable Production (Ha); Vegetable produce (Metric Tonnes (MT)); Share of the exported vegetables (€) and Employed workers in agriculture (annual average values). In the model we notice indication for a direction of the effects from the x variables to the y variable, so that the value of the latter seems to be influenced by the values of the former.

RESULTS AND DISCUSSIONS

Immigration in Spain has raised spectacularly during the past thirty years. If we go back in 1986, immigrants accounted for less than 1% of the total population and this remained the case until the early 1990s. In 2000 they represented 2% of the total population, but by the end of 2023 13% of the total population in Spain is foreign. While immigrants represented 2.7% and 1% of the total population of Almería and Murcia at the end of 90ties, according to the recently published data from the INE municipal registry, they now represent 30% and 17%, respectively. The increase of Romanians and Bulgarians has also been huge (Figure 1).

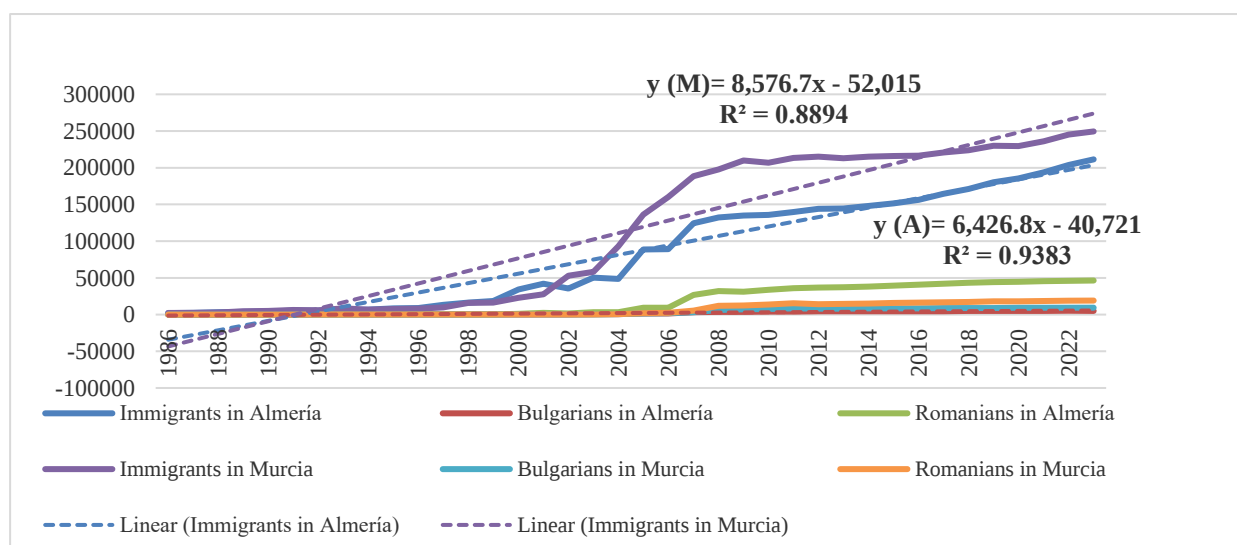


Fig. 1. Evolution of the immigrants in Almería and Murcia
Source: Ministry of Inclusion, Social Security and Migration [23].

The cumulative annual average rate of increase in immigrants' presence is 13% for Almería and 14% for Murcia.

The cumulative annual average rate was calculated using the formula:

$$n-1 \left(\sqrt[n]{\text{final value} \div \text{first value}} - 1 \right) \times 100 \dots (2)$$

Hence, the total growth rate of immigrants for the period is more than 10,000% in both regions.

The intensive agriculture which is so relevant in both regions is similar to an industrial process.

Meanwhile the share of migrants' workers in agriculture sector in each region was

insignificant in 1986, much less than 1% of the workers, in 2023 they comprise more than half of those employed in agriculture.

Agriculture itself is a sector that requires labour at a specific moment in time, since harvests cannot be delayed until the arrival of the workers. Therefore, in addition to being labour-intensive, this sector, unlike others, is much less likely to postpone its activity and if it does not have a sufficient number of workers, it is impossible to harvest the production.

Both regions have similar production models: capital- and labour-intensive horticulture that does not allow for much mechanisation, a similar climate and a predominance of salaried

labour, although with a decrease in the number of native workers (Figure 2).

It should be stressed out that this is an extremely important agricultural sector at both, regional and national level.

Its weight in the economies of the two regions is important and is growing more than other economic sectors.

It is also important to underline that intensive agriculture is very prominent in both regions,

especially in Almería, however in Murcia its growth has also been very fast.

The significant rise in production aimed at export is evident, increasing from less than 30% in 1987 to 56% and 70% in 2023 in Almería and Murcia, respectively. Notably, Almería and Murcia together account for 60% of the national vegetable exports, with 38% and 22%, respectively.

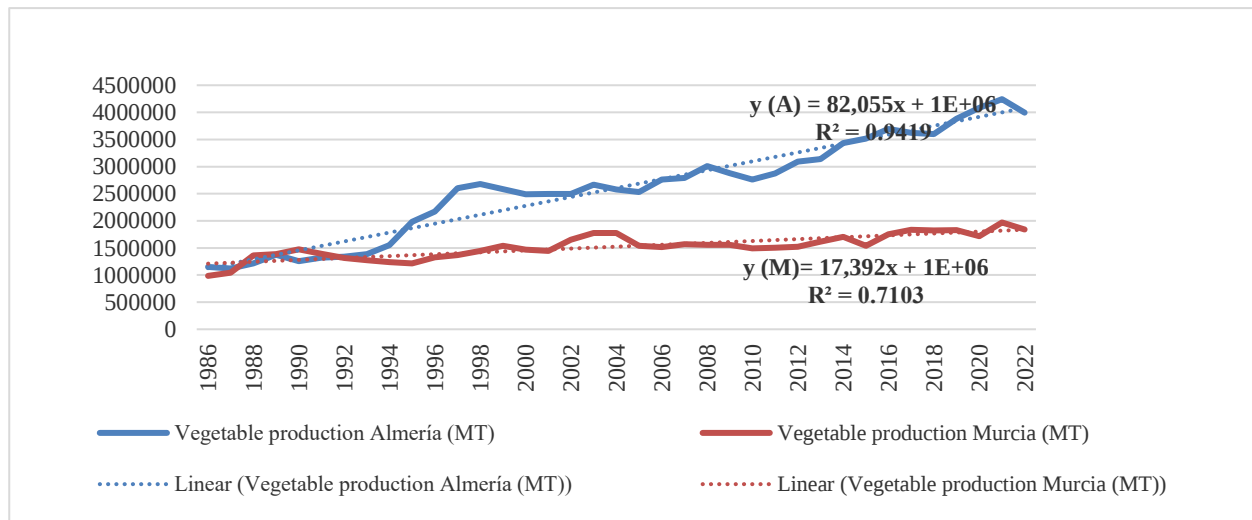


Fig. 2. Vegetable production Almería and Murcia 1986-2023 (Metric Tonnes, MT)

Source: Statistical Yearbook of Andalusia / Counselling of Agriculture and Fisheries, Provincial Delegation of Almería and Regional agricultural statistics, Department of Agriculture and Water, Region of Murcia [11, 5, 6].

This growth is attributed to industrialised agriculture under plastic, which has increasingly incorporated new technologies, it is labour-intensive, and has relatively low mechanisation.

A favourable combination of factors, including climate, access to agricultural credit, sufficient labour supply, and the rising demand for horticultural products from large European markets, has fuelled the sector's expansion.

Additionally, services and industries related to agriculture have also developed alongside the widespread agricultural activity.

In contrast, while intensive agriculture grew and both production and exports expanded, the

local population at working age began to shift toward other economic sectors.

The proportion of wage labour also increased. A strong demand for labour in the agricultural sector, which was largely met by migrant workers over time, resulted in a high and positive correlation between the number of migrant workers and the production of key vegetables. In other words, the decrease in the number of native workers employed in agriculture has been clearly compensated by the arrival of workers from abroad.

Definitely the average annual increase in immigrant labour force in agriculture has been spectacular: 1,556 in Murcia and 1,134 in Almería.

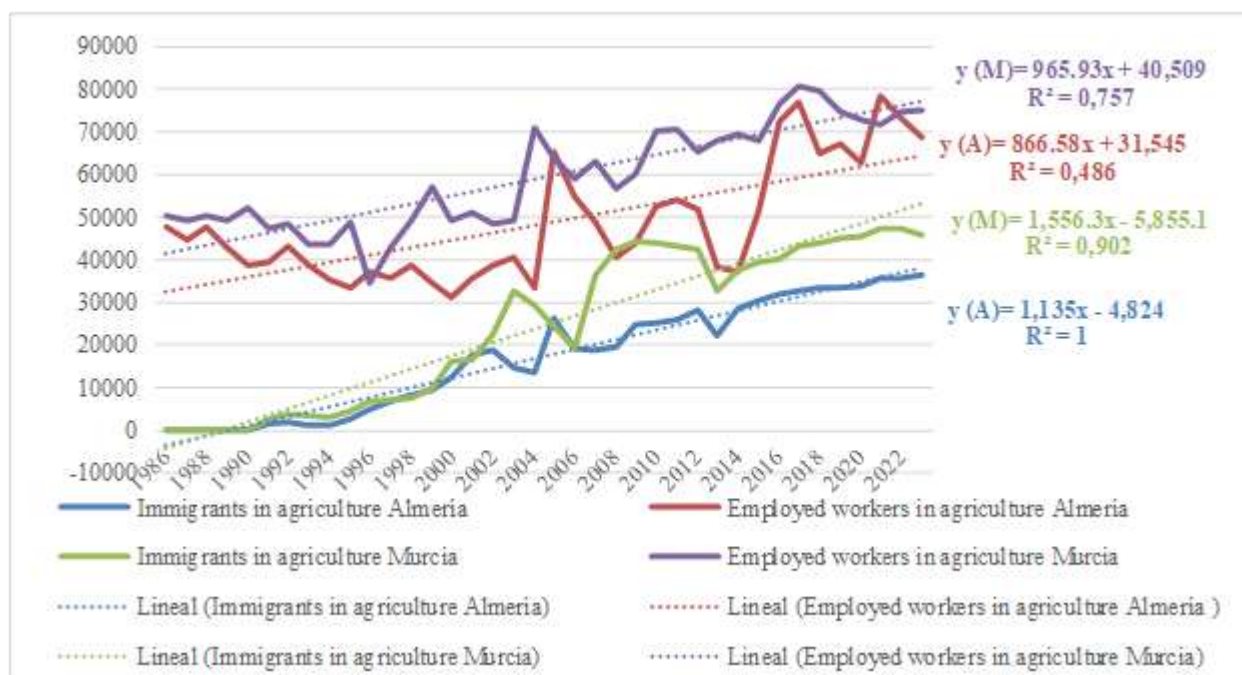


Fig. 3. Evolution of the employed and immigrant workers in agriculture
Source: Labour Force Survey, Spanish National Statistical Institute (INE); National Institute for Social Insurance; Ministry of Inclusion, Social Security and Migration and the Ministry of Labour and Social Economy (MTES) [9, 19, 20, 21, 22, 23].

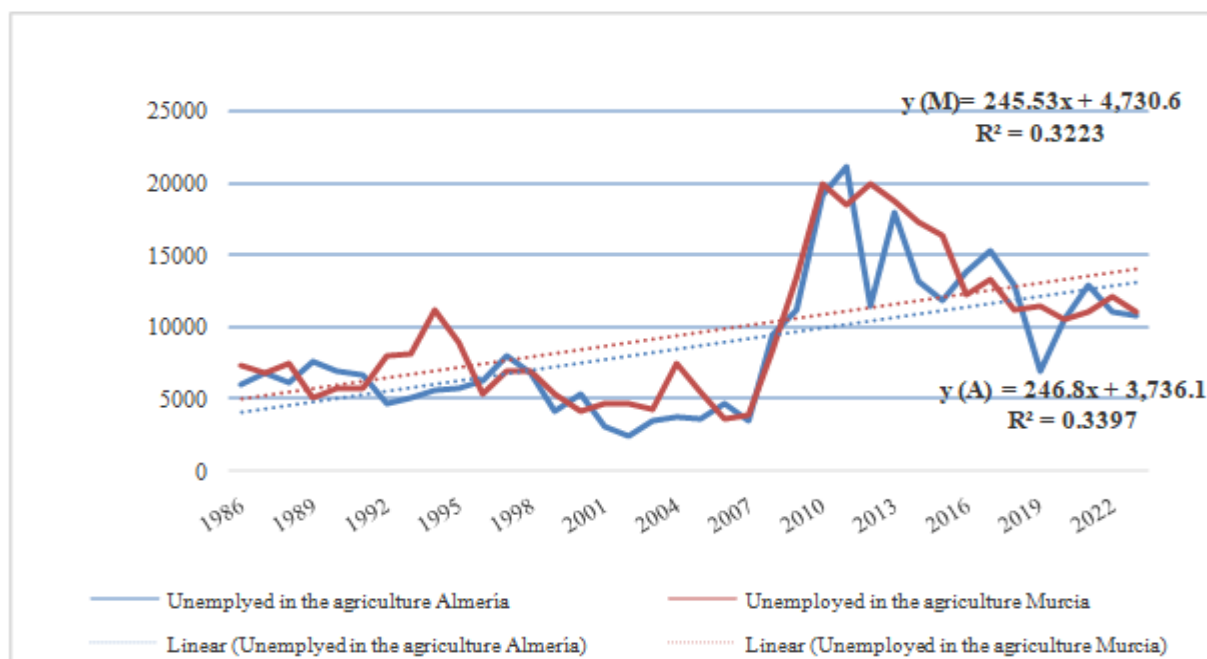


Fig. 4. Unemployed workers in agriculture (Almería and Murcia)
Source: Labour Force Survey, Spanish National Statistical Institute (INE) [9].

This happened to complement and add to the total number of employed in agriculture whose average annual increase was 966 in Murcia and 866 in Almería which suggests that meanwhile native workers have been abandoning the agriculture sector, immigrants have been arriving to support it (Figure 3).

Meanwhile the share of migrants' workers in agriculture sector in each region was insignificant in 1986, much less than 1% of the workers, in 2023 they comprise more than half of those employed in agriculture. Thus, Murcia and Almería are Spain's larger centers of immigrant-based agriculture.

Meanwhile the number of unemployed in the agriculture in both regions have not experienced a relevant increase only about 240 annually in each region (Figure 4). Out of the sixty variables created and analysed for the study, we selected several key independent variables (primarily calculated shares) and then used the number of immigrants in the agricultural sector as a dependent variable. The correlations between variables referring to production and exports, on the one hand, and,

on the other hand, variables referring to the total and immigrant population show in most cases high positive relationship.

Table 1 shows that the significance is less than 0.05 in both cases (Almería and Murcia), therefore the model is good at explaining the dependent variable, it is statistically significant.

Table 1. ANOVA Almeria and Murcia

ANOVA^a(Almería)

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	5667091473.400	4	1416772868.350	53.984	<.001 ^b
	Residual	892298672.497	34	26244078.603		
	Total	6559390145.897	38			

a. Dependent variable: Immigrants with valid work permission agriculture Almería

b. Predictors: (Constant).Vegetables Exports Almería/Vegetable Exports Spain; Green Houses Ha/Total Vegetable produce Ha (Almería); Employed population agriculture (annual average) Almería; Vegetable produce (MT) Almería

Model Summary^b (Almería)

Modelo	R	R squared	R squaredadjusted	Standard error of the estimation
1	.929 ^a	0.864	0.848	5122.897

a. Predictors: (Constant), Vegetables Exports Almería/Vegetable ExportsSpain; Green Houses Ha/Total Vegetable produce Ha (Almería); Employedpopulationagriculture (annualaverage) Almería; Vegetable produce (MT) Almería

b. Dependent variable: Immigrants with valid work permission agriculture Almería

ANOVA^a (Murcia)

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	10233016582.826	4	2558254145.706	35.283	<.001 ^b
	Residual	2465213490.610	34	72506279.136		
	Total	12698230073.436	38			

a. Dependent variable: Immigrants with valid work permission agriculture Murcia

b. Predictors: (Constante), Green Houses Ha/Total Vegetable Produce Ha (Murcia); Vegetable produce (MT) Murcia; Vegetable Exports Murcia/ Vegetable Exports Spain; Employed population agriculture (annual average) Murcia

Model Summary^b (Murcia)

Modelo	R	R squared	R squaredadjusted	Standard error of the estimation
1	.898 ^a	0.806	0.783	8515.062

a. Predictors: (Constant), Green Houses Ha/Total Vegetable Produce Ha (Murcia); Vegetable produce (MT) Murcia; Vegetable Exports Murcia/ Vegetable Exports Spain; Employed population agriculture (annual average) Murcia

b. Dependent variable: Immigrants with valid work permission agriculture Murcia.

Source: Authors' findings.

Then, the R-squared is 0.864 and 0.806 respectively, which indicates that the model explains 86.4% (Almería) and 80.6% (Murcia) of the dependent variable variance. Significance of the t-test: the variables employed population in agriculture, share of the national exports of vegetables in both regions, vegetable produce in Almería do

explain the justification of immigrants' increased presence in agriculture, since as the significance is less than 0.05. The variable on surface Share Green Houses/Total Vegetable Produce is not related to the increased presence of immigrants in agriculture since the significance is greater than 0.05.

Table 2. Coeficients- ALMERIA

Model	Unstandardised coefficients		Standardised coefficients	t	Sig.
	B	Desv. Error	Beta		
(Constant)	-39229.664	6713.816		-5.843	0.000
Vegetables Exports Almería/Vegetable Exports Spain	690.511	272.686	0.256	2.532	0.016
Green Houses Ha/Total Vegetable produce Ha (Almería)	49.721	94.516	0.050	0.526	0.602
Employed population agriculture (annual average) Almería	0.226	0.079	0.234	2.872	0.007
Vegetable produce (MT) Almería	0.008	0.002	0.515	4.577	0.000

a. Dependent variable: Immigrants with valid work permission agriculture Almería

Source: Authors' findings.

Table 3. Coeficients- MURCIA

Model	Unstandardised coefficients		Standardised coefficients	t	Sig.
	B	Desv. Error	Beta		
(Constant)	-97366.434	15607.376		-6.238	0.000
Green Houses Ha/Total Vegetable Produce Ha (Murcia)	1236.135	842.160	0.075	1.468	0.151
Vegetable produce (MT) Murcia	0.012	0.012	0.145	1.047	0.303
Vegetable Exports Murcia/Vegetable Exports Spain	1655.772	790.507	0.187	2.095	0.044
Employed population agriculture (annual average) Murcia	0.891	0.170	0.593	5.248	0.000

a. Dependent variable: Immigrants with valid work permission agriculture Murcia

Source: Authors' findings.

Finally, beta coefficients (β): The independent variable that most explains the presence and increase of immigrants with valid work permission in agriculture in both regions is the employed workers in agriculture in both regions: β is 0.6 for Murcia and 0.3 for Almería since in the case of Almería the highest influence has the huge increase in vegetable production (Figure 2).

The next variable that is most explicative is the national share of vegetable exports ($\beta = 0.3$ in the case of Almería and 0.2 in the case of Murcia) whose increase in both regions has been immense, too. Furthermore, the greater the Share Green Houses/Total Vegetable Produce (Ha), greater the trend to increase production and in consequence, immigrants' presence in agriculture, although the strength of this relationship is lower, as beta value is closer to 0.

CONCLUSIONS

Our findings indicate that a significant portion of immigrants in both regions is driven by the

high demand for labour from abroad. Within the agriculture sector, there has been complementarity between native workers and immigrants.

The obtained results from the F-test, R^2 , significance of the t-test and β coefficients are adequate to prove our hypothesis. The results go along with theories that explain migration as, among others, the dual labour market theory and the push and pull theory.

The expansion of production and exports has been facilitated by a sufficient labour supply, which has been increasingly met by immigrant workers in labour-intensive roles. Moreover, we suggest that there has been a positive spillover effect, with the growth of ancillary services and the processing industry, leading to the creation of new jobs.

Looking ahead, it is likely that the demand for horticultural products will continue to grow, and production capacities should be able to meet this demand. The increase in immigrant's labour in agriculture will depend on the sector's future needs. However, it is important to highlight that other countries, especially those

in the southern Mediterranean, also produce similar products. Nonetheless, both Spanish regions hold an advantage due to their extensive experience, quality of their produce, well-developed marketing networks, and established markets.

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