Lisbon School of Economics & Management
Universidade de Lisboa

MASTER

MASTER'S IN MANAGEMENT AND INDUSTRIAL STRATEGY

MASTER'S FINAL WORK

DISSERTATION

THE IMPACT OF IMMIGRATION FLOWS IN THE PORTUGUESE AGRICULTURAL SECTOR

MARGARIDA ANTUNES DE MORAES SARMENTO

JUNE – 2025

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SUPERVISION:

SUSANA BRISSOS

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GLOSSARY

AIMA – Agência para a Integração, Migrações e Asilo

CAP – Common Agricultural Policy

CPLP – Comunidade dos Países de Língua Portuguesa

EAFRD – European Agricultural Fund for Rural Development

EAGF – European Agricultural Guarantee Fund

EC – European Commission

EMS – European Monetary System

EU – European Union

FE – Foreign Employees

GDP – Gross Domestic Product

GEP/MTSSS – Gabinete de Estratégia e Planeamento / Ministério do Trabalho, Solidariedade e Segurança Social

INF – Inflation

NBI – Net Business Income

OECD – Organization for Economic Cooperation and Development

PE – Portuguese Employees

PEDAP – Programa Específico de Desenvolvimento da Agricultura Portuguesa

SEF – Serviço de Estrangeiros e Fronteiras

ABSTRACT

This dissertation looks at Portuguese agricultural sector's economic performance from 2008 to 2022 under the influence of immigrant influx. The study examines how immigration influences net business income (NBI) in agriculture under population decline, workforce shortage, and increasing structural reliance on foreign workers.

The study evaluates the impact on the sector's NBI of three variables: the number of foreign workers, the number of Portuguese workers, and the annual inflation rate, using a quantitative approach based on time-series econometric modelling. The findings show a statistically significant and favourable link between the number of foreign workers and agricultural income: every extra immigrant worker benefits the sector on average €13,000 to €57,000 yearly. By contrast, the contributions of inflation and native labour were not statistically relevant.

These results demonstrate that, especially in rural areas like Alentejo and Ribatejo, immigration has a major economic influence beyond demographic renewal. The research also points up structural limitations, including data restrictions and the difficulty to differentiate between seasonal and permanent immigrants. Nevertheless, it underlines how urgently effective policy making, including targeted integration policies and improved visa procedures, is needed to ensure the long-term sustainability of the agricultural sector by means of strategic labor migration.

KEYWORDS: Immigration; Agricultural Sector; Labour Market; Foreign Workers; Economic Performance; Portugal; Net Business Income; Migration Policy; Time-Series Analysis.

STATEMENT

Developing this dissertation, I structured my thoughts and language improvement using generative AI techniques such as ChatGPT. These instruments helped to raise coherence and clarity. AI was used only to improve the presentation of my work, it was not used to substitute for independent research or critical analysis. Throughout the process, I made sure that academic norms and ethical requirements were followed. Any errors, omissions or interpretations presented in this dissertation remain my responsibility.

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ACKNOWLEDGMENTS

Reaching the end of my time at ISEG is a significant milestone, and it would not have been possible without the people who walked beside me, each in their own way contributing to this achievement.

First and foremost, I would like to thank my supervisor, Professor Susana Brissos, for the opportunity to explore this topic and for her guidance throughout this journey

My sister has been by my side every step of the way, not just cheering me on, but truly sharing in the ups and downs. Her strength continues to inspire me more than she knows.

To my grandparents, with a special mention to my grandfather, thank you for always being present, for your endless encouragement, and for the example you've given me throughout the years.

I'm deeply grateful to my mother, who has always made me believe in myself, even when I doubted. Her support has been my safety net through every challenge and her faith in me has carried me further than she may realise.

To my father, whose work ethic and dedication have taught me more than words ever could, thank you for your constant concern, and willingness to help, even in the smallest things.

A sincere thanks to Inês, for always showing up when I needed it most, with kindness, laughter, or just the right words. Your friendship has been a grounding presence and a true comfort throughout this journey.

A special thanks to Mike, who managed to turn even the most stressful study sessions into something lighter, funnier, and always bearable.

Lastly, to the friends I met along this journey, especially Nonô and Margarida, thank you for growing with me, for all the laughs, the late-night talks, and the quiet support when things got tough. Your presence made this chapter of my life lighter, richer, and truly unforgettable

THE IMPACT OF IMMIGRATION FLOWS IN THE PORTUGUESE AGRICULTURAL SECTOR

By Margarida Sarmento

THIS DISSERTATION examines how immigration has influenced the economic performance of the Portuguese agricultural sector between 2008 and 2022. While native labour and inflation show little statistical relevance, the number of foreign workers has a significant and positive effect on net business income of the agricultural sector. These findings are according to a time-series regression model. Results draw attention to the increased structural reliance on immigrant labour and its relevance for industry sustainability.

1. INTRODUCTION

As we know, in the last century, immigration has become a highly relevant socio-economic phenomenon, interconnecting with areas such as demography, the labour market, and regional development. In recent years, economic, social and political factors have driven an increase in migratory movements, and, as a result, national economies have been impacted, particularly in countries with high ageing rates. In this context, migration flows have helped address labour shortages in specific economic sectors, contributing to their profitability and long-term sustainability.

I found it particularly interesting to study the agricultural sector, as in Portugal this sector clearly exemplifies this dynamic. Over recent years, agriculture has faced several challenges, including low productivity levels, an ageing workforce, and a decreasing interest among native workers, who, being generally more qualified, tend to seek other types of employment. As such, the sector's productivity has increasingly relied on immigrant workers, particularly in regions such as Alentejo, Ribatejo and Oeste.

The shortage of labour is not exclusive to Portugal. In countries like Spain and Italy, the same phenomenon occurs, and agriculture has become highly dependent on foreign workers (often from low-income countries) who are willing to accept working conditions typically refused by native workers. As I will demonstrate later in this dissertation, Portuguese statistics show a considerable increase in the number of foreign workers in agriculture. In 2014, they represented 9.3% of the workforce in this sector, and by 2023, this figure had risen to 41%. This reflects not only demographic changes but also rural

depopulation. Immigrant workers, many from South Asia (Nepal, India and Bangladesh), have become essential to the functioning of agriculture in Portugal.

Although this topic is commonly discussed in everyday life, few studies have addressed the economic impact of immigration on specific sectors, such as agriculture. As I will show throughout this dissertation, academic literature has underlined the importance of immigrants in overcoming labour shortages, increasing productivity, and contributing to sectoral growth. However, in Portugal, there is still little empirical data or research available on this topic.

Therefore, this dissertation seeks to investigate the impact of migration flows on the economic performance of the Portuguese agricultural sector. The research question guiding this work is: *What is the impact of the growth in the number of immigrants on the net income of the Portuguese agricultural sector?* Through this question, I aim to provide a perspective based on up-to-date data and empirical evidence regarding the real role of immigration in the sector's profitability.

Regarding methodology, this study adopts a quantitative approach, including an econometric analysis based on a multiple linear regression model. The model estimates the effect of three independent variables, being (1) the number of foreign workers, (2) the number of Portuguese workers, and (3) the annual inflation rate, on the dependent variable, which is the net business income of the agricultural sector. The model uses data from a 15-year period (2008–2022), collected from reputable sources such as PORDATA and the Strategy and Planning Office of the Ministry of Labour (GEP/MTSSS). By isolating the impact of foreign labour on income generation, the model seeks to quantify the added value of immigration.

In addition to what has already been mentioned, this study has several key objectives:

- To quantify the contribution of immigrant workers to the financial performance of the agricultural sector;
- To discuss the implications of these findings for labour market and migration policies, particularly in the context of rural development and demographic renewal;
- To contribute to the academic literature on immigration and economic growth, with a specific focus on low-skilled sectors.

This research also considers the broader context in which these dynamics occur. The Agricultural Sector in Portugal is influenced not only by labour availability, but also by the Common Agricultural Policy (CAP) incentives, climatic conditions, and the financial situation of the sector. Therefore, I will clearly define the scope of this study and highlight its limitations.

This dissertation also draws on relevant international literature, including studies by d'Albis et al. (2018), Peri (2012), and Zavodny (2011), which offer diverse perspectives on the impact of immigration on host countries' economies, particularly regarding productivity and job creation. These references not only help to contextualise the Portuguese case, but also reinforce the argument that immigration, when properly managed, can be highly beneficial for the host country.

2. IMMIGRATION

2.1. DEFINITION

First and foremost, it is crucial to comprehend the concept of migration, as it is directly interconnected with immigration. Migration essentially involves the movement of humans within a country or between different countries, whereas immigration refers to the act of granting individuals permission to enter a country, either on a temporary or permanent basis, as residents, which is a distinct form of global migration. Immigration refers to the process of individuals moving from their nation of origin to a foreign country (Heruela, 2024).

Migration has been an integral aspect of human history. Migrants can be defined from various perspectives, including legal, administrative, scientific, and statistical aspects. They can be distinguished based on their underlying causes, which encompass safety concerns, family reunification, and economic factors (Douglas et al., 2019).

Due to their complex nature, we can categorise migration events based on a person's citizenship, birthplace, place of residence, or duration of stay. The term "migrant" typically describes those who move within or between countries with the aim of improving their social and economic conditions, also called economic migrants (Douglas et al., 2019).

Regardless of their legal status, the nature of their migration, its duration, or their motivations, we classify anyone who crosses an international border or relocates within a state away from their usual place of living as a migrant. Both individuals migrating for economic reasons or those who are forced to leave their origin countries, such as refugees and internally displaced persons, fall under this concept (Douglas et al., 2019). Given this, it is evident that there are several types of migration, depending on the motive behind an individual's departure from their home country.

Over time, the field of migration studies has evolved and, as a consequence, the quantity of research on migration is growing at an accelerated pace compared to previous periods. The area of migration studies has expanded its scope to incorporate a wider range of interdisciplinary approaches and academic fields. The domain is characterised by substantial growth in research output, diversity, and the establishment of global research networks (Pisarevskaya et al., 2021). That being stated, it is evident that the definition of

immigration is not fixed, and there have been numerous research studies conducted on this subject.

2.2. MEASUREMENT

Migration studies have experienced changes over time. They have started with quantitative research and recently qualitative and transdisciplinary methodologies have also started to be used. The area had significant growth in 1930, with a particular emphasis on quantitative study, and the phenomenon of migration has been extensively examined in diverse fields such as economics, sociology, history, and demography. Scientists from all parts of the world have made significant contributions to this research, although most studies have been conducted by scientists from the Northern Hemisphere. Initially, migration studies predominantly employed quantitative approaches to monitor and examine migratory patterns. However, the use of empirical methodologies as a foundation for measuring migration has persisted. Contemporary migration studies include many methodologies from several fields, including qualitative methods, utilisation of big data and sophisticated statistical models. The quantification and examination of migratory patterns have been enhanced by the combination of these methods of investigation. The field of migration studies has had a substantial increase in activity since the mid-1990s, with a growing number of platforms and publications, and it has transitioned its attention from demography, statistics, and governance to mobilities, migration-related diversity, gender, and health (Pisarevskaya et al., 2021).

In order to accurately measure immigration, it is crucial to know both the duration of stay and the specific location of residence. Duration of residence is the period of time that a person has lived in their normal residence or the specific geographic area where it is situated. The emphasis is placed on the duration of residency inside the civil division, rather than a particular housing unit. Also, to obtain cross-sectional estimates of internal and international migration flows, one can inquire about the individual's prior place of residence, specifically the civil division or foreign country where they lived just before relocating. The designated time frame for determining the place of residence in the past is often either 1 or 5 years prior to the census. Countries should determine whether to gather data on the initial entry date or the most recent arrival date, based on their specific information requirements (U.S. Census Bureau et al., 2019).

The compilation of migration statistics is derived from three primary sources: border data collection, registries, and field investigations (U.S. Census Bureau et al., 2019).

The border data collection solely encompasses information regarding the arrival and departure of individuals, so this source itself is inadequate for determining the quantity or attributes of migrants residing in a country at any given moment (U.S. Census Bureau et al., 2019). Registries, such as population registers and employment registers, can supplement census data but have certain limitations. These include not being expressly designed for migration information and not requiring the reporting of migrants who depart for a duration shorter than a certain amount of time (U.S. Census Bureau et al., 2019).

Field inquiry, such as conducting home surveys and population censuses, is the most extensive and detailed method for obtaining migration flow information. Field inquiry is not able to provide ongoing evaluation of migration flow because it only focuses on net residual immigrants and relies on proxy responses to gather information on immigration (U.S. Census Bureau et al., 2019).

Population censuses are a highly reliable and complete source of internationally comparable statistics because they are conducted universally and in a regular time frame. They are highly suitable for gathering data on immigrant populations but have certain limitations, including being conducted at a decennial interval, offering a restricted level of detail, and carrying the potential for reporting some errors.

Field inquiry data can serve as a metric for internal migration, for example, when conducting a census, it is valuable to inquire about the typical and past places of residence, the motivations behind migration, and the georeferencing of both current and previous residences. This information can greatly contribute to the study of migration, and the provided data can be analysed by cross-tabulating it with important sociodemographic factors, estimating the distance moved, and generating tables that show net migration at a subnational level. By including the nation of birth, it becomes possible to conduct a thorough study of economic and demographic growth trajectories. Additionally, the creation of population pyramids can effectively illustrate the demographic impact of migration on the local population. By integrating census data from both the countries of

origin and destination of migrants, it is possible to evaluate the effect of immigration on a nation's population (U.S. Census Bureau et al., 2019).

2.3. POLICY

Demographic objectives and labour market needs necessitate immigration policies that may effectively address them. In order to do so, governments establish rules to control the arrival of migrants, particularly in more developed areas, and policies aimed at managing the movement of immigrants entering the destination country and facilitating their adaptation. Some countries have incorporated migration policies into their national strategies and development plans to take advantage of this phenomenon. Given this fact, since the mid-1990s, there has been a decrease in the proportion of governments implementing policies to reduce immigration, so there was an evident tendency in more developed regions to increase immigration (United Nations, 2023).

In recent years, there has been a change in the perception of immigration policies, which has resulted in a more selective approach, favouring transitory migration over permanent migration. This is contingent upon the country in question; however, Australia, Canada, New Zealand, and the United States are among the countries that prioritise permanent migration due to their laws that permit immigrants to remain for extended periods. These countries employ a point-based system that evaluates an individual's suitability to remain in the country based on factors such as education, employment experience, and other given criteria. There is also the case of countries that allow permanent migration based on religion, such as Israel, Finland, Greece, Italy, and Japan (United Nations, 2023).

Another type of migration is temporary migration, which, in contrast to permanent migration, enables migrants to remain in a country for a specific period of time that is frequently established by a work agreement. This type of migration is based on the concept of labour market segmentation, meaning that a specific country accounts if an individual is needed to fulfil labour needs if the workforce of the host country is unavailable for any reason. Additionally, governments regard transitory migration as a more advantageous form of migration due to its capacity to more effectively align the labour supply with the economic business cycle (United Nations, 2023).

Currently, labour migration policies are designed to attract highly experienced workers, as host countries are actively seeking qualified individuals, so, as a result, these policies are intended to facilitate the integration of migrants with this profile. Consequently, these individuals are granted favoured treatment and are subject to fewer restrictions than low-skilled migrants. In 2005, 22% of governments implemented initiatives to increase the immigration of highly qualified labourers, a proportion that rose to 39% in 2011 (United Nations, 2023).

Policy rankings are used to support success or failure when measuring immigration policies. Concretely, in the United States, there is still not a hierarchical framework for measuring immigration policies in what concerns their capability of accessibility and inclusiveness to immigrants. In Europe, the Migration Integration Policy Index (MIPEX) is a tool that evaluates countries according to eight distinct policy domains in order to produce assessments of integration policies that are either "favourable" or "unfavourable"(Filindra & Goodman, 2019).

3. IMMIGRATION IN PORTUGAL

3.1. STATISTICS

The foreign population in Portugal grew by around 33% in 2023 compared to 2022, bringing the total number of immigrants to around one million, according to the Portuguese government's 2023 Report on Migrations and Asylum (Sousa & Lopes, 2024). Members of the potentially active population make up about 80.5% of the foreign population living in Portugal, with a particular emphasis on those between the ages of 25 and 44 (532,214).

The Government asserts that the majority of residence permits issued in Portugal are for professional activities, and that these migrations contribute to the demographic revitalisation and the increase in the active population (Sousa & Lopes, 2024).

Below is the numerical data representing the number of Permanent Immigrants as well as the Migratory Balance of Portugal during the past decade, indicating significant growth. Permanent Migrants include those individuals who entered the country with the intention of residing here for a period equal to or greater than one year during the reference period, after having resided abroad for a continuous period equal to or greater than one year (INE, 2024a).

Migratory balance is the difference between migratory entrances and exits, international or internal, to a certain country region in a given period of time (INE, 2024b).

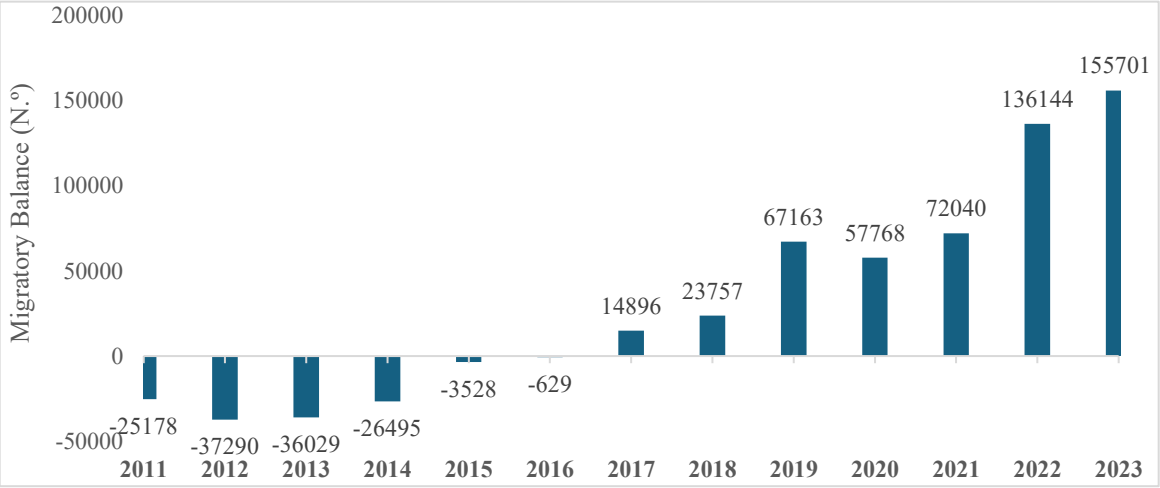

FIGURE 1: VARIATION IN THE PORTUGUESE MIGRATORY BALANCE (2008-2023)

Source: INE

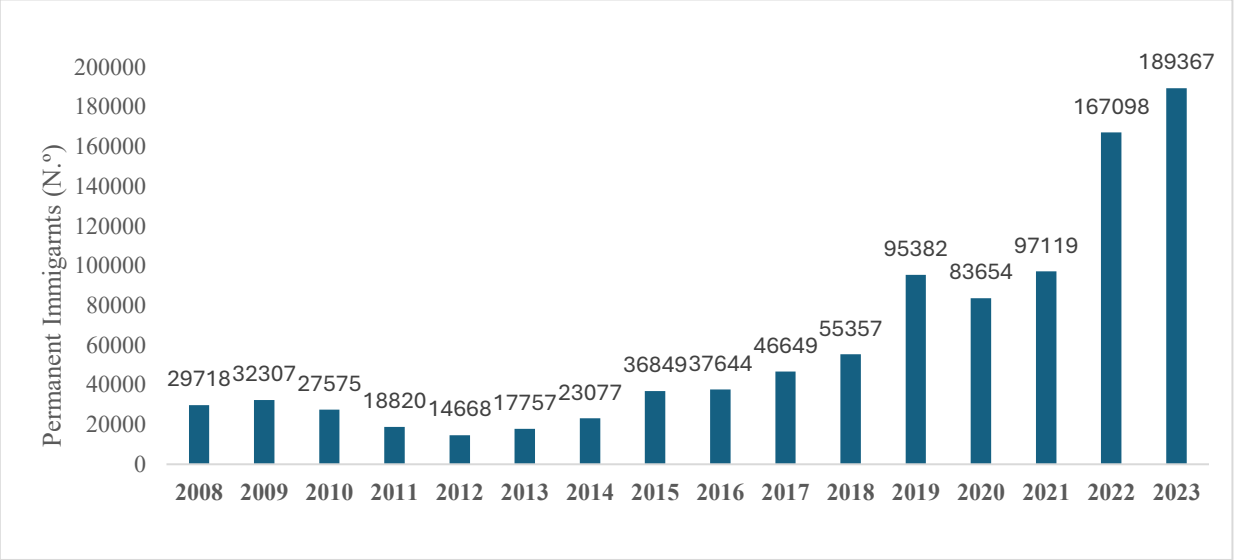

FIGURE 2: TOTAL NUMBER OF PERMANENT IMMIGRANTS IN PORTUGAL (2008-2023)

Source: INE

Portugal's migration balance has been positive since 2017, with an increase in both permanent emigrants and immigrants. This balance was reinforced in 2018 and 2019 with high permanent entries and reduced exits. However, the global pandemic caused a slight reduction in both entries and exits. In 2021 and 2022, the balance returned to pre-pandemic levels (Oliveira, 2023).

Males are slightly over-represented in residence visas granted at Portuguese consular posts, with men dominating certain categories. Nevertheless, women continue to dominate family reunification and study visas, accounting for 51.2% of these visas in 2022, despite a decrease in their significance in 2021 (Oliveira, 2023).

The number of Immigrants with residence titles has grown significantly between 1990 and the 21st century. However, between 2010 and 2015, the growth trajectory was disrupted, with a decline in permanent residents registered by the Portuguese Immigration and Borders Service (SEF). This led to a decrease in employment opportunities, a decrease in new residents, and a rise in the number of residents who disappeared from the country's census data.

In 2022, Portugal had 781,915 foreign citizens with valid residence permits, representing 7.5% of the country's total residents. This is 0.8 percentage points higher than in the previous year. In the first half of the last decade, there was a decrease in the foreign population, with 2014 being the first year with less than 400,000 and 2015 being

the lowest. However, from 2016 onwards, there was a recovery trend, with an increase of 2.3% in the number of foreigners since 2015. In 2017, there was a growth of 6%, returning Portugal to figures above 400,000 residents. In 2018, Portugal recorded 480,000 foreign residents, an increase of 13.9%. In 2019, Portugal surpassed half a million foreign residents, reaching 590,348. In 2020, the number of foreign residents rose to 662,095, a 22.2% increase from the previous year and a 51.6% increase from the start of the decade.

In 2021, Portugal reached 698,887 foreigners with a valid residence permit, a considerable increase compared to ten years earlier (Oliveira, 2023).

3.2. POLICY

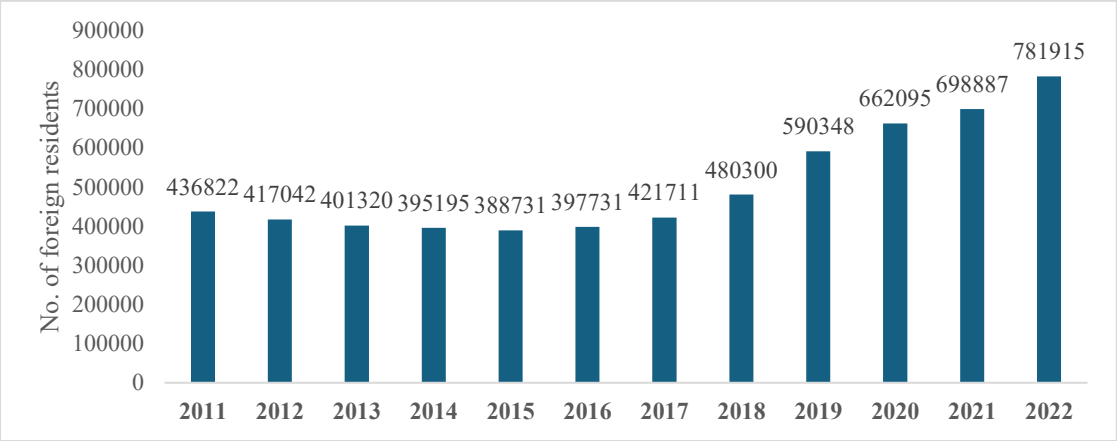

FIGURE 3: RESIDENT FOREIGN POPULATION IN PORTUGAL (2011-2022)

Source: Oliveira (2023: 51)

The immigration control system in Portugal has undergone significant changes over the years, with the implementation of the first law in 1981 that regulated the entry, stay, departure, and removal of foreigners (Carvalho & Borrego, 2017). The initial immigration legislation in Portugal was enacted in 1981 during the governance of the Social Democratic Party. Later, in 1993, the government implemented a new immigration law with the aim of preventing the permanent settlement of new immigrants and prioritising 'zero immigration'. In 1995, with the formation of a left-wing government led by the Socialist Party, there was a subsequent phase of exceptional regularisation, focusing specifically on immigrants who were excluded from the initial phase and had their legal status revoked or arrived in the country later. As a consequence, around 35,000 people acquired residence permits through this new procedure (Peixoto et al., 2009).

In 2001, the left-wing government considered the existing legal framework to be insufficient and excessively restrictive in addressing the shortage of workers in the Portuguese labour market and the influx of immigrants (Peixoto et al., 2009). Subsequently, the legal concept of "residence authorisation" was introduced to facilitate the regularisation of non-European Union (EU) citizens who were residing and working in Portugal without a work visa (Peixoto et al., 2009).

New immigration legislation was implemented in 2003, which resulted in the abolition of residence permits for newcomers. Nevertheless, the situation remained unaltered for individuals who either had a residence permit or were pending an extension. The primary method of regulation was a quota system, which was a continuation of the one that was implemented in 2001. Nevertheless, the Portuguese labour market quota system remained mainly ineffective, as foreign workers continued to enter the country illegally (Peixoto et al., 2009).

Immigrants were granted two additional opportunities for regularisation in 2003 and 2004. A distinctive bilateral agreement between Portugal and Brazil facilitated the regularisation of undocumented Brazilian workers in Portugal and Portuguese workers in Brazil. This agreement also permitted the regularisation of immigrants who were already employed and could demonstrate that they had made social security or tax payments for a minimum of 90 days prior to the law's implementation (Peixoto et al., 2009).

Portuguese nationality can be obtained through naturalisation by fulfilling the concept of *ius domicilli*, which entails obtaining citizenship by legally residing in Portugal for a period of six years or more. Nevertheless, in 2006, the legislation was modified to enhance the flexibility of the naturalisation process for obtaining nationality. This law facilitated the incorporation process for children of immigrants who were born in Portugal, thereby promoting greater assimilation of immigrants. Any authorisation or enrolment in the school system is now considered valid evidence of the child’s effective residence in Portugal and may support eligibility for nationality attribution under the regime for individuals born in the national territory. Portugal is distinguished by its policy of prohibiting individuals who are applying for naturalisation from relinquishing their nationality of origin, a policy that permits dual nationality (Carvalho & Borrego, 2017).

In Portugal, family reunion was a highly popular measure, with a consistent increase until 2007 and a subsequent decline until 2010. The countries that received the

most visa applications were Cape Verde, China, Ukraine, and India (Carvalho & Borrego, 2017).

In Portugal, external forces encompass several push mechanisms originating from sending countries and the country's new territorial situation. The EU exerts influence on Portuguese immigration policies by advocating for stricter border control measures and the implementation of European Commission (EC) directives, which are a type of legislation issued by the EU that is binding on Member States in terms of the results to be attained but allows Member States to choose the methods involved (GEMET, 2024). Nevertheless, the devotion to the Schengen Agreement resulted in the elimination of physical border checks with Spain, which has been a crucial method of controlling immigration (Peixoto et al., 2009).

In 2024, the Council of Ministers approved the Action Plan for Migration, aiming to address issues with entry rules, resolve the operational incapacity of the Agency for Integration, Migration and Asylum (AIMA), and ensure border control systems are operational. The plan is based on Portugal's desire to welcome more immigrants for demographic, social, and economic reasons. It is divided into four areas: regulated immigration, attracting foreign talent, effective human integration, and institutional reorganisation. The plan also includes a revision of entry rules, including the abolition of the Expressions of Interest procedure (Governo da República Portuguesa, 2024).

4. THE AGRICULTURAL SECTOR IN PORTUGAL

4.1. RECENT ECONOMIC TRENDS

Portuguese agriculture has undergone some changes over the last decades, more specifically, over the past six decades. The initial phase, from 1962 to 1972, was characterised by a downturn that resulted from the industrial growth model, and at the same time there was an increase in food demand due to the growth of the rural population. Between 1972 and 1982, the second phase, there were significant policy changes, notably the Agrarian Reform, which resulted in a weakened national agricultural production base, challenges in meeting the demand for agricultural products and later, a complex framework of prices and subsidies for agricultural products, leading to higher expenditure. The third phase, between 1982 and 1992, focused essentially on harmonising national and European Community agricultural policy, through two types of transition which had a negative effect on most prices. The application of the Specific Aid Programme for Agriculture (PEDAP) and the integration of the national economy into the Single Market and the European Monetary System (EMS) made it possible to effectively resolve the difficulties encountered by farmers. In the fourth phase, between 1992 and 2003, there was a gradual reduction in market support measures, resulting in the implementation of direct payments to producers. In the fifth phase, which ran from the 2003 CAP reform until the Troika intervention (in 2012), the CAP implemented the European Agricultural Guarantee Fund (EAGF) and European Agricultural Fund for Rural Development (EAFRD) programmes to organise its policy initiatives, which led to a steady transition towards more equitable agricultural production. The final phase, that is the sixth phase, took place from the Troika intervention to the present day. Some of the most important events in this phase were the 2013 CAP reform, the strong social/economic effects of the Troika intervention, the lockdown that took place in 2020 due to COVID-19 and the invasion of Ukraine from the beginning of 2022. In the face of these events, Portuguese agriculture has demonstrated its ability to respond to productive, technological, and structural challenges, resulting in favourable economic results for sectors and companies (Avillez, 2024).

The agricultural production volume has been relatively stable over the past six decades, experiencing a minor increase in the first decade following the adoption of the CAP, and a subsequent reduction in the most recent decade. Animal production has also

experienced a substantial increase, with a 3% rise in the initial two decades and a subsequent 2% gain in the most recent decade. Over the past decade, vegetable production has experienced a growth rate of 3.3%, outpacing the growth rate of animal production. Although there have been some advancements in the past ten years, animal output has generally remained at a low level, with a 2% decline during the past four decades (Avillez, 2024).

Over the past sixty years, the economic performance of the Portuguese agricultural sector has shown remarkable improvement, with a consistent increase in both land and labour productivity. This progress has been particularly notable in the years after Portugal's entry into the European Economic Community and in the most recent decades (Avillez, 2024).

The issue of abandonment is notably prevalent in forest areas, where land management is concerned. In 2017, the devastation and loss of life were the results of the burning of over 450,000 hectares of forest. Territorial planning, sustainable eco-tourism, cooperative management solutions, heritage preservation, and appropriate laws on inheritance and real estate are necessary to address this issue. The destruction is also being exacerbated by mining projects, such as lithium extraction, that are conducted in natural parks. The Portuguese government has failed to consider the requirements of local populations, despite the fact that local councils and associations are advocating against mining concessions (Almeida, 2020).

4.2. WEIGHT OF IMMIGRATION IN THE AGRICULTURAL SECTOR

The agricultural sector, including agriculture and fishing, was selected for this study due to the substantial presence of immigrants in this sector, as illustrated in the table below.

TABLE 1: SHARE OF WORKERS WITH FOREIGN NATIONALITY IN THE TOTAL NUMBER OF WORKERS BY SECTOR OF ACTIVITY (%)

Sector of Activity	**2014**	**2019**	**2023**
Agriculture and fishing	9,3	20,8	41,1
Accommodation and food services	5,3	15,9	31,1
Administrative activities	3,4	11,2	28,1
Construction	3,0	10,0	23,2

Real estate	3,8	7,2	13,3
Artistic activities	4,2	8,1	13,1
Information and communication	1,1	4,9	12,8
Other services	2,3	5,6	10,1
Consulting and scientific activities	1,3	4,2	9,9
Transportation and storage	1,8	3,3	9,5
Trade	1,7	4,0	9,2
Mining and quarrying	1,5	2,8	8,7
Manufacturing	0,9	2,5	7,8
Water	1,8	2,9	7,0
Financial and insurance activities	0,5	1,4	3,4
Electricity and gas	0,1	0,4	1,8

Source: Banco de Portugal, 2024

As we can see, the weight of foreign employees in the national context is considerably high, especially in activities such as agriculture and fishing, accommodation and food services, administrative activities, and construction.

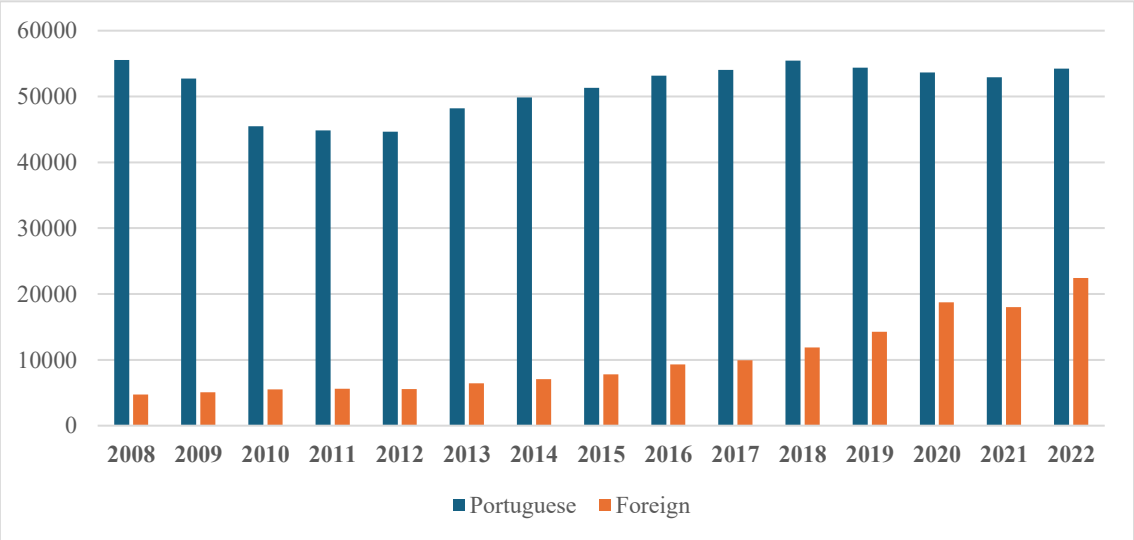

FIGURE 4: NUMBER OF EMPLOYEES WORKING IN AGRICULTURE, ANIMAL PRODUCTION, HUNTING, FORESTRY AND FISHING, BY NATIONALITY (2008-2022)

Source: GEP/MTSSS, Quadros de Pessoal (unpublished data provided by GEP/MTSSS, via email, October 2023)

Figure 4 illustrates the evolution in the number of Portuguese and foreign workers in the agriculture sector, from 2008 to 2022. The graph illustrates a trend of steady and increased growth in the number of foreign workers, peaking in 2022, indicating that

immigration is associated with enduring factors such as labour demand and conditions in the countries of origin. The graph indicates that immigrant workers constitute an increasing proportion of the total workforce, thereby becoming an essential economic component.

According to Banco de Portugal, the percentage of foreign workers in the country increased from 6% in 2019 to 13% over the course of four years. In 2023, 41% of agricultural and fisheries workers were immigrants, making the industry most reliant on immigration to operate. The president of the Confederation of Farmers of Portugal defends the implementation of a "transitional regime" that permits employment until the consulates are capable of promptly filling positions in this sector. The government intends to enhance the response capacity of the consular network, particularly at the posts in the Community of Portuguese Speaking Countries (CPLP) and at the consulate in New Delhi, which serves India, Bangladesh, and Nepal. This reinforcement is a result of the large representation of foreign workers from these last three countries (approximately 64%) in the agricultural sector (Mateus et al., 2024).

5. IMMIGRATION AND ECONOMIC GROWTH IN THE PORTUGUESE AGRICULTURAL SECTOR

In a study performed in 2018, d'Albis et al. (2018) analysed immigration flows around 15 Western European countries over 1985 and 2015. The conclusion of this study didn't identify any particular negative impacts of immigration on economic levels. Actually, this study concluded that immigration had a positive impact on tax revenues and Gross Domestic Product (GDP) per capita, especially where immigrants have access to permanent residence status. Although this study is not directly about the agricultural sector, its conclusions can also apply to this case. They concluded that foreign labour can significantly increase productivity, especially in sectors that are dependent on immigrant workers due to a lack of national manpower, such as agriculture in Portugal (d'Albis et al., 2018).

Another study investigated the impact of immigration on firms' productivity in Portugal between 2010 and 2019 (Ghasemi et al., 2024). The authors found no substantial overall effect of immigration on labour productivity, nevertheless, the results show some mixed effects. On one hand, less productive firms tend to experience negative effects of immigration, while small firms benefit significantly from it. Immigrants with 5 to 9 years of education increase production by matching labour-intensive tasks. These findings imply that immigration can have a positive impact on Portugal's labour market.

In addition to academic sources, the media have also reported on the role of immigration in Portuguese agriculture. A 2021 article by Deutsche Welle shows that farms in Portugal are increasingly relying on migrant workers from South Asia, especially from India, Nepal, and Bangladesh. These foreign workers help fill the current lack of Portuguese labour force. This example highlights the importance of immigration in the agricultural sector at the present moment. It is not only a source of labour, but also essential to maintain productivity in the face of demographic decline and a declining local workforce. Furthermore, Pinto (2022) explains that this sector relies more and more on immigrant workers. Portuguese workers avoid farm jobs because they are seasonal and physically hard. As a result, the agricultural sector depends on these workers to remain productive and profitable, especially in regions like Alentejo. These findings are consistent with other national and international studies on the role of immigration in agriculture. For instance, the International Migration Outlook 2023 report highlights that Portugal and Spain have established bilateral agreements for the recruitment of seasonal

agricultural workers, reinforcing the importance of migrant labour in addressing labour shortages within the sector (OECD, 2023). In Portugal, in 2021, 41.2% of the new immigrants arrived for labour reasons, and a significant part of this percentage was allocated to services and the agricultural sector (OECD, 2023).

National statistics confirm this structural dependency. According to the 2023 Annual Statistical Report on Immigrant Integration, the number of foreign residents in Portugal increased by 78.7% over the last decade, with agriculture among the sectors with the highest share of immigrant workers, particularly in the Alentejo and Ribatejo regions (Oliveira, 2023).

6. METHODOLOGY

6.1 RESEARCH STRATEGY

The objective of this study is to understand the impact of worker immigration flows on the economic performance of Portuguese agriculture. In order to do so, the following research question was defined:

What is the impact of the growth in the number of immigrants on the net income of the Portuguese agricultural sector?

To answer this question, I will use a quantitative explanatory approach supported by econometric modelling using time series data. The methodological approach is based on a multiple linear regression model, with the dependent variable being agricultural companies' Net Business Income. The primary independent variables are the number of foreign workers, the number of Portuguese workers, and the yearly inflation rate.

The econometric analysis was carried out with IBM SPSS Statistics, which was chosen for its reliability in performing time-series regressions as well as its capacity to apply statistical validity tests.

The general specification of the econometric model is as follows:

$$NBI_t = \beta_0 + \beta_1 FE_t + \beta_2 PE_t + \beta_3 Inf_t + u_t$$

where NBI represents the Net Business Income, FE the number of foreign employees, PE the number of Portuguese employees, Inf the inflation rate, and u the error term, all in year t.

Time-series analysis combined with multiple linear regression is an approach used to observe how variables evolve over time and influence sectoral results. This approach allows for the identification of long-term patterns and causal relationships, particularly when data spans several years and is focused on a specific sector.

For example, Badaruzaman and Ong (2022) also used a multiple linear regression model. They used data from 1980 to 2020, and their goal was to assess the effect of planted area on the total production of rice in Malaysia. This study was performed to demonstrate how major input variables might explain agricultural performance. Similarly, here I will use a time-series model to assess the impact of foreign workers on the net

business revenue of the Portuguese agriculture industry. This approach allows a dynamic understanding of how immigration trends impact economic performance over time.

6.2. DATA SOURCES

The data used for this analysis encompass the period from 2008 to 2022 and were collected from the following institutions:

- Quadros de Pessoal, provided by GEP/MTSSS, through unpublished data received via direct request;
- PORDATA, a statistical database managed by the Francisco Manuel dos Santos Foundation, to complement demographic and sectoral data.

6.3. VARIABLES

Dependent Variable: *Net Business Income* (NBI)

NBI is a key indicator for the economic performance of the agricultural sector. It reflects the income that is generated from agricultural activities, considering all operational costs. This indicator isolates the outcome of production. Therefore, it is possible to assess how changes in the workforce affect its profitability. According to the USDA (2024), NBI is commonly used to evaluate farm-level viability and is critical to understanding agriculture's long-term economic sustainability.

Independent Variables

Number of Foreign Employees (FE)

As previously stated, immigrant labour helps with structural labour shortages in the local workforce while also supporting the seasonal demands of farming. Several studies have found that migrant workers greatly boost the sector's productivity (OECD, 2023). This variable will be one of the model's independent variables, allowing us to investigate how its variations affect NBI.

Number of Portuguese Employees (PE)

The number of Portuguese employees is used as a baseline measure to compare the impact of native versus immigrant labour on sector performance. Understanding how

changes in domestic labour supply affect productivity provides context for the role of immigration.

Inflation Rate (Inf)

In the case of inflation, this indicator is a critical macroeconomic measure that represents total price fluctuations in the economy. This variable is necessary to isolate the effect of inflation on net income and also because it can capture economic patterns that influence other variables (Marisetty, 2025). According to Falnita and Sipos (2007), inflation increases price expectations, which can influence consumer behaviour. Therefore, it is vital to include this variable in economic models.

6.4. METHODOLOGICAL RATIONALE

Linear regression was the method chosen for this study due to its effectiveness in identifying statistically significant correlations between variables. This model calculates the impacts of each explanatory variable on NBI, while accounting for external trends, including inflation.

I will conduct the following tests to determine the robustness of the econometric model.

- Exogeneity Test: Model specification;
- White's Test: Signs of heteroskedasticity;
- First-Order Autocorrelation Test: Residual autocorrelation;
- Shapiro-Wilk Test: Normality of residuals.

These assessments together validate the model's reliability and the importance of the results.

6.5. LIMITATIONS

This model encounters some limitations, namely, the relatively small number of annual observations. Since this is a time-series analysis, this detail may constrain the results. Additionally, there is limited available data regarding workers in the agricultural sector, specifically about their nationality, wages, or qualifications. Furthermore, the analysis does not distinguish between permanent and seasonal immigration, which could be a significant factor in future research on labour mobility within the agricultural sector.

7. STATISTICAL RESULTS

Annual average growth (Annex D)

$$Y_t = \beta_0 + \beta_1 t + u_t$$

EQUATION 1 - ANNUAL GROWTH RATE

NBI grew on average 43,56 million € per year, $CI_{95\%}(\beta_t)$=] 18.918; 68.203[

$H_0: \beta_i = 0, growth\ i\ is\ not\ significant$ vs. $H_1: \beta_i \neq 0, growth\ i\ is\ significant$

NBI: p-value = 0.002

FE grew on average 1180.3 people per year, $CI_{95\%}(\beta_t)$=] 893.8; 1466.8 [

$H_0: \beta_i = 0, growth\ i\ is\ not\ significant$ vs. $H_1: \beta_i \neq 0, growth\ i\ is\ significant$

FE: p-value = <0.001%

Both NBI and FE presented a growth average during the period under analysis with 95% confidence.

For PE, $CI_{95\%}(\beta_t)$=] -26.0; 869.8[, considering the confidence interval includes zero, the hypothesis that this number did not change its not rejected.

$H_0: \beta_i = 0, growth\ i\ is\ not\ significant$ vs. $H_1: \beta_i \neq 0, growth\ i\ is\ significant$

PE: p-value = 0.063

These preliminary results provide a statistical foundation for further analysis, where the relationship between workforce composition and sector performance will be explored in greater depth.

Model for NBI explained by the number of workers and inflation (Annex D)

$$NBI_t = \beta_0 + \beta_1 FE_t + \beta_2 PE_t + \beta_3 Inf_t + u_t$$

EQUATION 2 - GENERAL MODEL FOR NBI, NUMBER OF EMPLOYEES, AND INFLATION

NBI = Net Business Income of the Agricultural Sector (Agriculture, Forest, Animal production, Hunting, and Fishing) in millions of euros

FE = Number of Foreign Employees in Agriculture, Forest, Animal production, Hunting, and Fishing

PE = Number of Portuguese Employees in Agriculture, Forest, Animal production, Hunting, and Fishing

Inf = Inflation in percentage points

$\widehat{NBI_t} = 619.668 + 0.035 * FE_t + 0.016 * PE_t - 30.016 * Inf_t$, n = 15 (2008 to 2022)
$R^2 = 0.71$

EQUATION 3 - ESTIMATED MODEL FOR NBI, NUMBER OF EMPLOYEES AND INFLATION

The determination coefficient $R^2 = 0.71$, meaning that 71% of NBI variation around its average can be explained by the model.

Testing for model global validity: p-value = 0.003 ($< \alpha = 0.05$), meaning that the model is globally significant.

Testing for the individual significance

$H_0: \beta_i = 0, variable\ i\ is\ not\ significant$ vs. $H_1: \beta_i \neq 0, variable\ i\ is\ significant$

leads to the conclusion that only **variable FE is significant** (t = 3.448, p-value = 0.005) **to explain the changes in NBI**. Variables PE (t =1.142, p-value = 0.278) and Inf (t = -1.3, p-value = 0.22) do not explain the variability in NBI.

$\hat{\beta}_{FE} = 0.035$, $CI_{95\%}$ (β_{FE})=]0.013;0.057[, meaning that it is estimated with 95% confidence that by each additional foreign worker, the annual NBI increases on average between 13,000€ and 57,000€. This can be due to both the increase in the number of workers but also *reflecting the increase in production efficiency.*

Theoretical hypotheses were validated ensuring the validity of the results (Annex E).

8. ANALYSIS AND DISCUSSION OF RESULTS

8.1. INTERPRETATION OF COEFFICIENTS

The regression model shows that the number of foreign employees is the only variable that has a statistically significant effect on the agricultural sector's NBI. The coefficient for foreign workers is $\widehat{\boldsymbol{\beta}}_{\boldsymbol{FE}}$ **= 0.035**, with a p-value of **0.005** and a 95% confidence interval that goes from **0.013** to **0.057**. This means that every new foreign worker adds between **13,000€** and **57,000€** to the NBI each year. **Chapter 5: Immigration and Economic Growth in the Portuguese Agricultural Sector** highlighted the labour shortage in the agricultural sector and emphasised the importance of immigrant workers in filling this gap. The model results are in line with these conclusions.

The results also support the idea that foreign workers not only make up for the lack of national labour, but also help the sector become more profitable. The other independent factors, the number of Portuguese workers and the inflation rate, did not have statistically significant effects on NBI, on the other hand. Their p-values were 0.278 and 0.22, both of which are higher than the usual 0.05 level, which means that they are not statistically significant at the 95% confidence level.

The model has a significant explanatory power, with a **R^2 value of 0.71**, even though it has some limitations, as mentioned before. This means that the variables in the model explain 71% of the changes in NBI, which shows how much immigration affects the sector's financial success.

8.2. RESULTS AND EXISTING LITERATURE

Peri (2012) created a regression model for the United States with the main goal of figuring out how immigration affects Total Factor Productivity (TFP), which is how well capital and labour work together. The model looks at factors including capital, the quality of labour, and the unique features of each sector to show that immigrant workers can not only encourage new ideas but also fill in for workers who are missing. Peri's model shows more complexity than the one constructed for this dissertation, however, since both models strive to figure out if immigrant workers help the economy of the host country, it

supports the conclusion that immigration boosts economic growth, especially in jobs that don't require a lot of skills, like the ones of the agricultural sector.

Peri (2012) also says that immigrant workers do not take the place of native workers. Instead, they tend to perform different kinds of tasks than the ones performed by native employees, freeing up these workers to develop more cognitive activities, which leads to a general rise in productivity. Like in the United States, the agricultural sector in Portugal depends a lot on physical labour and has a structural labour shortage. The arrival of foreign labour helps fill this shortage and allows native workers to focus on other kinds of tasks, increasing overall productivity. In addition, this contribution is especially helpful for areas with fewer people, like Alentejo and Ribatejo, just like it is for some of the less populated territories of the United States.

Additionally, Zavodny (2011) looked at the link between the number of immigrants and the number of jobs held by native workers in a study that was also conducted in the United States. The author concluded that immigrants usually create new jobs instead of taking ones away from locals. In Portugal, this means that the rise in foreign workers in the agricultural sector has likely led to higher incomes in that sector, especially since it is a low-skilled area where there aren't enough workers in the country. The conclusions are pertinent to this setting since the structure of the employment market is similar, with a heavy dependency on labour.

8.3. LIMITATIONS OF THE MODEL

In light of the results, it's vital to look at some limitations. The absence of statistical significance for factors like the number of Portuguese workers or the inflation rate may make it hard to understand what the estimated coefficients mean.

First, it's crucial to point out that the data is annual and aggregated, which makes it hard to see seasonal and regional differences that are important in the agricultural sector. This constraint can make the model ignore the effects of diverse factors that could be important in some situations.

Also, the fact that it is impossible to distinguish between permanent and seasonal immigrant workers makes the analysis less accurate. These two groups are diverse, which could have a big effect on the results.

Finally, the model doesn't include any extra variables, such as the workers' age, training, or experience, the degree of technology, or the subsidies received. This means that there is a danger of omitting important variables, which could make the coefficients less accurate and the findings less useful.

Even though these constraints do not make the conclusions invalid, they do suggest that we should be careful when interpreting them and, also, when applying them to other situations. These limitations show that more research is needed in the future using more detailed data and more complex econometric models to better understand how immigration affects the Portuguese agricultural sector.

9. POLICY IMPLICATIONS AND RECOMMENDATIONS

9.1. RECOMMENDATIONS FOR IMMIGRATION POLICY

The results of this study show that immigration has a positive effect on the NBI of the Portuguese agriculture industry. In this situation, it is very important to define what good public policies are in order to make sure that this contribution lasts. The most recent international literature and empirical data collected, namely the Organisation for Economic Cooperation and Development (OECD) reports on integrating immigrants into the labour market, make specific suggestions for how to better integrate immigrants into host countries in a way that will last.

The OECD (2023a) says that language skills are the most important factor in immigrants' performance at work and in school. This demonstrates that we need to invest in this area so that immigrants may become a significant asset for economic growth. According to these data, newly arrived immigrants tend to have lower employment rates and earnings for up to 10 years after they arrive. This could be because they are not comfortable with the local language, which makes it harder for them to get jobs.

Another OECD research study illustrates how immigrants are doing in the Danish job market. It says that foreigners have had much lower employment rates than Danish workers for more than 20 years, and that even immigrants with higher education have a harder time getting jobs. This survey also says that second-generation immigrants, who were born and educated in Denmark, nevertheless have lower rates of being able to find work. Weak social networks, not being able to speak the host country's language well, and discrimination are some of the biggest problems immigrants face. The report does, however, state that they need to support initiatives to make recruiting channels more diverse (OECD, 2007a).

The same report also says that practical training in business settings and wage subsidies for employers are very helpful for immigrants who are in the process of finding jobs. These measures make employers less hesitant to hire foreign workers, especially when there is a lack of information about their skills and qualifications. These policies have been shown to work, but most immigrants still can't get to them, therefore, it would be prudent to reinforce them. The report also talks about how new mentoring programs

and contact networks might benefit immigrants who don't have many social connections. (OECD, 2007a).

Thus, the information we looked at shows that immigration is a large part of what keeps the Portuguese agricultural business going, both in terms of productivity and profitability. But the issues that immigrants face while trying to find work, such as language barriers, lack of social networks, not getting enough credit for their skills, and discrimination, need systematic, government-led solutions that include everyone. Studies from the OECD and other sources show that language training, customised qualification programs, work-based training, hiring subsidies, and mentorship projects all have a direct impact on how likely someone is to acquire a job and how well they will fit in.

It is important to reinforce these measures in terms of availability, accessibility, and continuity, and to adapt them to the national agricultural context and the distinctive characteristics of migrant communities in order to make sure that immigration in Portugal remains sustainable.

10. CONCLUSIONS

The purpose of this research was to use a quantitative, econometric methodology based on data from 2008 to 2022 to see how immigrant flows affected the economic performance of the Portuguese agriculture industry. The reason for this study is that Portugal's agriculture sector is going through a structural change, and there is a demographic need for it. Agriculture in Portugal is becoming more reliant on foreign workers because there aren't enough native workers who are willing to do physically demanding and low-paying agricultural work, so more and more immigrant workers come to work in places like Alentejo and Ribatejo.

The research question that led to this work was: *What is the impact of the growth in the number of immigrants on the net income of the Portuguese agricultural sector?* A regression model was used to answer this question. The number of foreign workers, the number of Portuguese workers, and the inflation rate were the three key variables that explained this model. NBI, the dependent variable, served as an indicator of the economic performance of the sector.

The performed model made it evident that only the number of foreign workers had a statistically significant and positive effect on NBI out of the three independent variables considered. More specifically, the conclusion was that the sector's income would go up by between 13,000€ and 57,000€ a year for every extra foreign worker. This data clearly supports the idea that immigration is not only filling gaps in the labour market but also helping to keep the Portuguese agricultural economy succeeding. The data also show that native labour, currently, does not boost agricultural profitability in the same way.

These results are in line with what international research concludes. For example, d'Albis et al. (2018) have shown that immigration has positive effects on GDP and tax revenue at the macroeconomic level. Peri (2012) and Zavodny (2011) have shown that immigrant labour not only complements native labour but can also boost overall productivity by giving space for native workers to perform other kinds of tasks. This tendency seems to be the same in Portugal, especially in rural areas where there is a lot of demand for workers and a tendency for population decline.

On the other hand, this research also evidenced some key methodological and structural constraints. The model used data aggregated by year, which is good for identifying long-term patterns but not seasonal changes, which are very important in

agricultural work. The variable representing foreign workers did not separate permanent and seasonal immigrants, and did not take into account demographic factors like age, gender, education, or place of origin. These factors could have a big impact on productivity, but the data collected couldn't measure them. Also, because of a lack of data, other factors that could have had an impact, such as farm size, availability of subsidies, and weather conditions, were not included. This could have caused omitted variable bias. Even with these limitations, the model had a good explanatory power ($R^2 = 0.71$), which means that the factors included explain a large part of the difference in NBI. The results must be interpreted with caution, but they do provide strong evidence that foreign workers are a key part of the agricultural sector's economic success.

The results obtained are both theoretical and practical. In theory, the study backs up the idea that immigration should be seen as more than just a demographic or humanitarian issue, because it is an economic factor that has demonstrable effects on productivity in different sectors. This study contributed to the existing literature by giving a real data-driven example of how labour migration affects a low-skilled, labour-intensive sector in a Southern European country. It also shows how important it is to use real-world data to back up arguments that are typically based on politics or personal convictions.

Furthermore, the analysis suggests that certain policies regarding migration must be adopted. First, the immigration and visa processes for seasonal and agricultural workers must be simpler. This will make sure that labour shortages don't slow down productivity during busy times. Second, integration measures including language instruction, housing help, and legal protections should be reinforced so that immigrant workers may fully and sustainably contribute to economic growth. Third, plans for rural development should clearly take into account how immigration might help revive areas that are losing population, which will help both the economy and social cohesion. This is especially important when rural economies are facing challenges to their long-term survival due to depopulation, ageing, and climate change. In addition, enhanced data collection and monitoring must be adopted as part of the policy efforts. More detailed and specified data on the frame of the labour force, working conditions, and performance in different regions would help with more complex modelling and policy making.

Future research could involve more detailed data, for example, on more specific regions or companies, in order to better comprehend the link between immigrant labour and productivity. Mixed methods approaches that use both quantitative modelling and

qualitative fieldwork, such as interviews with farmers, workers, and policymakers, could also help us understand the real experiences behind the data. This could give more information about working conditions and integration processes. Lastly, future research might look into the links between immigration, new technologies, and environmental sustainability. It could look at how different ways of using land and labour function together nowadays, as we experience climate change, and the global market is getting more and more unstable.

In conclusion, this dissertation has proven that immigration is not just a way to fill gaps in the Portuguese agricultural workforce but is also a major factor in how well the industry performs economically. Immigrant workers help keep agricultural businesses financially secure and rural areas sustainable by offering a steady, flexible, and necessary labour. Recognising, valuing, and planning for this contribution is not only necessary for the economy, but it is also a question of social responsibility and strategic vision. As Portugal's population continues to decrease, its rural areas continue to lose people, and the world remains unpredictable, immigration will continue to play an important role in defining the future of the agricultural sector and society as a whole.

11. REFERENCES

Alexandra Sousa, & Sílvia Lopes. (2024). *RELATÓRIO DE MIGRAÇÕES E ASILO 2023*. https://aima.gov.pt/media/pages/documents/92dd0f02ea-1726562672/rma-2023.pdf

Almeida, M. A. (2020). The use of rural areas in Portugal: Historical perspective and the new trends. *Revista Galega de Economia*, *29*(2 Special issue), 1–17. https://doi.org/10.15304/rge.29.2.6750

Avillez, F. (2024). *Evolução económica da Agricultura Portuguesa nas últimas seis décadas*.

Badaruzaman, M. F., & Ong, H. C. (2022). *Forecasting rice production in Malaysia using multiple linear regression model*. *Proceedings of Science and Mathematics*, Universiti Teknologi Malaysia. https://science.utm.my/procscimath/wp-content/uploads/sites/605/2022/10/21.-MUHAMMAD-FIKRI-BIN-BADARUZAMAN-A18SC0135.pdf

Carvalho, J., & Borrego, B. (2017). *Demographics of Immigration in Portugal Demographics of Immigration in Portugal SUPPORT FOR AND OPPOSITION TO IMMIGRATION IN PORTUGAL IN A COMPARATIVE PERSPECTIVE*. https://doi.org/10.13140/RG.2.2.34483.63528

U.S. Census Bureau, UNFPA & USAID (2019). *Measuring Migration in a Census - Select Topics in International Censuses*. https://www.unfpa.org/resources/measuring-migration-census

d'Albis, H., Boubtane, E., & Coulibaly, D. (2018). *Macroeconomic evidence suggests that asylum seekers are not a "burden" for Western European countries*. Science Advances, 4(6), eaaq0883. https://doi.org/10.1126/sciadv.aaq0883

Douglas, P., Cetron, M., & Spiegel, P. (2019). Definitions matter: Migrants, immigrants, asylum seekers and refugees. In *Journal of Travel Medicine* (Vol. 26, Issue 2). Oxford University Press. https://doi.org/10.1093/jtm/taz005

Deutsche Welle (2021, June 11). *Cheap Asian workers flock to Portugal's farms*. https://www.dw.com/en/cheap-asian-workers-flock-to-portugals-farms/a-57811307

Falniță, E., & Sipoș, C. (2007). *A multiple regression model for inflation rate in Romania in the enlarged EU* (MPRA Paper No. 1057). Munich Personal RePEc Archive. https://mpra.ub.uni-muenchen.de/11473/1/MPRA_paper_11473.pdf

Filindra, A., & Goodman, S. W. (2019). Studying Public Policy through Immigration Policy: Advances in Theory and Measurement. *Policy Studies Journal*, *47*(3), 498–516. https://doi.org/10.1111/psj.12358

GEMET. (2024). https://www.eionet.europa.eu/gemet/en/concept/2422

GEP/MTSSS – Strategy and Planning Office of the Ministry of Labour, Solidarity and Social Security. (2023). *Unpublished data provided via email*.

Ghasemi, P., Teixeira, P. M. F., & Carreira, C. (2024). *From borders to boardrooms: Immigrants' impact on productivity*. Centre for Business and Economics Research (CeBER), University of Coimbra. https://estudogeral.uc.pt/bitstream/10316/116176/1/wp-ceber-2024-1-5.pdf

Governo da República Portuguesa. (2024). *Criar Estrutura de Missão para resolver os +400 mil processos pendentes. Assegurar o Sistema Informático de Controlo de Fronteiras*. https://www.portugal.gov.pt/pt/gc24/comunicacao/noticia?i=plano-de-acao-para-as-migracoes-conheca-as-principais-medidas

Heruela, C. (2024, March 5). *Migration vs. Immigration. Tomedes.*. Https://Www.Tomedes.Com/Translator-Hub/Migration-vs-Immigration

INE. (2024a). *Metainformaçao, Saldo migratório (N.º)*. https://www.ine.pt/bddXplorer/htdocs/minfo.jsp?var_cd=0013179&lingua=PT

INE. (2024b). *Metainformaçao, Imigrantes permanentes (N.º)*. https://www.ine.pt/bddXplorer/htdocs/minfo.jsp?var_cd=0006054&lingua=PT

Mateus, C., Almeida, G., Albuquerque, R., & Moleiro, R. (2024). *Mão de obra imigrante duplica na agricultura e no turismo*. https://expresso.pt/sociedade/2024-06-06-mao-de-obra-imigrante-duplica-na-agricultura-e-no-turismo-9cec8221

Marisetty, N. (2025). *Exploring the dynamics of inflation, interest rates, and bond yields: A comprehensive regression model comparison*. *IOSR Journal of Business and Management (IOSR-JBM), 27*(1, Ser. 1), 1–18. https://www.iosrjournals.org

OECD. (2007a). Jobs for Immigrants: Labour Market Integration in Denmark. OECD Publishing. https://www.oecd.org/en/publications/the-labour-market-integration-of-immigrants-in-denmark_233783261534.html

OECD. (2023). *International migration outlook 2023*. OECD Publishing. https://www.oecd.org/en/publications/international-migration-outlook-2023_b0f40584-en.html

OECD. (2023a). Indicators of Immigrant Integration 2023: Settling In. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/06/indicators-of-immigrant-integration-2023_70d202c4/1d5020a6-en.pdf

Oliveira, C. R. (2023). *Indicadores de Integração de Imigrantes RELATÓRIO ESTATÍSTICO ANUAL 2023*.

Peixoto, J., Sabino, C., & Abreu, A. (2009). Immigration policies in Portugal: Limits and compromise in the quest for regulation. *European Journal of Migration and Law*, *11*(2), 179–197. https://doi.org/10.1163/157181609X440022

Peri, G. (2012). The effect of immigration on productivity: Evidence from US states. Review of Economics and Statistics, 94(1), 348–358 https://www.nber.org/system/files/working_papers/w15507/w15507.pdf

Pinto, M. F. P. (2022). *Imigração laboural no setor agrícola português: Um olhar sobre as condições de trabalho dos imigrantes* [Master's thesis, Universidade do Porto]. Repositório Aberto da Universidade do Porto. https://repositorio-aberto.up.pt/bitstream/10216/145188/2/591060.pdf

Pisarevskaya, A., Levy, N., Scholten, P., & Jansen, J. (2021). Mapping migration studies: An empirical analysis of the coming of age of a research field. *Migration Studies*, *8*(3), 455–481. https://doi.org/10.1093/MIGRATION/MNZ031

PORDATA – Contemporary Portugal Database. (2024). *Inflation rate (%) by goods and services – Portugal*. Fundação Francisco Manuel dos Santos. https://www.pordata.pt/en/statistics/inflation/inflation-rate/inflation-rate-by-goods-and-services-portugal

PORDATA – Contemporary Portugal Database. (2024). *Net business income in the agricultural sector (2008–2022)*. Fundação Francisco Manuel dos Santos. https://www.pordata.pt

Wooldridge, J. M. (2020). *Introductory econometrics: A modern approach* (7th ed.). Cengage Learning

United Nations (2023). *International Migration Policies: Government Views and Priorities 30 United Nations Department of Economic and Social Affairs | Population Division*. http://esa.un.org/poppolicy/about_database.aspx/.

U.S. Department of Agriculture – Economic Research Service (USDA ERS). (2024). Farm Business Income. https://www.ers.usda.gov/topics/farm-economy/farm-sector-income-finances/farm-business-income

Zavodny, M. (2011).** *Immigration and American Jobs.* American Enterprise Institute for Public Policy Research & Partnership for a New American Economy. https://www.aei.org/wp-content/uploads/2011/12/-immigration-and-american-jobs_144002688962.pdf

Zikra, N., & Fakhruddin. (2018). *Does migration matter for agricultural productivity?* Proceedings of the 1st Aceh Global Conference (AGC), Atlantis Press.

ANNEXES

ANNEX A – ANNUAL NET BUSINESS INCOME OF THE AGRICULTURAL SECTOR (2008-2022)

Year	Net Business Income (€ million)
2008	1,799.2
2009	1,482.8
2010	1,679.7
2011	1,240.8
2012	1,438.8
2013	1,683.6
2014	1,550.6
2015	1,725.7
2016	1,826.1
2017	1,765.5
2018	1,729.6
2019	1,935.2
2020	2,044.3
2021	2,345.9
2022	1,957.2

Source: PORDATA, 2024

ANNEX B – NUMBER OF EMPLOYEES WORKING IN THE AGRICULTURAL SECTOR (2008-2022)

Year	Portuguese	Foreign	Total
2008	55,565	4,733	60,298
2009	52,748	5,076	57,824
2010	45,481	5,510	50,991
2011	44,840	5,614	50,454
2012	44,637	5,552	50,189
2013	48,192	6,428	54,620
2014	49,844	7,088	56,932
2015	51,297	7,803	59,100
2016	53,178	9,293	62,471
2017	54,035	9,951	63,986
2018	55,440	11,895	67,335
2019	54,376	14,272	68,648
2020	53,626	18,746	72,372
2021	52,941	17,997	70,938
2022	54,233	22,428	76,661

Source: GEP/MTSSS, Quadros de Pessoal (unpublished data provided by GEP/MTSSS, via email, October 2023)

ANNEX C – INFLATION (2008-2022)

Year	Inflation (% annual rate)
2008	2.59
2009	-0.84
2010	1.4
2011	3.65
2012	2.77
2013	0.27
2014	-0.28
2015	0.49
2016	0.61
2017	1.37
2018	0.99
2019	0.34
2020	-0.01
2021	1.27
2022	7.83

Source: PORDATA, 2024

ANNEX D – MODEL RESULTS

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.843[a]	.710	.631	162.7627

a. Predictors: (Constant), Inflation Rate, Portuguese Employees , Foreign Employees

b. Dependent Variable: Net Business Income

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	713492.576	3	237830.859	8.978	.003[b]
	Residual	291408.684	11	26491.699		
	Total	1004901.260	14			

a. Dependent Variable: Net Business Income

b. Predictors: (Constant), Inflation Rate, Portuguese Employees , Foreign Employees

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	619.668	674.593		.919	.378	-865.101	2104.438
	Foreign Employees	.035	.010	.739	3.448	.005	.013	.057
	Portuguese Employees	.016	.014	.229	1.142	.278	-.015	.047
	Inflation Rate	-30.016	23.083	-.238	-1.300	.220	-80.820	20.789

a. Dependent Variable: Net Business Income

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Year[b]	.	Enter

a. Dependent Variable: Net Business Income

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,727[a]	,529	,492	190,8684

a. Predictors: (Constant), Year

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	531301,320	1	531301,320	14,584	,002[b]
	Residual	473599,940	13	36430,765		
	Total	1004901,260	14			

a. Dependent Variable: Net Business Income

b. Predictors: (Constant), Year

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-86027,120	22984,294		-3,743	,002	-135681,669	-36372,570
	Year	43,560	11,407	,727	3,819	,002	18,918	68,203

a. Dependent Variable: Net Business Income

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Year[b]	.	Enter

a. Dependent Variable: Foreign Employees

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,927[a]	,859	,848	2219,323

a. Predictors: (Constant), Year

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	390067904,60	1	390067904,60	79,195	<,001[b]
	Residual	64030132,330	13	4925394,795		
	Total	454098036,93	14			

a. Dependent Variable: Foreign Employees

b. Predictors: (Constant), Year

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-2368138,237	267249,903		-8,861	<,001	-2945496,551	-1790779,922
	Year	1180,296	132,630	,927	8,899	<,001	893,767	1466,826

a. Dependent Variable: Foreign Employees

ANNEX E – MODEL VALIDITY TESTS

EXOGENEITY (RESET TEST)

$NBI_t = \beta_0 + \beta_1 FE_t + \beta_2 PE_t + \beta_3 Inf_t + \delta\ \widehat{NBI_t}^2 + u_t$, n = 15 (2008 to 2022)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	713733.966	4	178433.492	6.128	.009[b]
	Residual	291167.294	10	29116.729		
	Total	1004901.260	14			

a. Dependent Variable: Net Business Income

b. Predictors: (Constant), Estimated_NBI_2, Inflation Rate, Portuguese Employees , Foreign Employees

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	685.338	1010.125		.678	.513
	Portuguese Employees	.009	.075	.133	.124	.904
	Inflation Rate	-15.236	164.121	-.121	-.093	.928
	Foreign Employees	.017	.200	.353	.083	.935
	Estimated_NBI_2	.000	.002	.423	.091	.929

a. Dependent Variable: Net Business Income

$H_0: \delta = 0, there\ are\ no\ evidence\ of\ misspecification$

$or\ relevant\ ommited\ variables\ correlated\ with\ variables\ in\ the\ model$ vs.

$H_0: \delta \neq 0, there\ are\ evidences\ of\ misspecification$

p-value = 0,929 ⇒ H_0 is not rejected, supporting the hypothesis of exogeneity

HETEROSKEDASTICITY (WHITE SIMPLIFIED TEST)

$$\hat{u}_t^2 = \beta_0 + \beta_1 \widehat{NBI_t} + \beta_2 \widehat{NBI_t}^2 + \varepsilon_t \ ,\ \text{n = 15 (2008 to 2022)}$$

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.210[a]	.044	-.115	25071.79020

a. Predictors: (Constant), Unstandardized Predicted Value squared, Unstandardized Predicted Value

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	347246658	2	173623329	.276	.763[b]
	Residual	7543135968	12	628594664		
	Total	7890382626	14			

a. Dependent Variable: Unstandardized Residual squared

b. Predictors: (Constant), Unstandardized Predicted Value squared, Unstandardized Predicted Value

$H_0: \beta_1 = \beta_2 = 0,\ Homeskedasticity$ vs. $H_1: \exists_{\beta_i} \neq 0, Heteroskdasticit$

In the global significance test, p-value = 0,763 ⇒ H_0 is not rejected, supporting the hypothesis of homoscedasticity

Alternatively:

Test Statistic: $nR^2 \sim X_2^2$

Q_{obs}= 15 * 0.044 = 0.66 $\notin$ $CR_{5\%} =]5.991, +\infty[$ ⇒ H_0 is not rejected, supporting the hypothesis of homoscedasticity

AUTOCORRELATION (1ST ORDER)

$$\hat{u}_t = \beta_0 + \beta_1 FE_t + \beta_2 PE_t + \beta_3 Inf_t + \rho_1 \hat{u}_{t-1} + \varepsilon_t \quad , \text{n = 14 (2009 to 2022)}$$

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	423.984	795.381		.533	.607
	Foreign Employees	.010	.012	.405	.822	.432
	Portuguese Employees	-.011	.017	-.290	-.617	.552
	Inflation Rate	-1.915	26.631	-.030	-.072	.944
	Unstandardized Residual (-1)	-.509	.303	-.549	-1.678	.128

a. Dependent Variable: Unstandardized Residual

$H_0: \rho_1 = 0, no\ first\ order\ residuals\ autorrelation$ vs.

$H_1: \rho_1 \neq 0, autocorrelation$

p-value = 0,128 ⇒ H_0 is not rejected. There is no statistical evidence of first order autocorrelation.

RESIDUALS NORMALITY (SHAPIRO-WILK)

To test the normality of residuals in a sample with 15 observations the Shapiro Wilk test can be performed.

Tests of Normality

	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Unstandardized Residual	.107	15	.200*	.942	15	.405

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

H_0: Residuals follow a normal distribution vs.

H_1: Residuals deviate from normal distribution

p-value = 0,405 ⇒ H_0 is not rejected, supporting the residuals normality hypothesis