Ca' Foscari
University
of Venice

Joint Degree Programme
in Models and Methods of
Quantitative Economics

Final Thesis

Young and the Restless, a microeconomic analysis of the brain drain in Portugal

Supervisor
Ch. Prof. Gloria Moroni

Graduand
Maria João Soares Marques
Matriculation Number 896267

Academic Year
2023 / 2024

Abstract

The emigration of highly skilled individuals indicates a concerning situation for the country of origin. This emigration comes with a cost, both to the individual who decides to leave their home country behind hoping for a better situation, and to the country which loses part of their human capital. Highly skilled populations enhance the country's economic performance, and losing such skilled individuals could cause irreparable damages.

This paper intends to depict the level of education of the Portuguese population during the year 2010, and how being a Portuguese emigrant increases the odds of being highly educated. The data used to do this analysis was gathered from the observations of the Labour Force Surveys (LFS) and the Database on Immigration from the OECD Countries (DIOC).

This observation will be evaluated by applying a multinomial logistic model and the results show that Portuguese emigrants are 8 times more likely of being highly educated, compared to the Portuguese residing in the country. Estimating other European nationalities (Italian, Greek, French, Irish, Danish and Romanian) likelihoods of being highly educated did not show odds as high as the Portuguese Emigrants.

This study is relevant to characterize the emigrant population and should be considered as a reference for a study with up-to-date data. If Portugal shows signs of having an educated population fleeing the country and no measures seem to be considered to tackle emigration, Portugal might be gambling with the sustainability of its future.

Keywords: Portugal, Brain Drain, Highly Educated, Emigration.

Table of Contents

List of Tables

List of Figures

I. Introduction

Brain Drain is the emigration of highly educated individuals (Gibson & McKenzie, 2011). Even though it is a topic that dates back to 1960, there is still an ongoing debate, mainly due to the importance of addressing the push factors that are driving highly qualified people away from their country. Highly qualified individuals are noted to be those who have obtained qualifications higher than the average of the national population. The topic is pertinent since it is still currently observed, particularly in the mobility of academics and researchers (Kim, 2017).

This papers aims at describing the brain drain of the Portuguese population in the year 2010, as well as comparing the brain drain across European countries.

Portugal is the selected country for the analysis, studies show that the number of unemployed higher education graduates has significantly increased in recent years, leading many to seek employment outside of Portugal (Cerdeira, et al., 2016). Part of the government expenditure, for several years, was towards instructing a very low educated population, which could be attributed to an economy highly focused on the primary sector, agriculture and fishing (Lains, 2003).

Portugal was one of the countries, under the EU territory, that was strongly affected by the financial crisis of 2008 (Halvorsen, 2016). The year 2010, was important for the country due to the economic, political and fiscal crisis. Portugal has shown high levels of emigration throughout time, but after 2008 there was a quick and significant increase (Carrilho & Perista, 2016).

Europe became a heaven for the mobility of European citizens, it was even encouraged through several programmes. *Erasmus+* brought a new perspective and the possibility of new horizons. A new generation that is stimulated to study abroad, participate in internships, and become more prone to gain a European 'identity' (King & Ruiz-Gelices, 2003). European Union allows to join in the interchangeable experiences of other cultures and countries. Having the chance to live abroad is the opportunity to gain immeasurable skills and knowledge and the Portuguese students were a part of this, when involved in Erasmus programs they showed tendencies to stay in the country of destination or upon return showed a higher predisposition to move to another European Country (Gomes, et al., 2018).

When such mobility becomes a variable in the equation of inequality, between European countries, there should be measures and analysis to understand intra-European Migration from individuals of less developed European countries.

The migration patterns in Europe are now different, there is a new generation of emigrants that show a continued and stable relationship with their country of origin (Verwiebe, Wiesböck, & Teitzer, 2014). Schengen Area brings new accessibility between countries, which might help promote this relationship between the country of origin and the country of emigration. Even remittances do not follow trajectories as seen before (Rössel, Schenk, & Pap, 2024).

How can a country support investing in the younger generations, if they end up drifting away to other economies? Policies to improve the population's educational level have been made but without focus on supporting the highly educated individuals to stay in the country. The mismatch between the qualifications of the population and the labour market necessities is a relevant issue that can justify this.

Although people are emigrating and searching for a new occupation; there is empirical evidence that the probability of unemployment is lower, conditional on having higher education. (Machin & McNally, 2007). Focusing that perhaps the reason for emigration is not to find any job, but to find one that values the skills of the individual (Gomes, et al., 2018).

Studying is sometimes seen as a luxury, to have the opportunity of obtaining higher levels of education instead of entering the labour market immediately is a situation that many people cannot afford, so to see all the effort of those who study end up feeling trapped in their own country's economy does not seem acceptable.

Portugal is a small country that lacks innovation and opportunities to grow. These difficulties can be overcome by an investment both in technology and in the labour force, since when the labour force is more educated, they are prone to be more adaptable towards change as well as becoming more productive (Galor & Moav, 2000). Losing the individuals that could help overcome these struggles is not something the country can afford.

This study briefly describes the characteristics of the population (according to the sample) of seven European countries (Portugal, Denmark, France, Greece, Ireland, Italy

and Romania), and the features associated with an emigrant. The study is set in 2010 and should be considered as a reference for another analysis with more recent data.

The analysis has revealed that being a Portuguese emigrant increases the odds of being highly educated by 8 times, compared to the nationals. Where do the Portuguese emigrants stand in the frame of Europe? Portugal is the least educated country in the sample and shows the highest likelihood of its emigrants being highly educated. In 2010, among the European sample, Portugal has the highest proportion of citizens living abroad, it was approximately 19% of the Portuguese population.

The rest of this paper is organized as follow: starting with an extensive literature review on the topic of Brain Drain along with literature on the labour market and education in Europe. The next sections will be an overview of the collected data as well as the methodology used to address the purpose of this study. At last, a brief discussion of the results obtained that provide a suggestion on how Portugal stands among the rest of Europe. Concluding with some final remarks on how the results are relevant to understand the Brain Drain in Portugal.

II. Literature Review

Human Capital Flight is the term used to describe the emigration of highly qualified individuals (Matheson & Tomiwa, 2022). There are other terms used to label this type of emigration and are usually connotated with either negative or positive undertones. The term Brain Drain brings a negative interpretation suggesting a sign of loss to the country who loses *brainys* (above average educated individuals).

Several researchers have studied and observed the inherent loss of such emigration, theoretical literature such as Bhagwati and Hamada (1974) has even stated that in countries where it is observed emigration of such qualified populations, there are negative externality to those who stay in the country. Literature regarding brain drain is usually focused on emigration from developing countries, with considerably lower levels of human capital. Modern literature intends to counteract this connotation, and the term Brain Gain has been taken into more consideration (Kone & Özden, 2017).

Literature from 1970/1980, interpreted how the loss of a highly qualified population would result in the depreciation of human capital of the sending country, more recently studies from 1990 onwards, stand on the opposite side of the argument, possibilities to migrate transform into an incentive for the development of the human capital inside of the country (Stark, Helmensteinc, & Prskawetz, 1997).

The consequences of human capital flight are several, to the sending country and the destination one. Focusing on the Drain part from the emigration, losing a highly qualified population might result in losses beyond repair, without qualified manpower industries might struggle with lack of innovation.

Regarding Brain Drain is worth mentioning that the location where the individual has acquired education is a key factor for a proper analysis. In a situation where the reason to leave the country is to be able to acquire a higher level of education then the country of origin might be lacking in quantity and quality of education offered. If the emigration has been done after becoming highly educated, the causes for emigration can be a whole new set of possibilities that should be addressed. It is also important to clarify two concepts: push and pull factors. Push factors describe the reasons for which one might decide to emigrate; pull factor represents what countries possess to attract migrants. To analyse the brain drain it is more relevant to discuss the push factors since the focus is on countries that are losing highly qualified manpower.

In a study published in 2018 named “Asymmetric Mobility and Emigration of Highly Skilled Workers in Europe: The Portuguese case” the authors have designed and conducted a survey directed to the highly skilled emigrants, and the answers describe that the decision to migrate is mainly due to professional and economic reasons. More clearly within the pull professional factors 90% of the migrants state that in the destination country, they can have a job where their qualifications are valued. The economic push factors, that the answerers have attributed the decision to emigrate were the economic crisis and the inadequacy of remuneration in their country (Gomes, et al., 2018). The information on the push factors is rather relevant so that the country can address the situation and consider appropriate policies to contest against the emigration. In the previously mentioned study, it states that the labour market situation represents the principal reason for human capital flight.

As mentioned in the book “The consequences of Mobility” the critique of the mobility of high qualified individuals is not on generating a more educated population but yes to the fact that incoherently creates a system where there is not a competitive labour market to support this population reaching the point of “wastage of talent” (Cairns, Cuzzocrea, Briggs, & Veloso, 2017)

A consequence of the brain drain mentioned by Bhagwati and Hamada (1974) in a country where there has been made an investment in education, with the purpose of reclaiming such investment through taxation, upon the observation of brain drain, then it will be evident a deterioration on the social welfare of those left behind.

There is an inherent connection between emigrants and being young, there are studies such as Mountford and Rapoport, (2011) that have concluded the brain drain may reduce the fertility rates of the economies worldwide and even considering possible benefits from the emigration to both sending and receiving country, there is the prospect of a more developed economy benefit more from this migration, consequently, it is observed an intrinsic intensification of the inequality between economies.

The topic of human capital flight can be divided into two important topics, the education of the population and the conditions of the labour market.

1. Education

Theory shows that a highly educated population brings positive returns to production and it can be used in firms so they are able to filter the level of productivity for the work force.

From a macroeconomic point of view, there are models which show how a highly educated labour force impacts the growth of the economy. There have been models designed to consider the effect of shifts of technical changes in the production function. A model worth mentioning was designed by Solow (1957), who concluded that a shift of technical change, for instance an improvement of education in the workforce, translates into an increase on the gross output per man hour. The result might seem expected, but when observed the proportion of the impact between capital and technical change, only a small portion was attributed to the capital. Paul M. Romer (1986) has observed in endogenous growth equations the effect of knowledge in the production of goods, which has exhibit increasing returns, unlike capital that showed decreasing returns.

From the microeconomic perspesctive, Arrow (1973) has argued that returns on human capital are skewed because one cannot evaluate differences in the ability through differences in schooling. However, school and associated records should be used as a signal/filter of the productivity the individual represents. Creating the opportunity for the one hiring to access information about the worker beforehand. Education can represent the working skills of the worker, or the knowledge they might hold, but it provides as well an information on the social skills of the individual.

Portugal holds compared to Europe a very unsatisfactory level of education, there are several reasons that can justify such problem. For example, the fact that during several years the main source of income for families was by exploiting natural resources, or even historical and political aspects of the country. Portugal had in the twentieth century an economy very focused in the primary sector and as mentioned in the paper “Portugal’s Growth Paradox, 1870-1950” (Lains, 2003), even if focused in this specific sector, the Portuguese agricultural sector, still showed low levels of productivity.

Historically, the country was governed by a dictatorship for over 30 years, the improvement made in the education of the population had the sole purpose of decreasing the level of illiteracy. During these 30 years still a big part of the population continued to

struggle reaching higher levels of education either by lack of offer or by the high costs that these levels of education inferred (Cordeiro & Alcoforado, 2018).

The dictatorship was over throned in 1974 and since then it is perceptible the improvement on the level of education in the population, although the improvement was done slowly, only in 2009 it became mandatory to graduate from secondary school (all students under 18 years old). Recently, in Portugal there has been an enormous determination from the younger generations to attain higher levels of education. Several recent graduates still have a family background with low levels of education. Illiteracy has been successfully battled and Portugal shows a decreasing trend of the proportion of illiterate individuals, data from the Portuguese National Institute of Statistics (Pordata, 2024) show that in 1998 there was still 19,1% of the population which did not have basic levels of education, in 2010 the number had decreased to 10,6% and successfully in 2023 only 3,7% were illiterate. The population has become more educated over the years, that ascend as well for higher levels of education (ISCED 5/6). The statistics show an increasing trend, in 1998 only 6,1% had higher education, 2010, there was 11,8% and in 13 years it has doubled the level of 2010, translating to 23,2% of the Portuguese population holding some form of tertiary education.

According to (EUROSTAT) on the countries that were selected for this study show that Portugal as had one of the biggest evolutions in the education of the population between 1998 and 2023. Ireland in 2023 has one of the highest educated populations (among the selected countries) with 46,6% of the population with some form of tertiary education. As of 2023, Romania and Italy are the ones with the lowest proportion of highly educated, 16,1% and 19,2%, respectively. Followed by Portugal and Greece. This shows that emigration of the highly qualified is more concerning in these countries.

Greece and Portugal are in the bundle of countries where it is observed difficulties for young adults with higher education to access the labour market (Pompei & Selezneva, 2021). However, difficulty in accessing the labour market can indicate underlying issues within the labour market itself. Educational mismatch is observed when the qualifications of the candidates or the workers differ from the requirements of the job. There is evidence that Italy represents one of the worst labour markets in the European Union regarding vertical mismatch (comparison between the qualifications and the job that they have acquired), there is a big portion of overqualified employees, as well as underqualified

meaning that skills required by the labour market are not being attended (Montanari, Pinelli, & Torre, 2015).

Part of the government revenues are invested in education, and statistics from EUROSTAT show that the investment has been decreasing over the years. Getting a higher education diploma usually comes with a cost, still very high for a lot of families. In 2010, the investment in tertiary education in the following countries: Portugal, Denmark, France, Greece, Ireland, Italy and Romania, in proportion of GDP was around 0,4% and 1,4%. The lowest proportion was observed in Italy, and the highest in Denmark. Between 2010 and 2022, the investment of the government in education has lowered but contrarily to expectations the population has been getting more educated. This can signal that the labour market requires now a higher level of education.

Education is commonly used as a proxy for the skills of the candidate, typically used as an entry requirement for positions in companies, leaving individuals to expect that investing in education will bring a bigger possibility of higher earnings (Bills, 2003). This creates an unbearable situation for the labour market since education does not translate into skills, a problem that even with a higher qualification, there might be a mismatch between what is the demand and the supply of the labour force (Monti & Pellizzari, 2016).

Universities create opportunities for the recently graduated, however having a higher amount of graduates without the creation of new scenarios in the labour market the expected outcome of generating a more educated population becomes pointless since they feel forced to leave the country to find a labour market where the demand has a more direct connection to what the individual might supply (Madruga, et al., 2014).

2. Labour Market

The Labour Market represents a great concern for recent graduates possibly for the distress and anxiety of entering it, and when some attrition might be found, it can easily escalate to a reason for emigration. The labour market is a relevant reason for both sides of the equation either as a push and a pull factor. If the push factor is indeed the labour market found in the country of birth, it is also a relevant component when choosing the country of destination.

There is some theoretical evidence (Diebolt & El Murr, 2004) to what may cause deviations from the equilibrium point. The labour market has a point of equilibrium when

the supply of working population and the recent graduates find a labour market with demand to support this supply, a deviation from the equilibrium can generate 2 situations: Saturation or Shortage. Saturation is where there is an excessive supply of labour force to a specific market. Shortage is when the demand of a specific market is higher than the supply (Diebolt & El Murr, 2004). As per the aforementioned study, the authors have concluded through a cobweb model that the demand and supply when deviated from the equilibria tend to take time to reach it once again. Specifically, variations in earnings are usually handled in the subsequent period on the demand part, however the supply reacts many periods after. Supply struggles to adapt to variations in earnings, possibly causing saturation in the market and creating the vicious cycle of decrease in earnings.

Regardless of the investment in having a more educated population, it is noticeable that the labour market has a discrepancy between the demand and the supply, with old and dated industries sometimes with low-end technology usually it translates into situations of temporary work and low earnings.

There is evidence that young adults in Portugal have very atypical contractual situations and that younger generations have a higher unemployment level than the European union average (Contini, 2012). The situation seems to create a vicious cycle to pursue even higher education such as master's and PhD. Which already seems to be the case, it has been a growing evolution on the number of people following a master's education (Rodrigues, et al., 2022). From the population pursuing higher education in 2010, only 15,9% was enrolled in a master's program, as of 2022 the proportion has grown to 24,3%, statistics from the Portuguese National Institute of Statistics (Pordata, 2024).

OECD (2014) report SHOWS evidence that the hiring recruitment is usually made with labour force already existent in country's labour market, therefore it is usually seen that when foreign labour force is hired it is because there was a migration before, the recruitment is not usually outsourced. Some policies on hiring domestic workers where the job proposals are made according to national standards could be a solution to make domestic workers feel valued, Sweden has applied a policy for unions to analyse if job offers are made according to the national standards (OECD/European Union, 2014). Other policies that are being considered, for example in the United Kingdom, not attributing work visas for those who are specialized in fields that are not in the list of

shortage. By addressing a list of the fields that have shortage of supply there is a direction on those who can get a job in the country, trying this way to fight possible saturation of the labour market. Shortage or Saturation in the labour market can vary across different sectors, work visas play a crucial role as a pull factor and these also generate effects in the country of origin (Abarcar & Theoharides, 2024).

3. Brain Drain

The term Brain Drain has already been defined by the emigration of the highly qualified individuals. This term has an inherent connation to loss, loss towards the sending country. Education and Labour Market literature has already been tackled, however why does it matter that the qualified individuals emigrate, what are the actual consequences.

Brain Drain or Brain Gain might be a heated debate, but some literature has found empirical evidence that Beneficial Brain Drain (BBD) is observed and has a positive impact on education decisions specially when there are migration prospects, (Beine, Docquier, & Rapoport, 2001). This study was focused on small and developing economies. These results might be skewed depending on the selected countries of focus, as Southern American countries have the remittances from the emigrants playing a huge role in the countries' economy (Bussolo, et al., 2008).

When it comes to Europe, the scenario seems different, the reasons for moving abroad are not quite the same, they go not only for better opportunities but to find some respect for their investment in studying and hopefully in a place where they feel valued (Gomes, et al., 2018). There seems to be a new trend of young adults to start moving abroad in Portugal, there is an estimation that 1 in 3 young adults born in Portugal are currently living abroad (Caetano, 2024).

Brain Drain might have consequences not only economically, but it might grasp concerning consequences on the fertility of the country, both sending and destination (Mountford & Rapoport, 2011).

In order to observe a reverse in the trend of *brainys* moving abroad it is important that investment comes from several entities in the country, from the government to corporates, and perhaps the term brain drain might be replaced with brain circulation (Milo, et al., 2012).

III. Data

This section aims to describe the data used to assess the likelihood of being highly educated. The analysis will be conducted using individual observational data on the year 2010.

The data will aggregate 2 different datasets. The Labour Force Survey (LFS) (EUROSTAT, 2024) is a household survey that aims to observe the labour participation of individuals above 15 years old. The second dataset is called Data on Immigrants in OECD and non-OECD countries (DIOC) (OECD, 2024). Most of the results were obtained through CENSUS[1] of each country (exceptions are found in a few countries). DIOC has observations from over 100 destination countries (where the immigrants are residing) and gathers information from over 200 countries of origin.

Labour Force Survey (LFS), represent the data of individuals born and residing in their country of birth. This microdata was obtained through EUROSTAT, where it is publicly available data of the LFS from several European countries. Each country has yearly individual answers to the European Union Labour Force Survey (EU-LFS), although, to ensure the anonymity of the answerer, the public microdata does not provide full information on all the variables. An example, that represents a limitation to the study, is if the answerer is foreign-born (country of birth is different than the country where it is working) the variable country of birth is differentiated only through the region where the country is found and not precisely. Consequently, even with some information on immigrants, it is not possible to draw any conclusion on the emigration from a specific country.

DIOC dataset was created by the OECD purposely for immigration, in this dataset it is possible to observe the country of birth of the individual as well as the country of residence. It also assures the anonymity of the answerer is protected.

The focus of the study is on the Portuguese population, as mentioned before Portugal went under severe economic distress during the 2008 financial crisis and by having a population with low levels of education it cannot afford to lose highly educated individuals.

[1] - The census is a procedure (typically a survey) undertaken by the Office of National Statistics and provides the a picture of the people and the households.

The aggregation of these two datasets was made by selecting variables available in both: country of residence, country of birth (or national in case of LFS), age (in categories), sex and educational attainment (3 categories).

The codes of the country of residence available in the dataset can be found in the Appendix (Table 17 - Countries of Residence).

The country of birth was used to select the emigrants in the DIOC set (this dataset also included some observations on nationals, but they will not be included in the analysis) by selecting the country of birth it is possible to sort out the emigrants from each nationality. Regarding LFS, the answers were collected on a national frame and although it also includes the answers from immigrants, these individuals are excluded from the LFS sample.

The variable sex is a binary variable with 1 being the individual was born male, and 2 the individual was a woman.

Age is a categorical variable, in the DIOC dataset it was defined with 3 categories, even though the LFS dataset had more categories (between the years 25 and 65) and it was combined into the same categories as the DIOC dataset.

For age the categories (age that individual was at the time of the survey) are the following:

1 - Individual was between 15 and 24 years old
2 - Individual was between 25 and 64 years old
3 - Individual was over 65 years old

Regarding Education, this variable was categorically the same in both datasets and it represents the level of education attained:

1 - Low/Basic Level of Education: represented in the scale of ISCED[2] by the levels 0, 1 and 2.
2 - Medium Level of Education: representing the secondary education and ISCED levels 3 and 4.
3 - High Level of Education: Tertiary Education represents ISCED levels 5 and 6.

[2] - ISCED – International Standard Classification of Education

Due to data limitations, the possible analysis is straightforward. From a European perspective, it will potentially identify the nationality with the bigger tendency for emigrants to have completed tertiary education.

1. Descriptive Statistics

To create a frame of reference from Europe, other 6 nationalities were included in the analysis, as mentioned before. Some of these countries, such as Portugal, were severely affected by the financial crisis in 2008, namely Greece, Ireland and Italy. The other three countries were chosen so it would be possible to establish a comparison between other regions of Europe, Denmark representing the Nordic Countries, France representing Central Europe and finally Romania representing both Eastern Europe and a country that had just recently entered the European Union (2007).

The dataset has the following individual observations, National observations were obtained by LFS and the Emigrants' data by DIOC:

Table 1 – Number of Individual Observations

	Portuguese	Italian	French	Danish	Greek	Irish	Romanian
Nationals (LFS)	133623	535060	364956	64170	182216	164538	216133
Emigrants (DIOC)	1771	3379	3599	1624	1913	1397	1989

From Table 2 to Table 4 there is the description of the sample (aggregated data of LFS and DIOC, without being weighted by the actual proportion of emigrations), specifically the characteristics of each nationality.

Starting with the gender predisposition of each nationality.

Table 2 - Gender Distribution in Combined Dataset by Nationality

Gender	Portuguese	Italian	French	Danish	Greek	Irish	Romanian
Female	53,2%	52,8%	52,9%	52%	51,8%	51,7%	52,5%
Male	46,8%	47,2%	47,1%	48%	48,2%	48,3%	47,5%

All the nationalities show similar proportions, where slightly over 50% of the sample are women. Portugal represents the country with the highest share of women.

Table 3 displays the portion of the sample by age category:

Table 3 - Age Distribution in Combined Dataset by Nationality

Age	Portuguese	Italian	French	Danish	Greek	Irish	Romanian
15-24	13,5%	10,7%	16%	19,4%	11,1%	16,5%	13,3%
25-64	54,8%	49,5%	52,1%	54,8%	53,1%	61,9%	54,8%
+65	31,7%	39,8%	31,9%	25,8%	35,8%	21,6%	31,9%

Age is a very relevant statistic to understand the country's demographics, having a young population is an important aspect of the development of the country, besides assuring the sustainability of social security. Running the risk of letting young adults fly to other countries opens a door to what can be an unbearable future for the country.

In the dataset, Italy represents the oldest population, with almost 40% being over 65 years old, unlike Ireland where the share is only 21,6%. The youngest population is represented by Denmark where 19,4% of the individuals are found in the youngest category (15 to 24 years old). Southern Europe (Greece, Portugal and Italy) represents the oldest nations in the sample.

Table 4 displays the proportion of the population by level of education.

Table 4 - Education Distribution in Combined Dataset by Nationality

Education	Portuguese	Italian	French	Danish	Greek	Irish	Romanian
Low	77,9%	58,9%	39,4%	35,7%	53,5%	38,3%	41,7%
Medium	12,9%	31%	39%	38%	30,9%	34,3%	48,5%
High	9,19%	10,1%	21,6%	26,3%	15,6%	27,4%	9,78%

Among the combined sample Portugal has the least educated population followed by Italy and Greece, there is the assumption that in these countries having a brain drain will create an undesirable situation, meaning, if the highly educated decide to emigrate it will leave the labour force with low prospects of innovation. Romania shows interesting characteristics, it is the population with the highest proportion of individuals with secondary education.

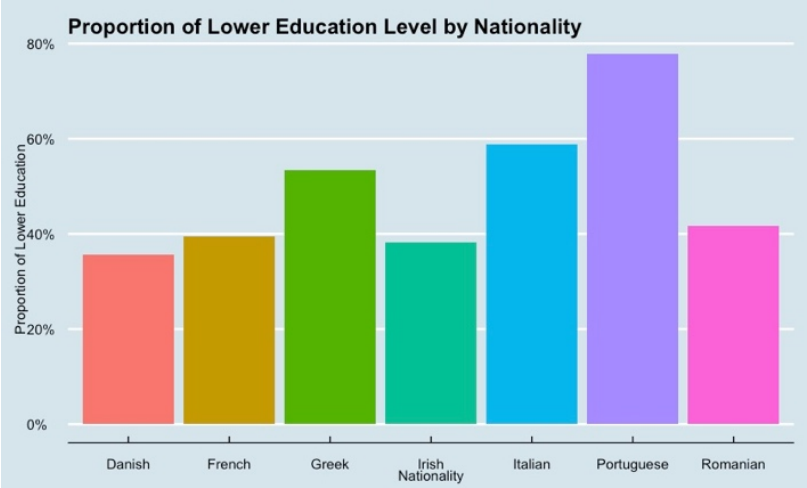

Figure 1 -Proportion of Lower Education by Nationality

The emigrant sample shows interesting numbers. From table 5 to table 7 it shows the distribution of gender, age and level of education of the emigrant population (DIOC dataset):

Table 5 – Gender Distribution in DIOC Dataset by Nationality

Gender	Portuguese	Italian	French	Danish	Greek	Irish	Romanian
Female	48,6%	46,8%	48,8%	48%	46,4%	48,2%	49,2%
Male	51,4%	53,2%	51,2%	52%	53,6%	51,8%	50,8%

The table shows that, unlike the data presented in Table 2, the gender distribution of the emigrants is inverted, and most migrants are males.

Table 6 – Age Distribution in DIOC Dataset by Nationality

Age	Portuguese	Italian	French	Danish	Greek	Irish	Romanian
15-24	24,5%	23,4%	26%	24,5%	23,5%	22,2%	25,8%
25-64	52,2%	52%	51,4%	50,8%	50,9%	54%	48,3%
+65	23,3%	24,6%	22,6%	24,7%	25,6%	23,8%	25,9%

Compared to the combined sample (table 3), emigrants show a tendency to be much younger. Those who are over 65 years old represent less than 30% of the sample, and the younger generation represents now over 20%. In Italy, we see a big disproportion between the younger generation emigrated (23,4%) and the younger generation in the aggregated dataset (10,7%).

As for the education of the migrants, the levels are represented in table 7:

Table 7 - Education Distribution in DIOC Dataset by Nationality

Education	Portuguese	Italian	French	Danish	Greek	Irish	Romanian
Low	34,4%	32,6%	32,1%	27%	32,6%	24,3%	30,8%
Medium	36%	36,8%	35%	37,5%	36,5%	36,4%	34,8%
High	29,5%	30,6%	32,9%	35,5%	30,9%	39,4%	34,4%

These statistics show that, approximately one-third of the emigrants have obtained tertiary education. Irish emigrants are the ones who show the biggest proportion of highly educated, almost 40%. Portugal has the lowest proportion, only 29,5%.

Figure 2 shows the share of education between citizens residing in the country and the ones who have emigrated: 0 represents nationals and 1 represents the emigrants.

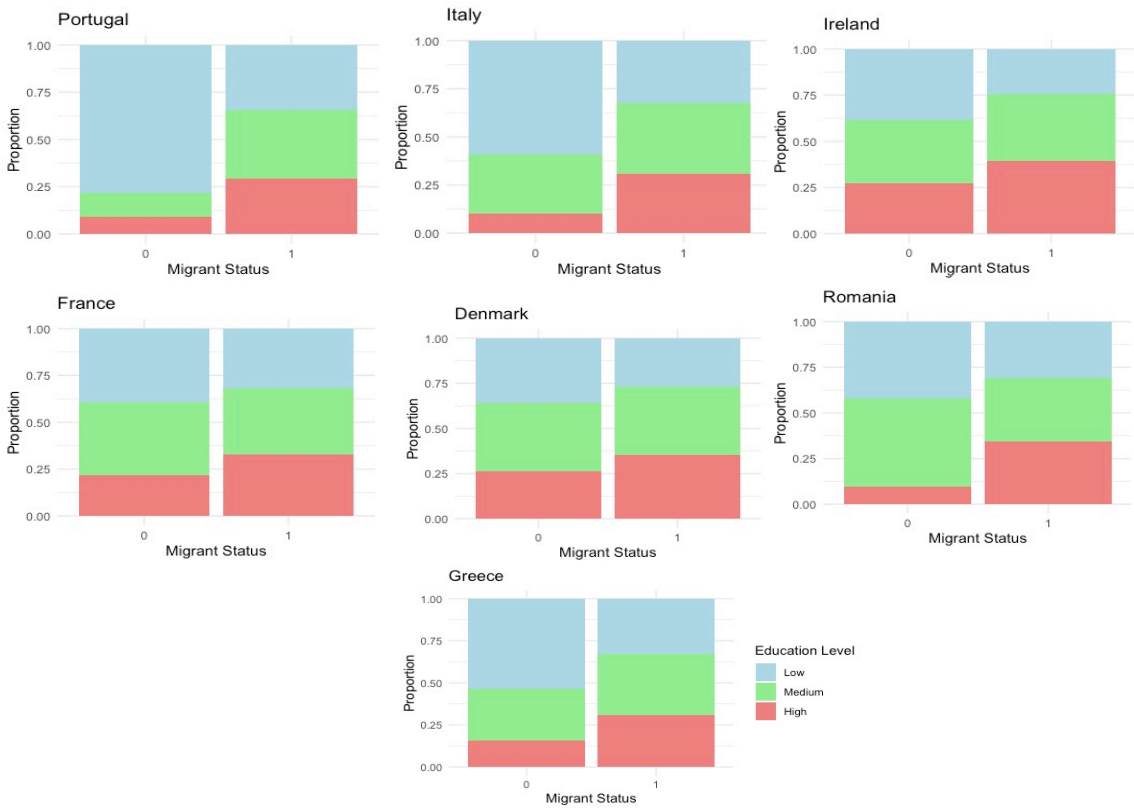

Figure 2 - Education Distribution between National and Emigrants

Through Figure 2, it is possible to observe that the emigrant population is more educated than the citizens that reside in the country.

Some countries do not show a big discrepancy between both populations, the case of Denmark, France and Ireland. On the opposite end, Romania shows the biggest difference followed by Italy.

On the emigrant's information (DIOC dataset), there is also a reference to the country where the individual was residing at the time of the survey, the graphic 3 shows the top 5 European destinations of the highly qualified emigrants.

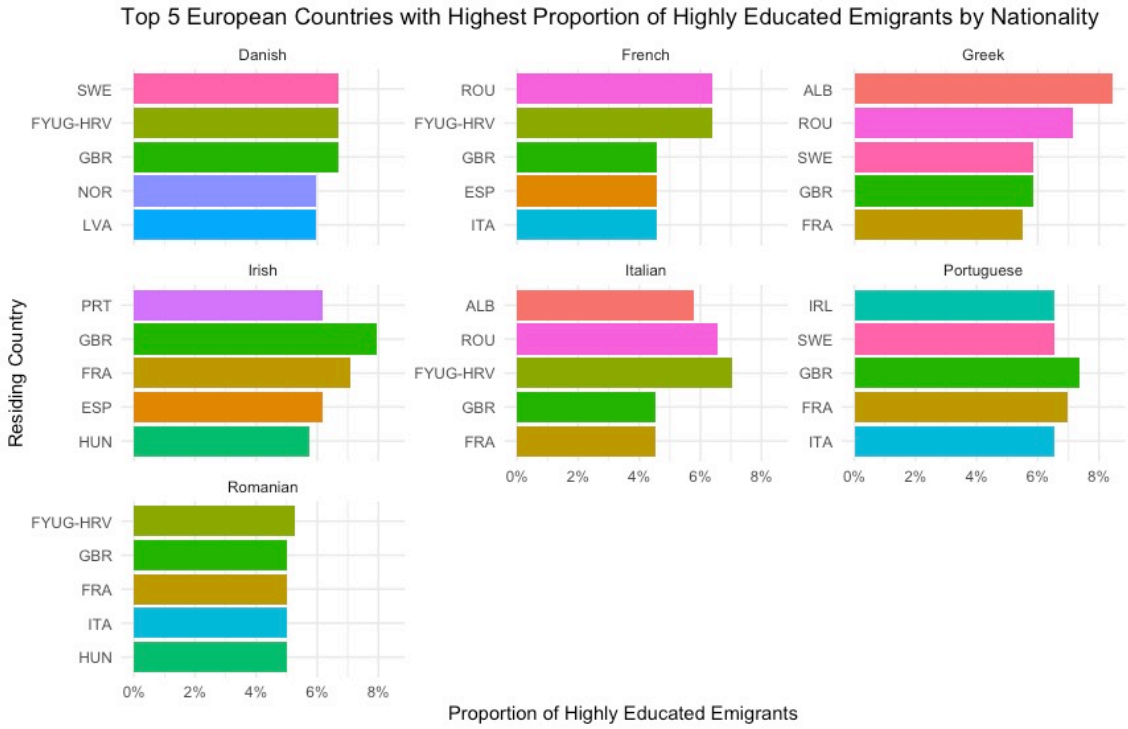

Figure 3 - Top 5 European Destinations of the Highly Educated by Nationality

Figure number 3 shows the top European Destinations of the highly educated emigrants. For example, over 6% of the Portuguese emigrants chose Great Britain as their country of destination, among the Greek emigrants 8% are living in Albania.

Among the selected countries for emigration, the proximity factor might be quite relevant, around 11% of Danish emigrant have chosen, Norway and Sweden as a destination country. Also seen in the Irish emigrant population, Great Britain represents the selected country of emigrations for over 8% of the sample.

Great Britain (GBR) absorbs a big proportion of these nationalities highly educated emigrants represented in the top 3 countries of destination of almost all nationalities, besides Italians. Sweden and France are also countries in the top considerations of the highly educated.

Surprisingly results could be Albania being a top destination for the top educated emigrants from Greece and Italy. Since Albania is not part of the European Union, emigration can involve more bureaucracy, perhaps proximity to the country of origin can be taken into consideration.

IV. Methodology

The existing literature has shown that a highly educated population is an important factor for the growth of the economy, a country losing their highly educated people to the labour markets abroad can result in a shortage of the supply needed to develop the expected growth.

Therefore, the choice of method to address this topic is to predict the likelihood of an emigrant being highly qualified, by understanding that an emigrant is more likely to be highly educated it states that the nationals do not have the same chances, either because they did not have the chance to study more, or because it reflects that the highly educated have decided to emigrate. The limitation in the data mentioned before makes it impossible to answer this question.

The analysis aims to predict the likelihood of an individual being highly educated and the explanatory variables consist of the characteristics of the individuals. The purpose is to understand whether being an emigrant affects the chance of having higher education and possibly quantifying.

The model that seems most appropriate to address this subject is the logistic regression. Logistic regression is a model that through a linear combination of variables models the logarithmic odds of an event happening. The event is the individual having higher education depending on the characteristic of the individual, this is age, sex and migrant status.

This model represents a binary dependent variable, where there will be assigned a probability (between 0 and 1) of the event happening.

The logistic regression is defined by:

$$p = Prob(y = 1|X) = \frac{e^{X'\beta}}{1 + e^{X'\beta}}$$

X' represents the variables and β the coefficients associated with such variables.

The Logit (log of Odds) are the following:

$$\ln\left(\frac{p}{1-p}\right) = X'\beta$$

The parameters are estimated using the Maximum Likelihood method and the Log Likelihood for the Logit Model is represented in the following manner:

$$\ln(\mathcal{L}) = \sum_{i=1}^{N} [y_i \ln\left(\frac{e^{X'\beta}}{1 + e^{X'\beta}}\right) + (1 - y_i)\ln(1 - \frac{e^{X'\beta}}{1 + e^{X'\beta}})]$$

However, being highly educated can have several definitions, depending on the average of the education of the population, consequently, the variable of education is divided into 3 categories (Low, Medium and High). A logit regression cannot model these variables since the dependent variable is not binary, as an alternative a multinomial logit model turns out to be more suitable for this specific dataset and to elucidate the likelihood of having each specific level of education.

The multinomial model has the key assumption of having 3 or more possible outcomes,

$$p_{i1} + p_{i2} + \cdots + p_{iK} = 1$$

p_{ij} is the probability of the *j-th* alternative for *i-th* observation.

The logistic regression needs to be rescripted in the following form:

$$p_{ij} = Prob(y = j|X) = \frac{e^{X'\beta_j}}{\sum_{k=1}^{K} e^{X'\beta_j}}$$

Since the sum of the probabilities of each possible outcome equals 1 the parameters need to be normalized. Taking the first possible outcome (j=1) it implies that:

$$\begin{cases} \frac{1}{\sum_{k=2}^{K} e^{X'\beta_j}}, & if\ j = 1 \\ \frac{e^{X'\beta_j}}{\sum_{k=2}^{K} e^{X'\beta_j}}, & if\ j \neq 1 \end{cases}$$

Interpretations of the coefficients become relative the $e^{X'\beta_j}$ a ratio of the probabilities, this means that this is just the relative risk ratio for a unit change in the explanatory variable.

Such as the logit regression the β parameters are estimated by Maximum Likelihood Estimation.

After the estimation of the model, the significance of the parameters is made by the Likelihood Ratio Test (LR Test). Where the null hypothesis considers the coefficients equal to 0. The test statistic is based on the log-likelihood differences between the estimated model ($\mathcal{L}$) and the null model ($\mathcal{L}_0$). The test statistic is $\chi 2$ distributed with the k degrees of freedom.

The test statistic is the following:

$$LR = 2(\mathcal{L} - \mathcal{L}_0)$$

This methodology will be applied to the aggregated dataset.

Since the dataset holds information on European emigrants the first model has the purpose of associating the characteristics of the individual to the likelihood of being emigrants. The designed model is the following:

$$logit\big(P(y_i = 1)\big) = \beta_0 + \beta_1 Education_i + \beta_2 Age_i + \beta_3 Gender_i \qquad (1)$$

It follows a logistic regression model. This model can address the odds of specific characteristics being associated with being an emigrant. This analysis is not the focus of this paper, just an overview of the European emigrants in 2010.

The focus of this paper is to study the likelihood of being highly educated based on the characteristics of the individuals.

The model (2) will be applied to the aggregated dataset.

$$logit\big(P(Education = j)\big) = \beta_{0j} + \beta_{1j} Emigrant_i(weighted) + \beta_{2j} Age_i + \beta_{3j} Gender_i \qquad (2)$$

j - each level of education

The proportion of emigrants' answers compared to the actual proportion of individuals living in a foreign country differs, consequently, to create a model that resembles the closest to the situation observed in each country the analysis will be weighted with the actual proportion of emigrants, presented in Table.

Table 8 - Proportion of the Emigrants' Data in the Dataset and Actual Emigration Proportion

Proportion	Portugal	Italy	France	Denmark	Greece	Ireland	Romania
Aggregated dataset	0.0131	0.0063	0.0098	0.0247	0.0104	0.00842	0.00911
Actual Emigration	0.1904	0.0461	0.0321	0.0448	0.0775	0.1826	0.1683

These proportions were calculated using the International Migrant Stock at mid-year by country of origin, this data is found in the United Nations Department of Economic and Social Affairs, Population Division (International Migrant Stock) and is in proportion of the National Resident Population, found in *Pordata* (Portuguese National Institute of Statistics) (Pordata).

V. Results

This section first shows the association between being migrant and education controlling for age and gender across all countries. The data on emigrant was weighted with the proportions in table 8.

The results of the regression are the following:

Table 9 - Logistic Model

Emigrant	Intercept	Education 2	Education 3	25-64 years	+65 years	Female
Coefficient	-6.808***	0.533***	1.392***	-0.898***	-0.790***	-0.152**
Odds-Ratio	0.001	1.705	4.025	0.407	0.454	0.859
std	0.07235	0.06751	0.07057	0.06730	0.07756	0.05323

**: p-value<0.05; ***: p-value < 0.01

The characteristics that show a higher likelihood of being an emigrant is having a higher education, in comparison to low/basic education, especially when the individual has attained tertiary education. Looking at the Odds-Ratio the results should be interpreted as follow the likelihood of an individual being an emigrant when it has secondary school is 1.7 times higher, while being a highly educated person increases the likelihood of being an emigrant by 4 times.

Regarding, the demographic characteristics of the emigrants, Males are around 14% more likely to be emigrants.

The variable Age represents what a country might fear the most. The younger group (15-24 years old) has a higher chance of being an emigrant, and the group age of the active population (25 to 64 years old) has lower odds of being an emigrant around 59% less (this result might be skewed since it is a very wide group).

According to this logistic regression, European emigrants (considering the sample analysed) are more likely to be males, young and have acquired higher education. The LR Test shows that the variables in the model show significance compared to the null model.

These results seem to be aligned with the expected profile of emigrants.

The following subsections present the results of the multinomial logistic regressions for Portugal and the other European countries.

1. Portugal

The Portuguese population presented in this sample (Table 4) is the least educated, approximately 80% (77,9%) have obtained only basic education (ISCOED 0/1/2). There is also a significant difference between the citizens living in Portugal and abroad. In Table 7 it shows that around 34,4% of the Portuguese Emigrants have the lowest level of education. The discrepancy between the two values is significantly big. This can be justified by the fact that only in 2009 it was imposed that underage citizens had to complete secondary school (ISCED 3/4). This policy might have had an effect that will be observed in the long run but not yet in this data frame, which is set in 2010.

Since the Portuguese population was so low educated a simple logistic regression model did not seem appropriate, since there is the chance to model with the different categories of education. A multinomial logistic regression can still observe the likelihood of being educated but specific to each level of higher education. As mentioned before the sample obtained from DIOC does not represent the actual stock of emigrants, the chosen model has been weighted with the actual proportion of Portuguese emigrants in 2010, in this case, the weight of being emigrant is 0.1904.

Table 10 - Portuguese Multinomial Logistic Regression

Education	Intercept	Emigrant	25-64 years	+65 years	Female
2 – Medium	- 1.053***	1.829***	- 0.700***	- 1.872***	0.128***
Odds-Ratio	0.349	6.225	0.496	0.154	1.137
std	*0.017*	*0.018*	*0.018*	*0.024*	*0.015*
3 – High	- 2.493***	2.087***	0.460***	- 0.617***	0.347***
Odds-Ratio	0.083	8.058	1.584	0.539	1.414
std	*0.026*	*0.019*	*0.025*	*0.029*	*0.017*

***: p-value < 0.01

The results show that compared to basic education (ISCED 0/1/2), there is a higher likelihood of an emigrant holding both medium and high education. Compared to nationals, emigrants are approximately 6 times more likely to have attained secondary school and 8 times more likely to have attained higher education, *ceteris paribus*.

A female individual also represents a higher odd of holding an upper level of education, compared to a man.

Age can be a tricky variable to observe since there is a possibility individuals might still be attaining higher levels of education, and individuals who belong to the younger bracket might still be studying. Individuals that are between 25 and 64 years old have 2 times higher odds of holding a tertiary education compared to the younger generation.

Individuals over 65 are more likely to have basic education.

These results do not seem surprising, observing the statistics overall position of the country, but they also show the problems a nation might have if these results do not change in the long run.

2. European Comparison

The comparison across countries show significant differences between nationalities and holding higher levels of education.

1. Italy:

The Italian emigrant stock was 4,61% in 2010. The following table presents the multinomial logistic model results weighted.

Table 11 - Italian Multinomial Logistic Regression

Education	Intercept	Emigrant	25-64 years	+65 years	Female
2 – Medium	-0.230 ***	0.677***	0.241***	- 1.530***	-0.015**
Odds-Ratio	0.795	1.967	1.273	0.216	0.985
std	*0.009*	*0.016*	*0.009*	*0.010*	*0.006*
3 – High	- 2.604***	1.793***	1.547***	- 0.406***	0.137***
Odds-Ratio	0.074	6.008	4.698	0.667	1.147
std	*0.019*	*0.018*	*0.019*	*0.021*	*0.009*

**: p-value <0.05; ***: p-value < 0.01

The results show similarities to the Portuguese population and show high odds for those who are emigrants to have medium and higher, approximately 2 and 6 times more likely, *ceteris paribus*. Males have a higher chance of holding a secondary education.

2. France:

The following table represents the results from the multinomial logistic regression of the French sample, and the emigration data was weighted by 0.0321.

Table 12 - French Multinomial Logistic Regression

Education	Intercept	Emigrant	25-64 years	+65 years	Female
2 – Medium	0.087***	0.053**	0.633***	- 0.708***	-0.258***
Odds-Ratio	1.091	1.055	1.883	0.492	0.772
std	*0.010*	*0.023*	*0.010*	*0.011*	*0.008*
3 – High	- 1.122***	0.639***	1.358***	- 0.625***	- 0.045***
Odds-Ratio	0.326	1.895	3.889	0.535	0.956
std	*0.013*	*0.025*	*0.014*	*0.016*	*0.009*

**: p-value <0.05; ***: p-value < 0.01

Male French individuals are more likely to hold both Medium and High Education compared to Females, *ceteris paribus*. Regarding higher education there is a positive relation with being an emigrant, an emigrant is approximately 1.9 more likely to hold tertiary education.

3. *Denmark:*

The Danish emigrant data was weighted with a proportion of 0.0448.

Table 13 - Danish Multinomial Logistic Regression

Education	Intercept	Emigrant	25-64 years	+65 years	Female
2 – Medium	- 0.814 ***	0.466 ***	1.721 ***	0.771 ***	- 0.287 ***
Odds-Ratio	0.443	1.594	5.588	2.161	0.751
std	*0.022*	*0.050*	*0.024*	*0.026*	*0.019*
3 – High	- 3.141 ***	0.922 ***	3.749 ***	2.261 ***	0.053 **
Odds-Ratio	0.043	2.516	42.467	9.588	1.054
std	*0.051*	*0.055*	*0.052*	*0.054*	*0.022*

**: p-value <0.05; ***: p-value < 0.01

The model for Denmark shows interesting results, namely in the third group of age (over 65), where for both medium and high education there is a positive relation between being older and being more likely to have a higher form of education compared to the youngest group.

In the gender category, females are more prone to hold tertiary education, contrary to medium education where males seem to have a higher expectancy.

More importantly, being an emigrant still reveals approximately 2 times higher odds of being highly educated.

4. *Greece:*

The data on Greece's emigration was weighted with the actual proportion of emigration stock in the year 2010, which was 7,75%.

Table 14 - Greek Multinomial Logistic Regression

Education	Intercept	Emigrant	25-64 years	+65 years	Female
2 – Medium	0.041 ***	0.580 ***	- 0.096 ***	- 1.738 ***	0.068 ***
Odds-Ratio	1.042	1.785	0.908	0.176	1.070
std	*0.015*	*0.022*	*0.016*	*0.017*	*0.011*
3 – High	- 1.910 ***	1.284 ***	1.397 ***	- 0.476 ***	- 0.032 **
Odds-Ratio	0.148	3.613	4.043	0.621	0.968
std	*0.027*	*0.024*	*0.027*	*0.030*	*0.013*

**: p-value <0.05; ***: p-value < 0.01

As already predicted by the logistic regression there is a positive relation between being an emigrant and holding a higher level of education, and the Greek population show analogous results. Being an emigrant makes the individual more likely to hold a higher level of education, specifically an emigrant is 3 times more likely to attain tertiary education.

Females are more likely to have medium-level education.

Regarding age, for both levels of education, the eldest show they hold a negative relation meaning by being over 65 they are less likely to have a higher level of education in comparison to basic level.

5. *Ireland:*

Ireland has not only the most educated population but has also the second highest stock of emigrants 18,26%, in 2010.

Table 15 - Irish Multinomial Logistic Regression

Education	Intercept	Emigrant	25-64 years	+65 years	Female
2 – Medium	- 0.269 ***	0.656 ***	0.468 ***	- 0.947 ***	0.221 ***
Odds-Ratio	0.764	1.928	1.597	0.388	1.247
std	*0.013*	*0.017*	*0.014*	*0.017*	*0.011*
3 – High	-1.405 ***	1.059 ***	1.459 ***	- 0.274 ***	0.385 ***
Odds-Ratio	0.245	2.884	4.303	0.760	1.470
std	*0.018*	*0.017*	*0.018*	*0.021*	*0.012*

***: p-value < 0.01

Irish females have a higher likelihood of being more educated, *ceteris paribus*. As observed in other nationalities older individuals still hold a lower chance of being highly educated. Once again, an emigrant has a higher odd of having higher education specifically 2.88 times more likely.

6. *Romania:*

Table 16 - Romanian Multinomial Logistic Regression

Education	Intercept	Emigrant	25-64 years	+65 years	Female
2 – Medium	0.114 ***	0.033**	0.766 ***	- 0.472 ***	- 0.387 ***
Odds-Ratio	1.121	1.033	2.150	0.624	0.679
std	*0.012*	*0.014*	*0.013*	*0.014*	*0.009*
3 – High	- 1.975 ***	1.709 ***	1.257 ***	-0.078***	- 0.304 ***
Odds-Ratio	0.134	5.521	3.516	0.925	0.738
std	*0.021*	*0.016*	*0.020*	*0.023*	*0.013*

**: p-value <0.05; ***: p-value < 0.01

Romanian men are more likely to hold higher levels of education, more specifically around 30% higher, in comparison to females.

Emigrants show a relative higher chance of being highly educated, specifically 5 times higher.

3. Portugal vs. Europe[3]

The results above show that being an emigrant shows a higher likelihood of having higher levels of education, which is expected considering the first logistic regression. The difference relies on the odds depending on nationality.

A Portuguese emigrant is 8 times more likely to be highly educated (compared to the Portuguese citizens in the country), an Italian emigrant shows the second highest likelihood, 6 times more likely of holding tertiary education. Finally, the Romanian citizens complete the podium, the emigrant status gets a 5.52 times higher likelihood of the individuals holding an education rated ISCED 5/6.

These high values show that being an emigrant is highly associated with holding higher levels of education. Assuming that the individuals that are living abroad are more likely to be more educated than the ones living in the country might also mean they are more likely to contribute to the development of another country, rather than the one they were born in, it signals that the country might not be attending to the needs of the more educated.

Portuguese and Irish populations are the only ones where females are more likely to obtain both Medium and High Education. Romanians are the ones where men are more likely to hold higher forms of education, the difference is considerably high, around 30%. Gender disparity enhances signs of inequality in the country.

There was only one country in the sample where being over 65 years old represents a higher likelihood of holding higher levels of education, the country is Denmark. The pictures get portrayed differently when being older decreases the odds of having higher education. In Portugal being young still represents a bigger likelihood of having a medium level of education

The landscape of education in Europe shows that those who are emigrants are more likely to hold higher levels of education, and the individuals who are in the active age bracket (25-64 years old) are also more likely to have achieved higher levels of Education.

[3] - All the multinomial logistic models have been tested with the Likelihood Ratio Test and show significance in the coefficients.

Portugal seems to show concerning levels of both emigration and education, among the selected sample it showed the highest proportion of emigrants, followed by the highest odd of those emigrants being highly educated.

Southern European countries do not display signs that could cause an apprehension as possibly expected, Greece shows among the sample a proportion of emigration around the mean (7,75%), and the odds of those individuals holding a higher level of education in the middle among the other 7 nationalities. Greece shows therefore a sign of having a slightly high emigration of highly qualified individuals, it is, however, not the most alarming scenario. Italy, even with high odds of the emigrants holding high levels of education, the fact that the emigration level was not that high suggest that Italians were not considering leaving the country behind; it still means that those who leave most likely hold a high level of education.

France shows one of the most interesting results, it has the lowest proportion of emigrants, and the lowest odd (compared to the other nationalities) of these emigrants being highly educated. Denmark shows similarities with France, presumably this emigration will not cause a large loss in the country.

Ireland shows interesting results. Irish emigration is the second highest among the selected countries, however, the odds that being an emigrant represents in holding higher education is around 2 times higher (among the other European countries this result is not high), representing that even with the high levels of emigration those who stay in the country probably still hold high levels of education.

Romanians seem to compete with the Portuguese status; Romania shows the third highest proportion of emigrants (among the 7 countries here represented) and holds the third highest odd of an emigrant having attained tertiary education.

Among these results, Portugal in 2010 showed signs of suffering from a concerning phenomenon of brain drain, the only other country (among the selected sample) that could hold a comparison was Romania.

VI. Final Remarks

Migration of the human population is part of the DNA of Humanity. A country should try to create the best environment possible in order not to lose the human capital that could bring improvement to the country, especially countries that are in economic distress. The consequences of losing such highly qualified individuals might be bigger than taking actions and measures to prevent this from happening since economic positive consequences of the brain drain are mostly observed in the migrants and not in the country since they profit from increasing earning, (Gibson & McKenzie, 2012).

A highly educated individual represents endless possibilities for the country they reside in. In this paper it was measured the likelihood of an emigrant having higher education, the analysis was set in 2010. This study differs from the initially expected proposal due to missing information in the public available dataset. Emigrant data lacks crucial information for an interesting brain drain analysis: the date of emigration preventing from making any type of conclusions on emigration decisions. Other limitation found was the absence of data common in both datasets. Missing more recent data, it transforms the study not as relevant as it could be, however having a study done in 2010 creates a reference for following possible research studies.

The results found are, to say the least, unsettling and represent a very distressed nationality. Being a Portuguese emigrant increases the likelihood of having tertiary education by 8 times (compared to nationals). In aggregation with the highest rate of emigration (among the selected countries), highly educated Portuguese individuals seem to be outside of Portugal. In comparison with the other European countries, Portugal was in the worst position, most likely followed by Romania.

To understand how the representation has changed over the years, it would be necessary an updated version of the data for recent observations. A proposed study would be to include further characteristics of the individuals, such as labour force status and monthly income. Another branch from this study interesting to analyse would be, by accessing fully to the EU-LFS, understand the characteristics of both the emigrants and the immigrants of the country.

This study does not provide any information on the push factor that has brought Portugal to get these results nor the consequences that might arise from this migration. According to the literature on the topic, an underqualified labour force is negatively

reflected in the economy, so if the results from this paper represent brain drain, this will affect the country.

Portugal and the other countries in this study have been severely affected by the 2008 financial crisis; however, none of them shows the same levels of emigration rate or the odds of the emigrants being more qualified than the nationals. Even if this level of emigration could be explained by the country's economic status, it does not seem reflected in the other countries, at least not in the same proportion.

The Brain Drain effect is not only observed in magnitude but in intensity (the proportion of highly educated people remaining in the source countries) (Mountford & Rapoport, 2011), the analysis has showed that being an emigrant shows higher odds of being highly educated compared to the national residents, therefore the intensity of this phenomenon seems relevant to be paid attention to.

Policymakers need to evaluate the push factors and the consequences of such emigration, if this study is done with up-to-date data and shows similar results, then the country should indeed pay more focus on this subject.

Brain Drain can become Brain Circulation when the appropriate measures are carried out, transforming possible future research gaps about the beneficial impact of Brain Circulation, with no further need to investigate the negative consequences of the Brain Drain.

VII. Bibliography

Abarcar, P., & Theoharides, C. (2024, January). MEDICAL WORKER MIGRATION AND ORIGIN-COUNTRY HUMAN CAPITAL: EVIDENCE FROM U.S. VISA POLICY. *The Review of Economics and Statistics, 106*(1), 20–35.

Arrow, K. J. (1973). Higher education as a filter. *Journal of Public Economics, 2*, 193-216.

Beine, M., Docquier, F., & Rapoport, H. (2001). Brain drain and economic growth: theory and evidence. *Journal of Development Economics, 64*, 275–289.

Bhagwati, J., & Hamada, K. (1974). The brain drain, international integration of markets for professionals and unemployment: A theoretical analysis. *Journal of Development Economics, 1*(1), 19-42.

Bills, B. D. (2003). Credentials, Signals, and Screens: Explaining the Relationship between Schooling and Job Assignment. *Review of Educational Research, 73*(4), 441-469.

Brunello, G., Garibaldi, P., & Wasmer, E. (2007). *Education and Training in Europe* (Vol. 1). Oxford: Oxford Academic.

Bussolo, M., Martínez Peria, M. S., Calderón, C., Mascaró, Y., Nielsen, M. E., Acosta, P., . . . Guadamillas, M. (2008). *Remittances and Development Lessons from Latin America.* IDB Publications.

Caetano, E. (2024, Jan. 12). *Quase um em cada três jovens nascidos em Portugal vivem fora do país. 2013 foi o ano com mais saídas*. From Observador: https://observador.pt/2024/01/12/quase-um-em-cada-tres-jovens-nascidos-em-portugal-vivem-fora-do-pais-2013-foi-o-ano-com-mais-saidas/

Cairns, D., Cuzzocrea, V., Briggs, D., & Veloso, L. (2017). *The Consequences of Mobility.* Palgrave Macmillan.

Carrilho, P., & Perista, H. (2016, Feb. 15). *Portugal: High and rising emigration in a context of high, but decreasing, unemployment.* From Eurofound: https://www.eurofound.europa.eu/en/resources/article/2016/portugal-high-and-rising-emigration-context-high-decreasing-unemployment

Cerdeira, L., Machado-Taylor, M., Cabrito, B., Patrocínio, T., Brites, R., Gomes, R., . . . Ganga, R. (2016). Brain drain and the disenchantment of being a higher education student in Portugal. *Journal of Higher Education Policy and Management, 38*(1), 68-77.

Contini, B. (2012). Youth employment in europe: do institutions and social capital explain better than mainstream economics? *The European Journal of Comparative Economics, 9*(2), 247-277.

Cordeiro, A., & Alcoforado, L. (2018). Education and development: Contributions to the changes of democratic Portugal. *Méditerranée*.

Diebolt, C., & El Murr, B. (2004). A COBWEB MODEL OF HIGHER EDUCATION AND LABOUR MARKET DYNAMICS. *Brussels Economic Review, 47*, 409-430.

EUROSTAT. (2024). *Labour Force Survey*. From Eurostat: https://ec.europa.eu/eurostat/web/microdata/public-microdata/labour-force-survey

EUROSTAT. (n.d.). *Population by educational attainment level, sex and age (%) - main indicators*. From EUROSTAT: https://doi.org/10.2908/EDAT_LFSE_03

Galor, O., & Moav, O. (2000). Ability-Biased Technological Transition, Wage Inequality, and Economic Growth. *The Quarterly Journal of Economics, 115*(2), 469-497.

Gibson, J., & McKenzie, D. (2011). Eight Questions about Brain Drain. *Journal of Economic Perspectives, 25*(3), 107-128.

Gibson, J., & McKenzie, D. (2012, May). The Economic Consequences of "Brain Drain" of the Best and Brightest: Microeconomic Evidence from Five Countries. *The Economic Journal, 122*(560), 339–375.

Gomes, R. M., Lopes, J. T., Cerdeira, L., Vaz, H., Peixoto, P., Cabrito, B., . . . Silva, J. P. (2018). Asymmetric Mobility and Emigration of Highly Skilled Workers in Europe: The Portuguese case. *Studia Migracyjne – Przegląd Polonijny, 3*(169), 143–164.

Halvorsen, K. (2016). *Economic, Financial, and Political Crisis and Well-Being in the PIGS-Countries.* SAGE Open.

International Migrant Stock. (2024). From United Nations | Population Division: https://www.un.org/development/desa/pd/content/international-migrant-stock

Kim, T. (2017). Academic mobility, transnational identity capital, and stratification under conditions of academic capitalism. *High Educ, 73*, 981-997.

King, R., & Ruiz-Gelices, E. (2003). International Student Migration and the European `Year Abroad': Effects on European Identity and Subsequent Migration Behaviour. *INTERNATIONAL JOURNAL OF POPULATION GEOGRAPHY, 9*, 229-252.

Kone, Z. L., & Özden, Ç. (2017, March). Brain Drain, Gain, and Circulation. *KNOMAD*.

Lains, P. (2003, Dec.). Portugal's Growth Paradox, 1870-1950.

Machin, S., & McNally, S. (2007). *Tertiary Education Systems and Labour Markets.* Education and Training Policy Division | OECD.

Madruga, P., Raimundo, A., Cardoso, J., Escária, V., Varanda, M., & Ferreira, V. (2014). Employability and Higher Education in Portugal. *Journal of Graduate Employability*, 17-31.

Matheson, G., & Tomiwa, O. (2022, Sep.). The Human Development Index: Examining Impact on Human Flight and Brain Drain.

Milo, S., Lattanzi, R., Casadio, F., Crosta, N., Raviglione, M., Ricci, P., & Scano, F. (2012). *Brain Drain, Brain Exchange and Brain Circulation. The case of Italy viewed from a global perspective.* Aspen Institute Italia.

Montanari, M., Pinelli, D., & Torre, R. (2015, June). From tertiary education to work in Italy: a difficult transition. *ECFIN Country Focus, 12*(5).

Monti, P., & Pellizzari, M. (2016). *Skill Mismatch and Labour Shortages in the Italian Labour Market.* Innocenzo Gasparini Institute for Economic Research.

Mountford, A., & Rapoport, H. (2011). The brain drain and the world distribution of income. *Journal of Development Economics, 95*, 4–17.

OECD. (2024). *Database on Immigrants in OECD and non-OECD Countries: DIOC* . From OECD: Database on Immigrants in OECD and non-OECD Countries: DIOC

OECD/European Union. (2014). *Matching Economic Migration with Labour Market Needs.* OECD Publishing.

Pompei, F., & Selezneva, E. (2021). Unemployment and education mismatch in the EU before and after the financial crisis. *Journal of Policy Modeling, 43*, 448-473.

Pordata. (2024). *Resident Population*. From Pordata: https://www.pordata.pt/en/europe/resident+population+total++nationals+and+foreigners-3807

Pordata. (2024). *Resident population aged between 16 and 89: total and by highest level of educational qualifications obtained*. From Pordata: https://www.pordata.pt/en/portugal/resident+population+aged+between+16+and+89+total+and+by+highest+level+of+educational+qualifications+obtained-2101

Pordata. (2024). *Students enrolled in higher education: total and by level of education*. From Pordata: https://www.pordata.pt/en/portugal/students+enrolled+in+higher+education+total+and+by+level+of+education-1023

Rodrigues, M., Suleman, F., Guimarães, R., Pereira, M., Pacheco, M., & Araújo, M. (2022). *Livro Branco | Mais e melhores empregos para os jovens.* Lisboa : Fundação José Neves.

Romer, P. M. (1986, Oct.). Increasing Returns and Long-Run Growth. *Journal of Political Economy, 94*(5), 1002- 1037.

Rössel, J., Schenk, P., & Pap, I. (2024). Patterns of remittances of intra-European migrants:social relations and moral obligations. *JOURNAL OF ETHNIC AND MIGRATION STUDIES, 50*(10), 2529–2550.

Solow, R. M. (1957, Aug.). Technical Change and the Aggregate Production Function. *The Review of Economics and Statistics, 39*(3), 312-320.

Stark, O., Helmensteinc, C., & Prskawetz, A. (1997). A brain gain with a brain drain. *Economics Letters, 55*, 227-234.

Verwiebe, R., Wiesböck, L., & Teitzer, R. (2014, May). New Forms of Intra-European Migration, Labour Market Dynamics and Social Inequality in Europe. *Migration Letters, 11*(2), 125 – 136.

VIII. Appendix

Table 17 - Countries of Residence

Code	Country	Code	Country
ALB	Albania	LUX	Luxembourg
ARG	Argentina	LVA	Latvia
AUS	Australia	MEX	Mexico
AUT	Austria	MLI	Mali
BEL	Belgium	MLT	Malta
BGR	Bulgaria	MOZ	Mozambique
BRA	Brazil	MUS	Mauritius
BWA	Botswana	MWI	Malawi
CAN	Canada	MYS	Malaysia
CHE	Switzerland	NAM	Namibia
CHL	Chile	NER	Niger
CMR	Cameroon	NLD	Netherlands
COL	Colombia	NOR	Norway
CRI	Costa Rica	NZL	New Zealand
CYP	Cyprus	PAN	Panama
CZE	Czech Republic	PER	Peru
DEU	Germany	POL	Poland
DNK	Denmark	PRI	Puerto Rico
DOM	Dominican Republic	PRT	Portugal
ECU	Ecuador	PRY	Paraguay
EGY	Egypt	ROU	Romania
ESP	Spain	RUS	Russia
EST	Estonia	RWA	Rwanda
FIN	Finland	SLV	El Salvador
FRA	France	SVK	Slovak Republic
FYUG-HRV	Croatia	SVN	Slovenia
FYUG-YUG	Serbia and Montenegro	SWE	Sweden
GBR	United Kingdom	SYC	Seychelles
GRC	Greece	TGO	Togo
HUN	Hungary	THA	Thailand
IRL	Ireland	TTO	Trinidad and Tobago
ISL	Iceland	TUR	Turkey
ISR	Israel	URY	Uruguay
ITA	Italy	USA	United States
JPN	Japan	USSR-ARM	Armenia
KEN	Kenya	USSR-BLR	Belarus
KHM	Cambodia	ZAF	South Africa
LTU	Lithuania		