Migration - a Phenomenon Generating Imbalances in the Labor Market

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Abstract: *This paper deals with the phenomenon of domestic and international migration, from the perspective of identifying the generating countries and, respectively, the recipient countries of this phenomenon.*

Migration is a multidimensional process that includes a variety of areas, with the main goal of increasing the quality of life. The decision to migrate is based on several components: economic, social, demographic, etc. Based on these things, countries are divided into two groups: countries of origin and countries of destination.

The methods of multivariate analysis, discriminant analysis and logistic regression, included in the analysis the Number of immigrants, the Number of emigrants as well as other socio-economic indicators relevant to the migration phenomenon. Following the analysis, the countries of the European Union, included in the analysis, were divided into countries of origin and destination, and the results show that in Europe there is a trend of migration from underdeveloped countries to developed countries.

Keywords: *Migration, Labor market, Discriminant analysis, Logistic regression*

JEL Classification: *O15, R23 J1, C3*

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1. Introduction – Conceptual delimitations

Migration is one of the main imbalances in the labor market, having implications in several areas, while being closely related to other phenomena that cause social and economic imbalances. One of the main causes of the phenomenon of migration is the need to obtain higher incomes - a phenomenon with a strong economic motivation - in order to obtain better living and working conditions. It is obvious that as long as home conditions do not force individuals to migrate and the cumulation of the benefits of staying at home is higher compared to the benefits of migration, they decide not to migrate.

Because migration is a complex multidimensional phenomenon, defined as "the mass movement of tribes or populations from one territory to another, determined by economic, social, political or natural factors"[1], statistical modeling and analysis involves the inclusion of several fields and disciplines of science: economics, statistics, geography, demography, sociology. If from the perspective of human capital mobility, migration "is a sui generis form of human capital mobility, which gives increased chances to adaptability and socio-human flexibility, in accordance with the rapidly changing conditions of the knowledge-based information society" (Vasile & Zaman, 2005, p. 23), it can be defined as "the movement of a person or group of persons from one geographical unit to another across an administrative or political frontier, and who wishes to settle permanently or temporarily in a place, other than the place of origin "(Roman & Voica, 2010, p. 51). On the other hand, "Migration or the migratory movement is, practically, the process through which the movement of people and labor is achieved. It could be saying it's the hard core of the latter and that, over time, in terms of content, scope, forms of manifestation, has suffered the most significant displacements" (Vasile & Zaman, 2005, p 101).

From the perspective of the age pyramid, in order to be able to balance the balance between young people and the elderly, an essential role is played by the demographic component, sometimes requiring migration. Without such intervention, the population of that area would become aging, with the risk of the pension system collapsing imminently. Although migration should be a very clear and very well-defined phenomenon, in reality this happens very rarely because migration has many forms, the way in which migration is viewed differs from the perception of each individual.

Migration can be temporary - if the migrant chooses to leave the home for a certain period of time (for studies, for a job for a certain period, etc.) or permanently - if the migrant leaves the home for an indefinite period.

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[1] https://dexonline.ro/definitie/migratie

Another classification of migration divides this phenomenon into legal migration and illegal migration. In the paper "Labor migration and sustainable development of Romania", Vasile and Zaman (2006) defined legal migrants, persons with "short, medium and long term residence, who meet the legal requirements for entry, stay and employment in the country of destination must be integrated in the respective communities, to enjoy the same socio-economic and legal rights as the other citizens of the country, according to the national legislations". In the same paper, illegal immigrants (undocumented or irregular) represent those persons "who do not meet the requirements established by the legislation of the country of destination regarding the entry, stay or development of an economic activity" (Vasile & Zaman, 2005, pp. 67-69). On the other hand, the same authors highlighted the existence of an interdependence between the phenomenon of migration and sustainable development, emphasizing that "internal and external labor migration is both an explanatory factor of sustainable development and an effect or result thereof, based on the natural desire of individuals to increase their income and improve their quality of life, by changing jobs, beyond the boundaries of their current residence, which, as a consequence, could contribute to GDP growth and sustainable development "(Vasile & Zaman, 2005, pp. 82-83). At the same time, "the search for a better job through migration has become, in the market economy, a quasi-permanent concern of individuals, who feel the need to regularly update their information related to possible migration destinations" (Vasile & Zaman, 2005, pp. 36).

According to Stankeviciene (2012), quoted by Ramirez, migration is one of the most analyzed indicators in the economy, being closely related to the unemployment rate, between these two indicators there is an inverse correlation (Mihi-Ramírez, et al., 2013, p.429).

Throughout life, people can keep their home - they decide not to migrate. Young people who leave their hometown to complete their studies do not fall into this category, this category includes only people who do not leave their hometown for good. Another class represent it is individuals who change their home at least once in their lifetime - either to continue their studies or to work. These movements can be inside the country and then the phenomenon of internal migration takes place or outside the borders, resulting in the phenomenon of international migration.

Migration is one of the most important and complex socio-economic phenomena. Thus, according to Etzo (Enzo, 2008, p. 2), a preliminary classification is thus necessary and is based on three distinct aspects:

- The first aspect refers to the spatial context of migration flows and distinguishes between studies on international migration and domestic migration. Studies on

international migration focus on the movement/displacement of individuals to different countries, while internal migration involves the relocation of individuals within a country;

- The second aspect involves migration modeling, a key between microeconomic and macroeconomic approaches;
- The third aspect concerns the determinants of migration or the exploration of the consequences of migration.

As the two types of migration are very likely to intertwine, the integrated / parallel analysis of the two phenomena is indicated. In Europe, thanks to the creation of the European Union, people have the freedom to move to any member country, which makes the difference between domestic migration and international migration seem less important. This phenomenon was also analyzed by J. Bijak who states that accession to the European Union has increased international migration to the detriment of internal migration (Bijak, 2006, p. 5). At the same time, according to Willekens (1994), quoted by Bijak, theories of international migration do not differ substantially from theories of internal migration, on the one hand due to the reasons stated above and on the other hand due to globalization and the integration of processes in Europe - the creation of the European Union (Bijak, 2006, p. 16).

It should be noted that current theories ignore forced migration and migration based on political factors, crucial factors in terms of the actual size of the observed population flow (Bijak, 2006, p. 16). Practically we can consider the process of emigration "leaving the country of origin in order to settle in another country, so, according to the current definition, with the definitive change of domicile. The emigration is final, it has a permanent character, being associated, as a rule, later, with the receipt of the citizenship of the country of adoption and, implicitly, with the observance of the specific legal regulations" (Vasile & Zaman, 2005, p. 102).

As long as the decision to migrate is based on the desire to have a better life, this phenomenon is considered a natural one. According to Cattaneo, quoted by Ramirez, migrating to places where the chances of having a much higher net income and the probability of finding a job are higher is a natural phenomenon (Mihi-Ramírez, et al., 2013, pp. 427). If Vasile and Zaman (2005, p. 103) considered immigration to be “the process of permanent entry and establishment in the territory of a country other than that of origin or previous adoption”, in this case it is a matter of temporary change or, as the case may be, Mihi-Ramirez and co-workers (2013, p. 427) completed this definition, emphasizing that immigration can be seen as an opportunity, can have positive effects for people who do not have enough chances / opportunities in their country, with in order to find a job, to have access to better working conditions and a higher standard of

living in the country of destination, a country of destination that could benefit from immigrants, if they resemble those socio-economic and demographic characteristics of the host country. Suitable to the same study, it was concluded that emigration and immigration are constantly increasing, showing a different behavior in terms of imbalances in the evolution of unemployment and income. These phenomena act over time as PUSH and PULL factors (Mihi-Ramírez, et al., 2013, p. 436).

Since 1990, due to the increase in international travel, policy makers have paid increasing attention to migration issues, as well as expectations that migration can support the economic development of countries of origin have increased (Dumont, et al., 2010, p. 8). This can be interpreted in two ways (not being mutually exclusive): destination countries that are OECD members apply much more selective policies to immigrants from poor countries or the second way of interpretation focuses on the costs of prohibitive (from the point of view of the cost of emigration from a poor country) so that only educated people manage to survive the migration process (Dumont, et al., 2010, p. 33).

The factors that determine the phenomenon of internal migration include a multitude of influences from the economic, social, geographical sphere, manifesting both at the microeconomic level and at the macroeconomic level. The migrant will face a series of difficulties, but also a series of chances, advantages following the decision to migrate and the sum of the advantages of the decision-making act is expected to exceed the sum of the difficulties encountered. Each individual is different, therefore the decision of an individual or a family to migrate can be considered by different factors. Individuals may have different demands, react differently to change, adapt differently, therefore, migration incentives depend on a number of factors such as level of education, religion, social values.

The main trigger for the decision to migrate (internal or external) is economic in nature. Apart from the strictly economic determinant related to income level and career success, pleasant living conditions or amenities, a complex notion with multiple integrated components specific to sustainable development, have become a generating factor not only of demographic growth, but also of immigration. (Vasile & Zaman, 2005, p. 27).

Certainly, the infrastructure of a city or a country, security, education are other factors that explain internal or external migration. It can be said that public services play a rather important role in making the decision to migrate in addition to the above-mentioned factors. If migrant individuals have children or intend to have children, education is a factor behind the decision to migrate.

An important aspect worth mentioning is the difference between mobility and migration. We can consider mobility included in the migration act, while mobility does not

necessarily imply migration: “mobility represents exchanges of domicile (home address) without meaning change of city or country, while migration involves moving to another locality, passing over a territorial delimitation” (Vasile & Zaman, 2005, p. 35).

Another factor that plays an important role in the decision to migrate or not is age - as individuals get older, the decision to migrate decreases, the level of adaptation decreases, the inclination to risk also decreases. University centers located in large cities favor internal migration. After young people complete their university studies, most are looking for a job in the same city. Few return to their hometowns. Another possibility is that after completing their studies, young people go abroad (external migration). In this case we are dealing with a cascade-type migration - first the phenomenon of internal migration is present, being followed by that of external migration.

Another aspect related to internal migration is commuting. This phenomenon usually manifests itself around major cities. The meaning of this phenomenon is from rural to urban areas. This will lead to agglomeration and overcrowding in large cities and can have both advantages and disadvantages. Big cities are real socio-economic centers, which contribute greatly to the development of the country, leading to improved quality of life. At the same time, large metropolises can easily become the target of terrorist attacks, drug trafficking, fraud, crime, etc. The meaning of moving individuals in the case of internal migration can also be from urban areas to rural areas. As rural areas develop, they become attractive to individuals in urban areas, with agriculture becoming a growing focus in recent years.

There are cases where those who migrate within a country do not adapt or aspire to more, where labor demand and supply do not tend to balance. In these cases, individuals resort to external migration. "International population migration has existed at all times, at significant quantitative and qualitative levels, due to the influence of a complex of objective and subjective factors that currently directly interfere with the components of the process of globalization and globalization" (Vasile & Zaman, 2005, p. 39). One of the factors that has contributed to the promotion of external migration is the unprecedented development of technology. Internet access helps to find jobs - specialized jobs are posted on specialized sites in a very wide area, regardless of the level of education. Development of means of transport - the emergence of high-speed trains, air transport is another element in the field of technology that has contributed to promoting international migration.

The main purpose of migration is to increase the quality of life, this phenomenon encompassing a multitude of factors: income level, safety, education, opportunities for professional development. However, individuals who decide to migrate are subject to risks of a social nature - integration into the new community, of an economic nature - too

high taxes, below-paid pay, a job for which individuals are overqualified but have to practice a profession that does not require higher education.

International migration entails a number of advantages but also disadvantages for both the country of origin and the country of destination. One of the main disadvantages for the country of origin is the loss of investments in education, in human capital. Immediately after completing their studies, more and more young people (the case of Romania) choose to work in another country. The migration of a very large number of people with higher education is called brain drain, and the presence of this phenomenon leads to a decrease in the number of people with higher education and an increase in the share of people with primary and secondary education. This phenomenon can lead, on the one hand, to very large disturbances and imbalances on the labor market, and on the other hand, if the migration of people with higher education is temporary, this can have multiple advantages as the experience gained abroad can be used on return to the country of origin. "The losses caused by the emigration of highly skilled labor are appreciable, at least in the short and medium term; In reality, there is the so-called self-selective migration, according to which the best prepared and with the greatest entrepreneurial spirit, scientific creativity and innovation emigrate as a rule" (Vasile & Zaman, 2005, p. 44). In addition to the adverse effects due to international migration, there are a number of benefits, advantages for the country of origin. Most people who work in another country financially support families in the country - in this way the standard of living increases, the level of poverty decreases, the level of investment increases. Because most emigrants have higher incomes compared to those in the country, this phenomenon can be an incentive for those who remain in the country - to increase their level of training in the hope of a higher gain, to become more competitive.

Another advantage for the country of origin may be the reduction of the unemployment rate given that those who went to another country were unemployed in the country of origin.

The migration of the unemployed also leads to an adjustment of the budget and social spending. Immigrants have a number of advantages and disadvantages in terms of destination country, "the entry of migrants into the labor market is a factor influencing the distribution of income, in sense of reducing the income of resident (native) occupants who are competing with newcomers and the use of cheaper foreign labor by employers (employers)" (Vasile & Zaman, 2005, p. 41). According to Beine, Docquier, Rapoport (2003), quoted by Vasile and Zaman, when the share of brain migration exceeds 20% of the total number in a country or represents about 5% of the country's population, the negative impact on the country of origin is very large (Vasile & Zaman, 2005, p. 41).

Another disadvantage in terms of the destination country is represented the possible increase in the unemployment rate, but also the reduction of income. This may be due to the fact that immigrants contribute to the increase in labor supply leading to a new balance between supply and demand, and therefore to a reduction in income. In general, the level of immigrants' salaries is lower compared to that of the natives. There are cases where certain countries promote policies to attract foreign population in order to stabilize the balance between labor demand and supply. An example in this sense could be Germany - it is known that many Romanians, and not only, emigrated to Germany, they are doctors by profession.

Temporary migration is a positive aspect for both the country of origin and the country of destination. For the country of origin, we mention the following advantages: it reduces the unemployment rate, people return to the country with experience, increased development and possible financing due to the gain obtained abroad. Regarding the country of destination, temporary immigrants cover very specific needs for a certain period of time (this phenomenon also includes seasonal migration - the need for employees is for a well-defined period, a relatively short period). If immigrants have a high qualification and higher education, temporary migration can only bring benefits to the country of destination. There are cases when immigrants are more productive, giving a higher yield in the country of destination than in the country of origin, this being due to better infrastructure and technology.

The meaning of the migration phenomenon for highly qualified people is from developing countries to developed countries and benefits the countries of destination and disadvantages the countries of origin. Countries of origin could only benefit if migrants return to the country.

The change in the unique, cultural structure, sometimes even political within the destination country, as a result of the migration phenomenon, is a neutral effect.

In recent years, in the literature the emphasis has been on the phenomenon of international migration. International migration is seen by most scientists as more important than domestic migration in terms of its implications. Domestic policies, geopolitics, migration priorities and policies, as well as opportunities are seen as generating for the attention paid to international migration to the detriment of domestic migration (King & Conti, 2013, p. 4).

Most studies create the impression that the two types of migration are completely different processes. In some scenarios, this impression is real, but in other situations the same individuals or members of a family may be involved in both migration processes, at an aggregate level between the two types of migration processes there are functional links. If we are dealing with both types of migration, the logical process would be the

following: domestic migration is followed by international migration. This phenomenon is framed in the spatial logic of step / cascade migration - where migrants progressively move to urban areas and then migrate outside the country (King & Conti, 2013, p. 6). Another aspect worth analyzing is the fact that in the migration process the phenomenon of displacement or the phenomenon of replacing the locals can take place. Immigrants take the place of locals at work, at homes or locals move anyway, and immigrants take advantage of these trips (King & Conti, 2013, p. 8). Either immigrants have access to jobs that locals refuse - in this way both sides have something to gain, or immigrants compete for the same jobs as locals. This aspect differs from country to country, more precisely from individual to individual, depending on the level of training of each.

With regard to domestic migration and international migration, one aspect worth analyzing is the return of migrants. If they return to a place other than the one from which they emigrated, then the net migration effect occur, in this sense proving evidence that those who migrate from rural areas outside the country, when they return, settle in urban areas. (King & Conti, 2013, p. 9). If we study the phenomenon of migration at household level, we can consider that we are dealing with both types of migration. Some family members migrate abroad, while other members migrate inside the country. An example in this sense could be: parents migrate abroad, and children migrate to urban areas to continue their studies - high school or college.

Over time, there have been countries that have transformed from countries where the number of emigrants is higher than that of immigrants to countries where the number of immigrants is clearly higher than the number of emigrants. One such country is Italy (Del Boca & Venturini, 2003, p. 1), in which, at present, most immigrants are Romanian, Albanian, Moroccan, Chinese (2010).

The phenomenon of migration also includes an emotional cost, a cost that is too high for some people (King & Conti, 2013, p. 35), attachment to family, friends, the city where you live is a good incentive not to migrate. The decision to migrate is based on a multitude of factors, and is not only based on the precarious conditions in the country of origin or the clearly favorable conditions in the country of destination. Which means that, in addition to the determining factor - the economic one, the decision to migrate is influenced by other factors of a social, political, ethical nature, etc.

Age plays an important role in the migration process, the younger the individuals, the higher the migration rate, because older people are less open to change, adopt the new much harder and are less flexible.

The family is another decision factor in the migration process. If individuals are single, unmarried, they are willing to leave their country of origin much easier, they are willing to

risk more. It turned out that men migrate in a much larger number compared to women, and in the case of families (with or without children) it turned out that most of the time women are the ones who follow men - they migrate, following that after a period time for women to migrate as well. If migrant families leave their children in the care of grandparents or other relatives, the latter may develop complex social problems such as: school dropout, juvenile delinquency, exclusion from society, lack of adequate development due to the absence of both parents during child development etc.

Friends are another factor that can influence the decision to migrate and / or the choice of destination country, if individuals who decide to migrate have acquaintances / friends or relatives in the destination country, they will adapt and integrate much more easily.

The known foreign language is another factor that contributes to the decision to establish the destination country. Individuals choose as their destination country the country where the official language is English (or the country where English is sufficient to be able to handle it), the country with a language close to the native language (Dutch is related to German, Romanian to Italian etc.) or the country whose language can be easily learned (for Romanian citizens - Spanish, Italian). Basically, knowing the official language of the destination country, individuals can adapt much more easily, they can have much more chances to enter the labor market - most of the time not knowing the official language is a major disadvantage, considerably diminishing the chance to be equal. those already established and who speak the language of the destination country.

The cost of migration is another important factor in the decision to choose the country of destination. The cost of migration does not only involve the cost of moving from the country of origin to the country of destination, but all costs - transport costs, rental / housing costs, public transport costs, tuition costs (if migrants have children), product cost food, the cost of services, the cost of health insurance.

The decision to migrate is also influenced by the expectations that individuals have in the destination country - expectations of a financial nature, of advancement in the profession.

Migration is based on push and pull factors. Push factors are the factors that cause individuals to migrate from the perspective of the country of origin, while the pull factors are the factors that cause individuals to migrate from the perspective of the destination country. Although it is said that labor mobility has a positive impact on the country of origin, as the duration of migration increases, the positive effects turn into negative effects (Vasile, 2014, p. 743).

Whether internal migration or international migration, decision-making takes place on the basis of a cost-benefit analysis. Sjaastad, quoted by Bijak, treats migration from a microeconomic (neoclassical) perspective as an investment in human capital, but also as a result of a cost-benefit analysis (Bijak, 2006, p. 11). Modeling migration as human behavior is therefore more of a complement than an alternative approach - rational people maximize their utility function, so the decision to migrate or not is made following a cost-benefit analysis. (Enzo, 2008, p. 3). At the same time, the micro theory of neoclassical economics focuses on potential individual factors that decide to migrate, considering the cost-benefit calculation that results in a net benefit generated by migration (Vasile & Zaman, 2005, p. 84). According to this theory, migration is influenced on the one hand by the social, technological dimension, but also by human capital.

"Push and pull" theory is determined by the factors of attraction of the destination country (*pull*) and by the factors that determine an individual to migrate (*push*). The dominance of particular factors determines to some extent the characteristics of population migration: favorable factors from the perspective of destination (*pull factors*) tend to attract migrants who are selected on the basis of motivation and human capital. On the other hand, *push* factors - unfavorable factors - also play an important role in intensifying the migration phenomenon (Bijak, 2006, p. 6). The absence of opportunities in the country of origin, at the same time as the expectations that individuals have regarding the country of destination are the push and *pull* factors. Higher wages in the destination country act as a *pull* factor (Kelo & Wächter, 2004, p. 22).

Like any economic terror, like any terror regarding the labor market, migration theory pursues the microeconomic perspective and the macroeconomic perspective. The microeconomic perspective focuses on migration seen as a unit - this being the individual or family in terms of the decision to migrate. On the other hand, the macroeconomic perspective focuses on migration in relation to the spatial context and the aggregate variables related to the model (Enzo, 2008, p. 1). According to Greenwood (2003), quoted by Etzo, the microeconomic model answers the question "Why do people migrate?", While the macroeconomic model answers the question "Where do migrants come from and where do they go?" (Enzo, 2008, p. 2).

According to Carrington (1996) and Bauer and Zimmermann (1995), cited by Etzo, a new discovery in the microeconomic approach is the dynamics of migration relations, which emphasize the idea that immigrants create networks in the destination countries, which leads to reduced migration costs for new immigrants, thus facilitating new migration flows. In essence, microeconomic theory emphasizes the role of heterogeneity of migrants, which is represented by the aspect of human capital, as well as the complexity underlying the decision-making process (Enzo, 2008, p. 4).

The dual theory of the labor market justifies the segmentation of the labor market - the local population migrates to more attractive professions, while immigrants to 3D jobs (dirty, dangerous and heavy). The division is intensified by the varied nature of occupations - attractive jobs are those in which capital predominates, while 3D jobs are those in which hard work is predominant, to the detriment of capital (Bijak, 2006, p. 10).

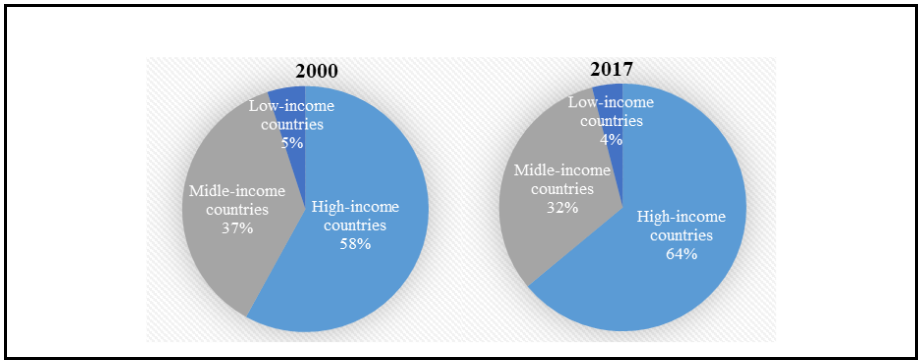
Geographical theories are based on elements of gravitational models. According to Bijak, this theory is similar to Newton's Law of Gravity, and assumes that the migration between two regions and the number of people in the country of origin and the number of people in the destination country are proportional, and the distance between the two regions is inversely proportional. 2006, p. 13).

2. The general framework

International migration, although considered an important factor in contemporary demographic dynamics, due to its volatility, remains the most unpredictable element of population change.

This is also highlighted in the International Migration Report 2017, by the fact that in an increasingly interconnected world, international migration has become a reality that affects almost all regions of the globe. In addition to the above, modern transportation has made it easier, cheaper, and faster for people to find jobs, opportunities, education, and quality of life (United Nations, 2017). Following the analysis of the global migration phenomenon for the period 2000-2017, in the same report, there is an increase in the number of migrants, reaching 258 million in 2017 compared to 173 million in 2000. In the analyzed period the evolution of the number of migrants had an upward trend. If in the period 2000-2005 an average growth rate of 2% was observed and in 2005-2010 this growth intensified, reaching approximately 2.9% per year, after 2010 the annual growth rate decreased to about 2.4%, reaching 2% in the period 2015-2017. It is noteworthy that 64% of the total international migrants in the world (165 million people) live in high-income countries, the difference of 36% (approximately 92 million migrants) live in middle- and low-income countries. Of these, 81 million lived in middle-income countries and 11 million in low-income countries. In Figure no. 1 we note in 2017, compared to 2000, that the share of international migrants living in high-income countries increased slightly, while the share of low- and middle-income countries decreased (United Nations, 2017).

Figure 1. Percentage of international migrants by income group, 2000, 2017



Source: United Nations (2017a), International Migration Report 2017: Highlights, p. 4 Note: For both charts, the classification of countries and areas by income level is based on 2016 gross national income (GNI) per capita, in U.S. dollars, calculated by the World Bank

On the other hand, the analysis of data by geographical regions provides additional information on current trends. In 2017, over 60% of international migrants from all over the world lived in Asia or Europe.

In Europe, the population forecast is difficult to achieve due to a lack of good quality migration data. The need for reliable methods of predicting migration is based on the fact that population forecasts are essential for making rational decisions in many areas, including the labor market, social security or spatial planning and organization. Thus, Jakub Bijak (2011), in his book, adopts a Bayesian statistical perspective for solving such problems, a natural way to combine previous subjective information with statistical data. At the same time, the Bayesian framework provides a natural way to further develop the migration forecasting process leading to the reduction of various uncertainties, and the results are analyzed from the point of view of the forecasted users - decision makers - in order to show the relevance and usefulness. methods presented in practical applications (Bijak, 2011).

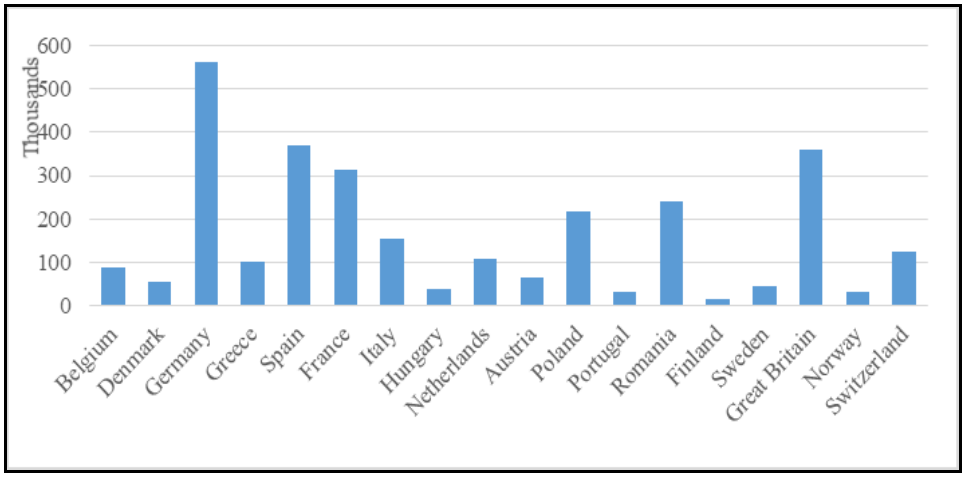
3. Methods, Variables and Data

3.1. Migration statistics

For the proposed analysis, it is necessary to include indicators that quantify the phenomenon of migration both from the perspective of the number of emigrants and from the perspective of the number of immigrants. In **Error! Reference source not found.** shows the number of emigrants from 2017 for a part of the European Union

countries. We note that Germany has the highest number of emigrants (560700 people), followed by Spain (368860 people) and the United Kingdom (359665 people). We note that Germany has the highest number of emigrants (560,700 people), followed by Spain (368860 people) and the United Kingdom (359665 people). Most people leaving Germany choose the US, Turkey and the UK as their destination. Emigrants from Spain migrate to France, Germany and Argentina, and emigrants from the United Kingdom migrate to countries such as Australia, the USA and Canada.

Figure 2. Emigrants (number of persons), 2017



Source: Eurostat(http://ec.europa.eu/eurostat, own processing

At the opposite pole are Finland (16973 people), Norway (31963 people) and Portugal (31753 people). The migrant population in Finland chooses Sweden, Germany and the United Kingdom as destinations. Those leaving Norway choose Sweden, USA and Spain as their destination, while those leaving Portugal choose France, Brazil and Germany as their destination.

Regarding the number of immigrants, the highest values are registered in Germany (917109 people), Great Britain (644209 people) and Spain (532132 people). Most immigrants from Germany are from Turkey, Italy and Poland. The UK has immigrants from India, Poland and Pakistan. Most of those who immigrate to Spain are from Romania, Morocco and Ecuador.

The lowest values are recorded in Portugal (36639 people), Finland (31797 people) and Norway (53351 people). Portugal hosts immigrants from Angola, France and Mozambique. In Finland most emigrants are from Sweden, Estonia and Russia, and in Norway from Sweden, Denmark and the USA.

The countries where the number of male emigrants is significantly higher compared to the number of female emigrants are Germany, Greece, Spain, France and the United Kingdom. In Belgium, Greece, Spain, Portugal, Italy, Hungary, the Netherlands, Finland and Sweden, the difference between the number of male emigrants and the number of female emigrants is decreasing in 2014 compared to 2010.

Finland is the only country included in the analysis for the number of female emigrants is higher compared to the number of male emigrants. For both countries this difference decreased in 2014 compared to 2010 (Annex 1, Figure no. 7).

Carrying out a similar analysis in terms of the number of immigrants, the following countries have a higher number of male immigrants than the number of female immigrants: Germany, Great Britain, Italy, Belgium, Greece (Annex 1, Figure no. 8).

Some of these countries had a more pronounced increase in the number of female immigrants compared to the number of male immigrants, these being: Austria, Norway and Denmark.

Although we note that, during the analyzed period, the share of migrant women has not changed significantly and even if most females migrate with the aim of finding a job or continuing their studies, they still face stronger discrimination compared to with male migrants. On the other hand, male migrants are also exposed to vulnerabilities in migration processes, leading to the conclusion that data on gender inequality in relation to migration have the potential to promote greater equality and provide opportunities for groups. disadvantaged (IOM's Global Migration Data Analysis Center (GMDAC), 2017). According to the Migration Data Portal, if globally there is a decrease in the share of migrant women - 47.9% in 2019 compared to 49.1% in 2000 - and an increase in the percentage of male migrants - 52.1.9% in 2019 compared to 50.7% in 2000 (UN Department of Economic and Social Affairs, 2019). On the other hand, according to the "ILO Global Estimates on International Migrant Workers" report, the labor market participation rate of female migrants is higher than that of women who do not migrate, while among men there is a small difference between the labor force participation rate of male migrants compared to non-migrant men. The same report states that although in 2017, the percentage of migrant workers was estimated at 58.4% among men and 41.6 percent for women, the participation rate of immigrant women was higher than that of immigrants. non-migrant women - 63.5% and 48.1%, respectively (ILO Labor Migration Branch & ILO Department of Statistics, 2018).

Regarding the situation in Spain, France and Portugal, both in 2014 and in 2017 the number of female immigrants is higher than the number of male immigrants. For Spain this difference is growing, while for Spain and Portugal the gap seems to be narrowing.

In the case of the analysis by age groups of emigrants (Alexa 1, Figure no. 9) and immigrants (annex 1, Figure no. 10), 15-29 years, 30-49 years and 50-64 years, the year 2014 is observed The lowest number of emigrants was registered in Romania where for the age group 50-64 there were only 519 people who emigrated. A small number of emigrants were also in Finland (1528 emigrants for the 50-64 age group), Denmark (2348 emigrants for the 50-64 age group) and Norway (2524 emigrants for the 50-64 age group). It is obvious that for the age group 30-49 years, the number of emigrants is higher compared to the other two age ranges.

The highest values reached were in France, where the number of emigrants for the age group 15-29 was 222827, Spain with 185613 emigrants for the age group 30-49 years and Germany with 137539 emigrants for the age group 30-49 years.

In 2017 the countries included in the analysis follow the same trend as in 2010, except for Romania, which no longer registers values as low for the age group 50-64 (in 2017 there were 1987 emigrants for the age group 50-64 years).

Regarding the number of immigrants by age groups, we find that Germany (353358 immigrants for the age group 15-29 years in 2014 and 353027 immigrants for the age group 15-29 years in 2017), Spain (183876 immigrants for the age group 15 -29 years in 2017 and 179230 immigrants for the age group 30-49 years in 2017), France (160948 immigrants for the age group 15-29 years in 2017) and Italy (147393 immigrants for the age group 15-29 years in 2017) recorded very high values.

At the opposite pole were countries such as Finland with 2337 immigrants for the 50-64 age group in 2014 and 1965 immigrants for the 50-64 age group in 2017, Portugal with 2267 immigrants for the 50-64 age group in 2014, Norway (2740 immigrants for the 50-64 age group in 2017).

Romania registers higher values in 2017 compared to 2014 for all three age ranges.

3.2. Discriminant analysis - results and discussions

Classification methods are *supervised* statistical analysis techniques and have as their main purpose the classification of a new observation based on known information and a target variable. Based on certain characteristics and the target variable, each observation in a data set (*training*) is classified. Based on the rules *learned*, any new observation can be classified.

Among the main statistical classification methods are: logistic regression, discriminant analysis, k-NN algorithm (k nearest neighbor), decision trees, naive bayes algorithm, Support Vector Machines (SVM) algorithm.

For a better view of the whole system, an a priori predictive method of market segmentation was used in the analysis: discriminant analysis.

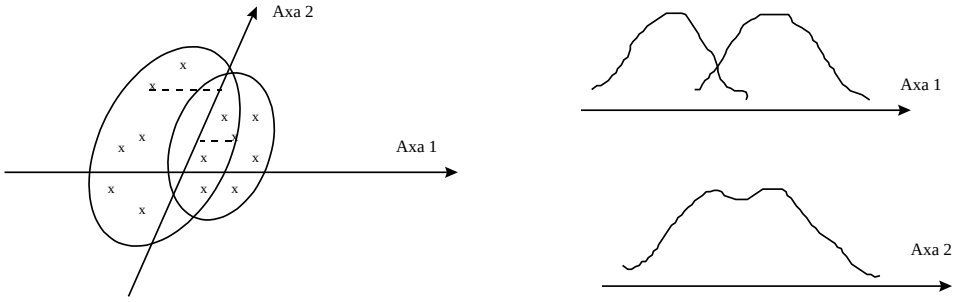
The purpose of discriminant methods (Boboc, 2007) involves estimating the relationship between a qualitative variable with k categories using p predictors, generally exogenous quantitative variables. Discriminant factor analysis (AFD) consists in looking for new variables, called discriminant variables, corresponding to the directions in R^p that best separate in observation the k groups of observations.

Next, we assume R^p endowed with the metric M, and the discriminant axis a is associated with the discriminant factor u so that $u = Ma$, where:

a – the discriminant axis and is the eigenvector of the matrix $M^{-1}V^{-1}BM$ associated with the largest eigenvalue;

u – the factor associated with the discriminant axis (Xu will be the discriminant variable). It is the eigenvector of the matrix $V^{-1}B$ associated with the eigen value λ_1: $V^{-1}Bu = \lambda_1 u$.

Figure 4. Representation of groups of observations on axes



Source: Boboc, 2007, p. 84

Thus, in Figure no. 4, it is observed that axis 1 has a good discriminating power while axis 2 does not allow the separation of the two groups of observations projected on it.

Discriminant factors and Xu discriminant variables are independent of the M metric.

We can choose $M = V^1$, so: $\begin{cases} BV^{-1}a = \lambda_1 a \\ V^{-1}Bu = \lambda_1 u \end{cases}$

Observation: $0 \leq \lambda_1 \leq 1$:

1. $\lambda_1 = 1$, then: $a'MBMa = a'MVMa$. In this case, the projections on the intraclass dispersions are zero. The k clouds are each in an orthogonal hyperplane on a. And if the centers of gravity are projected at different points it is perfect discrimination.

2. If $\lambda_1 = 0$, then: $a'MBMa = 0$. It is the case when the centers of gravity g_i are confused, and the best axis does not allow their separation. The clouds are concentric and no linear separation is possible. There is, however, a possibility of non-linear discrimination.

The eigenvalue λ is a pessimistic measure of the discrimination power of an axis.

In the general case where $n > p > k$ and where the variables are not linked by linear relations, the number of discriminant axes (number of eigenvalues other than zero) is equal to $k - 1$.

After obtaining the best representation of the n individuals in k classes, an attribution rule can be formulated. The general rule consists in calculating the distances of the observation e at the k centers of gravity of each class, and then at assigning the smallest distance. For this, the metric to be used must be defined.

In order to be able to perform the discriminant analysis for the following European countries: Belgium, Bulgaria, Denmark, Germany, Spain, France, Croatia, Italy, Latvia, Lithuania, Luxembourg, Hungary, Poland, Portugal, Romania, Slovenia, Sweden and Norway were selected indicators related to the migration process - factors that contribute to the decision to migrate or not: *Number of emigrants*, *Number of immigrants*, *GDP*, *Inflation rate*, *Mean and median income*, *People at risk of poverty or social exclusion*, *Population with higher education*. With the exception of the first two indicators, the rest of the indicators are predictive. The data were taken from the Eurostat website for 2014 and 2017, and the statistical tool used XLSTAT[1]. For a relevant analysis of the data and for the accuracy of the results, a first step was the standardization of the data.

[1] Addinsoft (2020). XLSTAT statistical and data analysis solution. New York, USA. https://www.xlstat.com

To obtain a categorical variable, using the *Number of emigrants* and the *Number of immigrants*, we calculated $Net\ migration\ rate = \frac{număr\ imigranți - număr\ emigranți}{1000}$ for the years 2014 and 2017.

It should be noted that in the period 2014-2017 the number of immigrants increased considerably in Spain, Portugal and Slovenia, which led to these countries being considered in 2017 as destination countries.

Table 1 – Classification of countries for the years 2014, 2017

Leaving country $Net\ migration < 0$		**Receiving country** $Net\ migration > 0$	
2014	**2017**	**2014**	**2017**
Bulgaria	Bulgaria	Belgium	Belgium
Spain	Croatia	Denmark	Denmark
Croatia	Latvia	Germany	Germany
Latvia	Lithuania	France	Spain
Lithuania	Poland	Italy	France
Poland	Romania	Luxembourg	Italy
Portugal		Hungary	Luxembourg
Romania		Sweden	Hungary
Slovenia		Norway	Portugal
			Slovenia
			Sweden
			Norway

Source: own processing

In Table no. 2 the values of the average for each indicator from the two categories make it possible to determine the most discriminating variables between groups. Thus, for the first group the highest value of the average is for the indicator *People at risk of poverty or social exclusion* (0.88), while for the second group the highest value of the average is for the indicator *Mean and median income* (0.47).

Table 2 – Means by class (2017)

Class \ Variable	GDP	Inflation Rate	Mean and median income	People at risk of poverty or social exclusion	Population by educational attachment level tertiary
leaving country	-0.534	0.213	-0.936	**0.885**	-0.687
receiving country	0.267	-0.107	**0.468**	-0.442	0.343

In 2017, compared to 2014, we notice an increase in the number of *People at risk of poverty or social exclusion* in their countries of origin and a decrease in *Mean and median income* - a fact also explained by the change in the flow of migrants.

Table 3 – Box test (Chi-square asymmetric approximation), (2014 vs. 2017)

-2Log(M)	42.095
Chi-square (Observed value)	28.063
Chi-square (Critical value)	24.996
Df	15
p-value	0.021
Alpha	0.05

Interpretation test:
H0: The within-class covariance arrays are equal.
Ha: The within-class covariance matrix es different.
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

-2Log(M)	71.012
Chi-square (Observed value)	42.177
Chi-square (Critical value)	24.996
Df	15
p-value	0.000
Alpha	0.05

Interpretation test:
H0: The within-class covariance arrays are equal.
Ha: The within-class covariance matrix es different.
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

Testing the validity of a discriminant analysis is performed using the *Box Test*, *correlation*, and *Wilks 'Lambda Test*.

The Box test is used to test the equality hypothesis for intra-class covariance matrices. Two approximations are available, one based on the Chi2 distribution and the other on the Fisher distribution. The results of both tests are displayed. In the *Box Test*, observed in Table no. 3 and Table no. 4, the value of M must be as high as possible, and the significance of the *F Test* must tend to 0.

Table 4 – Box test (Fisher's F asymptomatic approximation), (2014 vs. 2017)

-2Log(M)	42.095
F (Observed value)	1.830
F (Critical value)	1.676
DF1	15
DF2	1031
p-value	0.027
Alpha	0.05

Interpretation test:
H0: The within-class covariance arrays are equal.
Ha: The within-class covariance matrix es different.
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

-2Log(M)	71.012
F (Observed value)	2.636
F (Critical value)	1.691
DF1	15
DF2	404
p-value	0.001
Alpha	0.05

Interpretation test:
H0: The within-class covariance arrays are equal.
Ha: The within-class covariance matrix es different.
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

The results of the two tests presented above confirm that we must reject the alternative hypothesis that the covariance matrices are equal between groups.

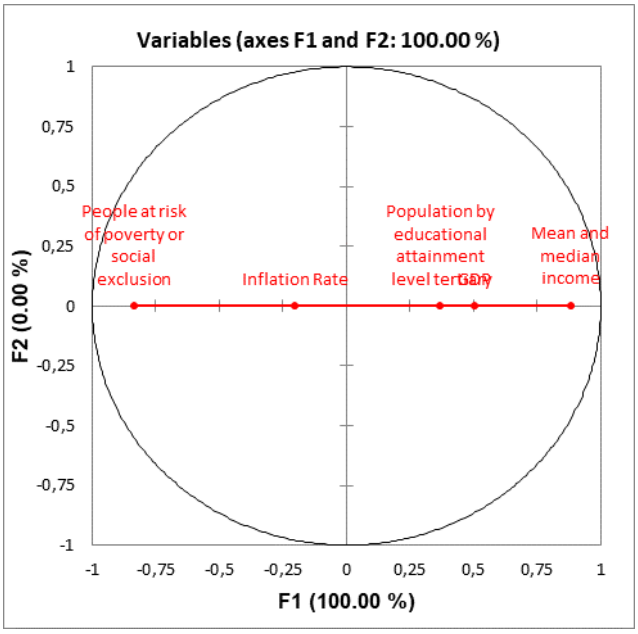
The *Wilks' Lambda* and *F Tests* presented in Table no. 5 helps to identify statistically significant indicators included in the analysis. Thus, analyzing the values of the *Wilks' Lambda* and *F Tests* and how $p - value < 0.05$, the *Mean and median income* and *People at risk of poverty or social exclusion* are statistically significant values. These indicators can be included in subsequent analyzes.

Table 5 – One-dimensional test of equality of the means of the classes 2017

Variable	Lambda	F	DF1	DF2	p-value
GDP	0.849	2.842	1	16	0.111
Inflation Rate	0.976	0.394	1	16	0.539
Mean and median income	0.536	13.839	1	16	**0.002**
People at risk of poverty or social exclusion	0.585	11.329	1	16	**0.004**
Population by educational attachment level tertiary	0.918	1.430	1	16	0.249

The general correlation is evaluated in Annex 2 - Table *Eigenvalues and Canonical correlations* (**Table no. 13**), in which the obtained functions are presented. For 2017, in the analysis, we have only one factor, and this will be those with a value of 0.771 for *Canonical Correlation*. The closer the value of the factor is to 1, the better the model is considered. At the same time, it is observed that 100% of the variation is represented by the first factor, which is confirmed in the following graph:

Figure 5. Correlation of the initial variables with the two factors



Source: own processing

The *Standardized Canonical Discriminant Function Coefficients* table indicates the values for the discriminant function:

$$0{,}27 \cdot (\text{GDP}) + 0{,}2 \cdot (\text{Inflation rate}) + 0{,}88 \cdot (\text{Mean and median income}) -$$

$$-0{,}58 \cdot (\text{People at risk of poverty or social exclusion}) + 0{,}61 \cdot (\text{Population tertiary})$$

Table 6 – Standardized Canonical Discriminating Function Coefficients

	F1
GDP	0.271
Inflation Rate	0.195
Mean and median income	0.884
People at risk of poverty or social exclusion	-0.579
Population by educational attachment level tertiary	-0.606

In order to analyze the clarity of the representation, it is necessary to ensure that the discriminant function classifies the analyzed countries well into subgroups. To do this,

we analyze the results presented in **Table no. 7**, which contains the percentages in the model for each group as a result of the prediction. For *leaving country* we have 83.33% chance that a leaving country will be of the same type after the analysis, and for *receiving country* we have 91.67% chances for a receiving country to be of the same type after the analysis. We can conclude that the highest percentage of correct classification is for *receiving country*. Basically, the analysis of 88.89% of correctly classified cases from the original group and 77.78% of correctly validated cross-classified cases.

Table 7 – Confusion matrix for the training sample and the cross-validation results

from \ to	leaving country	receiving country	Total	% correct
leaving country	5	1	6	83.33%
receiving country	1	11	12	91.67%
Total	6	12	18	88.89%

from \ to	leaving country	receiving country	Total	% correct
leaving country	4	2	6	66.67%
receiving country	2	10	12	83.33%
Total	6	12	18	77.78%

In **Table no. 15** Prior and posterior classification, membership probabilities, scores and squared distances (2014 vs. 2017) presented in Annex 2, for each observation are represented the scores of factors (coordinates of observations in the new space), the probability of belonging to each group and the distances of Mahalanobis squares compared to the group's centroid. In this sense, that each observation is included in the group for which the probability of belonging is highest. In 2014, the only country to change its group following the analysis was Hungary. It was initially classified as *receiving country*, and based on the indicators included in the analysis was classified as *leaving country*, with a probability of being included in the first category of 97.5% and a probability of being included in the second category of 2.5%. If in 2014 only one country was reclassified, in 2017 we notice that Spain and Poland were reclassified. As the validity of the data used cannot be questioned, for further analyzes it will be necessary to include in the analysis other criteria that may contribute to the setting of a type of category: origin / destination.

In the case of our country, we can say that Romania is part of the leaving country category, with the probability of being part of the *leaving country* category 94.60% and a probability of being part of the *receiving country* category 5.40%.

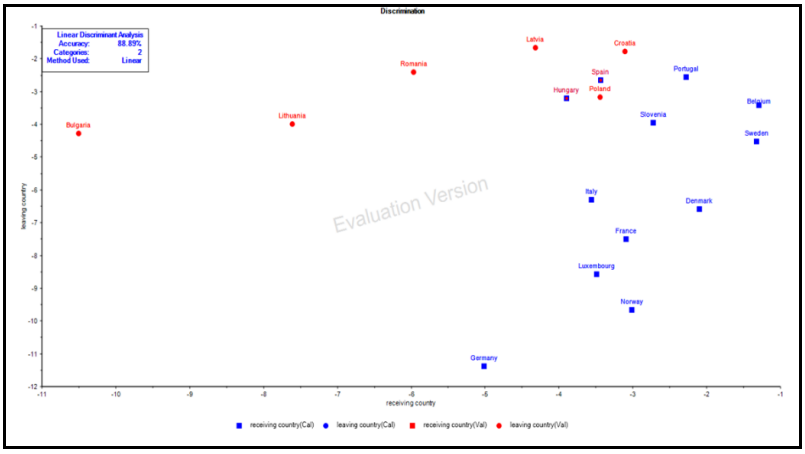
As a general note, it can be stated that the analysis performed was correct, due to the fact that almost all countries had an initial classification identical to the final classification, with the exception of Hungary.

Note that after calculating the predictions for cross-validation, to identify what would be the prediction for a given observation if it is left out of the estimation sample, we notice other countries that are identified as misclassified: Spain, for 2014, and for 2017, Hungary and Croatia.

Because the dependent variable is an alternative, the results obtained from the analysis with XLSTAT also return the ROC curve, which displays the performance of the model and allows comparison with other models. The terms used come from the signal detection theory. The proportion of well-classified positive events is called *Sensitivity*, and the proportion of well-classified negative events is *Specificity*.

According to the literature, *Area under the curve* (or AUC) is a synthetic index calculated for ROC curves. The AUC corresponds to the probability that a positive event has a higher probability given to it by the model than a negative event. A model is usually considered good when the AUC value is greater than 0.7. In this case, both the model for 2014 ($AUC = 0.926$) and the one for 2017 ($AUC = 0.972$) can be considered well discriminated models.

Figure 6. **Linear Discriminant Analysis (2017)**



Source: own computations, processing with Unscrambler 11 by Camo Analytics

In conclusion, migration is a multidimensional process that includes a variety of areas, with the main goal of increasing the quality of life. The decision to migrate is based on several components: economic, social, demographic, etc. Based on these things, countries are divided into two groups: countries of origin and countries of destination.

Following the analysis performed (discriminant analysis) we classified some European countries only based on the indicator created *Net Migration Rate* as *input*, and as *output* we obtained a parallel classification based on indicators related to the migration process. For 2017, the countries for which the initial classification did not correspond to the final classification are Spain and Poland. For the rest of the countries, the two classifications correspond, which urges us to say that the analysis performed is correct.

3.3. Logistic regression - results and discussions

If the dependent variable is dichotomous, the discriminant analysis is similar to the logistic regression. If discriminant analysis is useful for the detailed study of covariance structures and for providing a graphical representation, logistic regression has the advantage of allowing the use of step selection methods, including for qualitative explanatory variables. The data processing was performed with XLSTAT, and the results of the analysis are presented in Annex 3 – Logistic Regression Data.

In the analysis we will mark with 0 *leaving country* and with 1 *receiving country*. The corresponding values of the coefficients R^2 (Cox and Snell) and R^2 (Nagelkerke), presented in the table *Goodness of fit statistics* - which represent measures equivalent to R^2in the linear regression - are close to 1 which indicates that the predictors explain a large percentage of the variation of the *Type country* variable. One of the most important values in this output is the Chi-square test, equivalent to the *F Test* (Fisher test). With this value it is evaluated if the variables bring significant information by comparing the model as defined with a simpler model, with a single constant. In this case, since the probability is 0.005 – for 2014 and 0.000 – for 2017, we can conclude that the information is significant.

The two regression equations resulting from the data analysis are:

2014 (1)

$$Pred(Type\ Country\ 2014) = 1\ /\ (1 + exp(-(-1.9293 + 3.5953E-07 * GDP - 0.3979 * Inflation\ Rate + 5.2638E-04 * Mean\ and\ median\ income + 9.7317E-02 * People\ at\ risk\ of\ poverty\ or\ social\ exclusion - 0.2991 * Population\ by\ educational\ attainment\ level\ tertiary)))$$

2017 (2)

$$Pred(Type\ Country) = 1 / (1 + exp(-(77.6636 + 2.2445E-05 * GDP + 37.9717 * Inflation\ Rate + 7.6376E-03 * Mean\ and\ median\ income - 2.4854 * People\ at\ risk\ of\ poverty\ or\ social\ exclusion - 6.1828 * Population\ by\ educational\ attainment\ level\ tertiary)))$$

The analysis confirms that logistic regression models are successfully applied to dichotomous variables with a binomial distribution and the probabilities for 0 and 1 are close to 50%; –50%, as can be seen from the analysis for 2014.

4. Conclusions

The labor market plays a central role in determining the course of the economy in any society. Therefore, it is essential to study the mechanisms underlying this market, as well as its dynamics.

The main imbalances in the labor market are unemployment and migration. Migration is one of the most important and complex socio-economic phenomena, being among the main imbalances in the labor market, having implications in several areas, being also closely related to other phenomena causing imbalances in the labor market. Thus, as a future study, it is necessary to introduce in the analyzes performed non-economic indicators that influence the migration phenomenon.

At the same time, the use of the previous rules leads to incorrect assignments when the dispersions of the groups are very different from each other because then the use of the same metric for different groups cannot be justified. The problem of optimizing a geometric decision rule cannot be solved without reference to a probabilistic model. Indeed, the problem is to know how this rule behaves for new observations, which requires the construction of distributional hypotheses on the distribution in the space of new observations. Here the limits of the descriptive methods used in this analysis are reached.

For the study of migration, discriminant analysis was used, resulting in a classification of some European countries only based on the indicator created *Net Migration Rate* as *input*, and as *output* a parallel classification was obtained based on indicators related to the migration process. The applied statistical method included in the analysis, in addition to the number of immigrants, the number of emigrants as well as other relevant socio-economic indicators. Following the analysis, the countries of the European Union (among those included in the analysis) were divided into countries of origin and destination. The countries for which the initial classification did not correspond to the final classification are Hungary (for the year 2014), respectively Spain and Poland (for the year 2017). For Romania and the rest of the countries, the two classifications correspond, which urges us to state that the analysis performed is valid.

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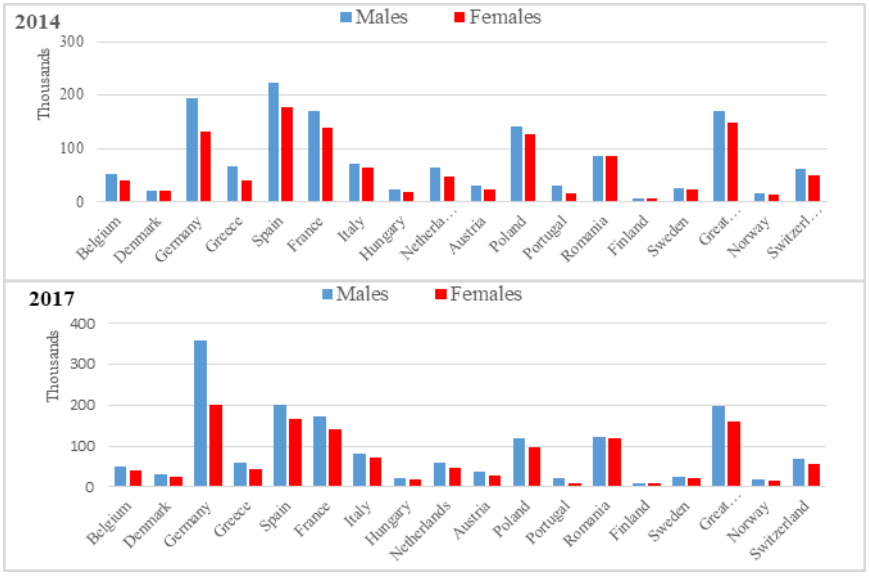
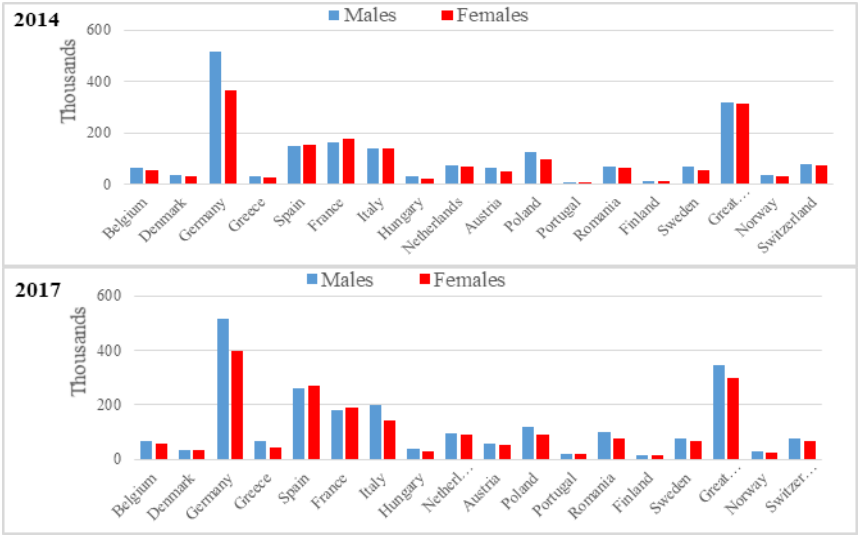
Annex 1

Figure 7. Emigrants men and women (number of persons), 2014 and 2017



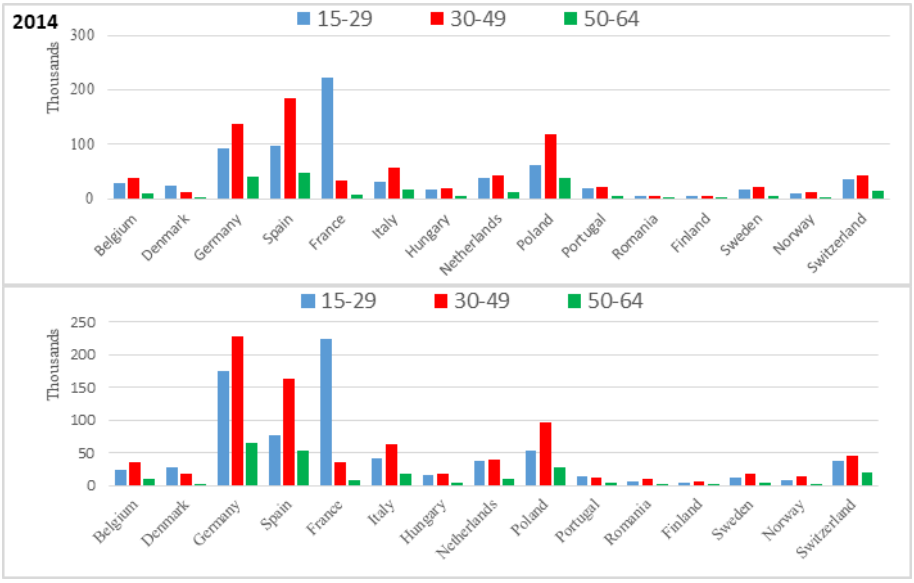
Source: Eurostat (http://ec.europa.eu/eurostat), own processing

Figure 8. Immigrants men and women (number of persons), 2014 and 2017



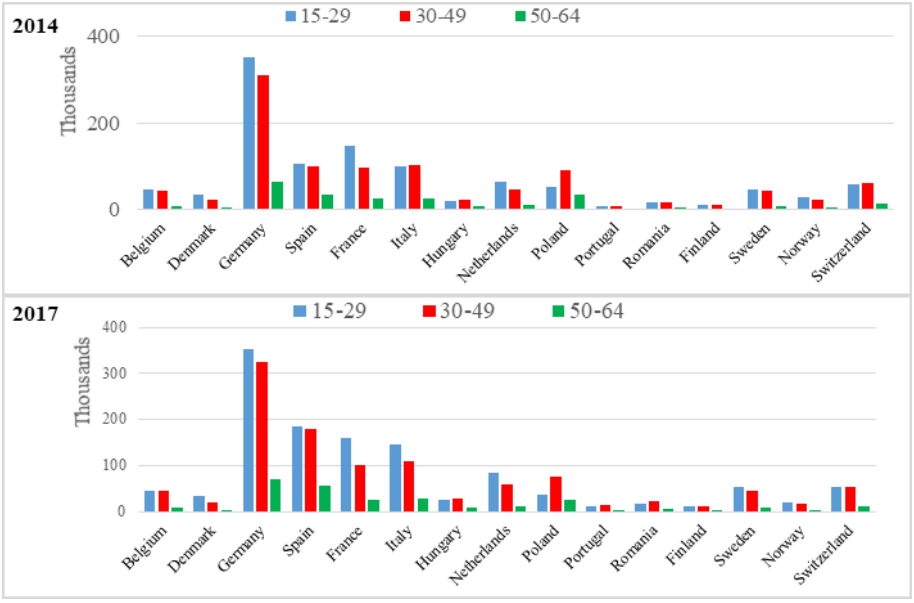
Source: Eurostat (http://ec.europa.eu/eurostat*), own processing*

Figure 9. Emigrants by age group (number of persons), 2014 and 2017



Source: Eurostat (http://ec.europa.eu/eurostat*) and INS (*http://www.insse.ro*),own processing*

Figure 10. Immigrants by age group (number of persons), 2014 and 2017



*Source: Eurostat (*http://ec.europa.eu/eurostat*)and INS (*http://www.insse.ro*),own processing*

Annex 2 – Data Discriminant analysis

Table 8 - Summary statistics 2014 vs 2017

Summary statistics:

Variable	Categories	Frequencies	%
Type Country 2014	leaving country	9	50.000
	receiving country	9	50.000

Variable	Categories	Frequencies	%
Type Country 2017	leaving country	6	33.333
	receiving country	12	66.667

Table 9 - Correlation matrix (2014 vs. 2017)

Variables (2014)	GDP	Inflation Rate	Mean and median income	People at risk of poverty or social exclusion	Population by educational attainment level tertiary
GDP	**1.000**	0.147	0.218	-0.278	-0.087
Inflation Rate	0.147	**1.000**	0.509	-0.452	0.203
Mean and median income	0.218	0.509	**1.000**	-0.832	0.700
People at risk of poverty or social exclusion	-0.278	-0.452	-0.832	**1.000**	-0.649
Population by educational attainment level tertiary	-0.087	0.203	0.700	-0.649	**1.000**

Variables (2017)	GDP	Inflation Rate	Mean and median income	People at risk of poverty or social exclusion	Population by educational attainment level tertiary
GDP	**1.000**	-0.252	0.242	-0.261	0.152
Inflation Rate	-0.252	**1.000**	-0.094	0.055	-0.327
Mean and median income	0.242	-0.094	**1.000**	-0.685	0.170
People at risk of poverty or social exclusion	-0.261	0.055	-0.685	**1.000**	0.056
Population by educational attainment level tertiary	0.152	-0.327	0.170	0.056	**1.000**

Table 10 - Summary statistics

Class \ Variable (2014)	GDP	Inflation Rate	Mean and median income	People at risk of poverty or social exclusion	Population by educational attainment level tertiary
leaving country	-0.426	-0.333	-0.719	0.603	-0.340
receiving country	0.426	0.333	0.719	-0.603	0.340

Table 11 - Multicolinearity statistics (2014 vs. 2017)

Statistic (2014)	GDP	Inflation Rate	Mean and median income	People at risk of poverty or social exclusion	Population by educational attainment level tertiary
Tolerance	0.781	0.682	0.226	0.275	0.391
VIF	1.281	1.465	4.420	3.639	2.559

Statistic (2017)	GDP	Inflation Rate	Mean and median income	People at risk of poverty or social exclusion	Population by educational attainment level tertiary
Tolerance	0.810	0.558	0.349	0.477	0.311
VIF	1.235	1.793	2.866	2.096	3.220

Table 12 - One-dimensional test of equality of the means of the classes (2014)

Variable	Lambda	F	DF1	DF2	p-value
GDP	0.808	3.800	1	16	0.069
Inflation Rate	0.882	2.135	1	16	0.163
Mean and median income	0.453	19.314	1	16	0.000
People at risk of poverty or social exclusion	0.615	10.014	1	16	0.006
Population by educational attainment level tertiary	0.878	2.226	1	16	0.155

Table 13 – Eigenvalues and Canonical correlations (2014 vs. 2017)

Eigenvalues:

	F1
Eigenvalue	1.917
Discrimination (%)	100.000
Cumulative %	100.000

Bartlett's test for eigenvalue significancy:

	F1
Eigenvalue	1.917
Bartlett's statistic	14.451
p-value	0.013

Canonical correlations:

F1
0.811

Eigenvalues:

	F1
Eigenvalue	1.469
Discrimination (%)	100.000
Cumulative %	100.000

Bartlett's test for eigenvalue significancy:

	F1
Eigenvalue	1.469
Bartlett's statistic	12.201
p-value	0.032

Canonical correlations:

F1
0.771

Table 14 - Classification functions (2014 vs. 2017)

(2014)	leaving country	receiving country
Intercept	-1.545	-1.545
GDP	-0.613	0.613
Inflation Rate	0.293	-0.293
Mean and median income	-2.444	2.444
People at risk of poverty or social exclusion	0.026	-0.026
Population by educational attainment level tertiary	0.682	-0.682

(2017)	leaving country	receiving country
Intercept	-2.404	-0.732
GDP	-0.461	0.230
Inflation Rate	-0.310	0.155
Mean and median income	-1.893	0.946
People at risk of poverty or social exclusion	1.186	-0.593
Population by educational attainment level tertiary	0.991	-0.496

Table 15 - Prior and posterior classification, membership probabilities, scores and squared distances (2014 vs. 2017)

Observation (2017)	Prior	Posterior	Pr(leaving country)	Pr(receiving country)	F1	D²(leaving country)	D²(receiving country)
Belgium	receiving country	receiving country	0.250	0.750	-0.421	5.075	2.876
Bulgaria	leaving country	leaving country	0.974	0.026	1.388	10.994	18.240
Denmark	receiving country	receiving country	0.016	0.984	-1.578	11.524	3.287
Germany	receiving country	receiving country	0.004	0.996	-2.127	19.335	8.230
Spain	leaving country	leaving country	0.673	0.327	0.277	6.264	7.712
France	receiving country	receiving country	0.019	0.981	-1.505	12.809	4.951
Croatia	leaving country	leaving country	0.963	0.037	1.252	2.994	9.531
Italy	receiving country	receiving country	0.018	0.982	-1.540	14.528	6.486
Latvia	leaving country	leaving country	0.995	0.005	2.044	4.193	14.866
Lithuania	leaving country	leaving country	0.997	0.003	2.253	5.242	17.008
Luxembourg	receiving country	receiving country	0.014	0.986	-1.624	13.611	5.134
Hungary	receiving country	**leaving country**	0.975	0.025	1.396	1.847	9.136
Poland	leaving country	leaving country	0.973	0.027	1.371	3.432	10.588
Portugal	leaving country	leaving country	0.851	0.149	0.668	4.086	7.573
Romania	*leaving country*	*leaving country*	*0.990*	*0.010*	*1.762*	*10.744*	*19.944*
Slovenia	leaving country	leaving country	0.871	0.129	0.733	5.310	9.134
Sweden	receiving country	receiving country	0.045	0.955	-1.173	8.718	2.596
Norway	receiving country	receiving country	0.000	1.000	-3.176	25.581	8.998

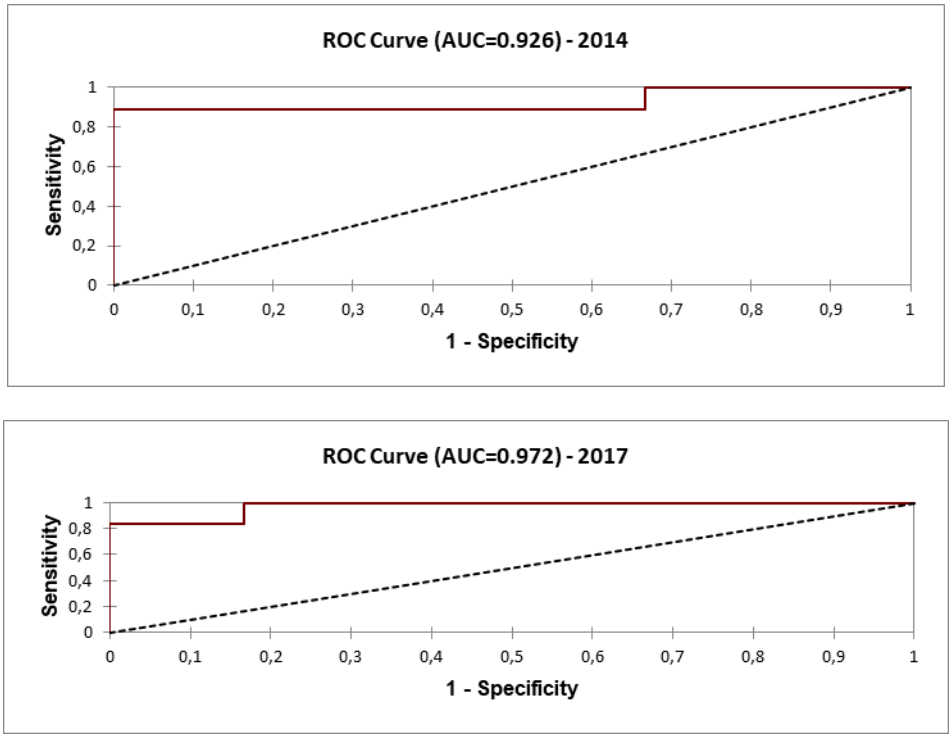
Observation (2017)	Prior	Posterior	Pr(leaving country)	Pr(receiving country)	F1	D²(leaving country)	D²(receiving country)
Belgium	receiving country	receiving country	0.056	0.944	0.473	7.643	2.004
Bulgaria	leaving country	leaving country	0.996	0.004	-2.970	9.378	20.431
Denmark	receiving country	receiving country	0.006	0.994	1.450	13.986	3.609
Germany	receiving country	receiving country	0.001	0.999	2.232	23.607	9.443
Spain	receiving country	**leaving country**	0.519	0.481	-0.722	6.137	6.293
France	receiving country	receiving country	0.006	0.994	1.421	15.830	5.598
Croatia	leaving country	leaving country	0.652	0.348	-0.949	4.377	5.635
Italy	receiving country	receiving country	0.031	0.969	0.731	13.427	6.541
Latvia	leaving country	leaving country	0.876	0.124	-1.498	4.135	8.050
Lithuania	leaving country	leaving country	0.949	0.051	-1.897	8.791	14.643
Luxembourg	receiving country	receiving country	0.003	0.997	1.699	17.979	6.396
Hungary	receiving country	receiving country	0.494	0.506	-0.680	7.255	7.204
Poland	leaving country	**receiving country**	0.393	0.607	-0.510	7.172	6.299
Portugal	receiving country	receiving country	0.270	0.730	-0.281	5.953	3.969
Romania	*leaving country*	*leaving country*	*0.946*	*0.054*	*-1.872*	*5.621*	*11.351*
Slovenia	receiving country	receiving country	0.127	0.873	0.107	8.732	4.869
Sweden	receiving country	receiving country	0.020	0.980	0.918	9.864	2.071
Norway	receiving country	receiving country	0.001	0.999	2.348	20.170	5.444

Table 16 - Cross-validation: Prior and posterior classification and membership probabilities (2014 vs. 2017)

Observation (2014)	Prior	Posterior	leaving country	receiving country
Belgium	receiving country	receiving country	0.317	0.683
Bulgaria	leaving country	leaving country	0.534	0.466
Denmark	receiving country	receiving country	0.024	0.976
Germany	receiving country	receiving country	0.003	0.997
Spain	leaving country	**receiving country**	0.232	0.768
France	receiving country	receiving country	0.037	0.963
Croatia	leaving country	leaving country	0.944	0.056
Italy	receiving country	receiving country	0.042	0.958
Latvia	leaving country	leaving country	0.994	0.006
Lithuania	leaving country	leaving country	0.998	0.002
Luxembourg	receiving country	receiving country	0.025	0.975
Hungary	receiving country	**leaving country**	1.000	0.000
Poland	leaving country	leaving country	0.956	0.044
Portugal	leaving country	leaving country	0.725	0.275
Romania	leaving country	leaving country	0.961	0.039
Slovenia	leaving country	leaving country	0.665	0.335
Sweden	receiving country	receiving country	0.064	0.936
Norway	receiving country	receiving country	0.000	1.000

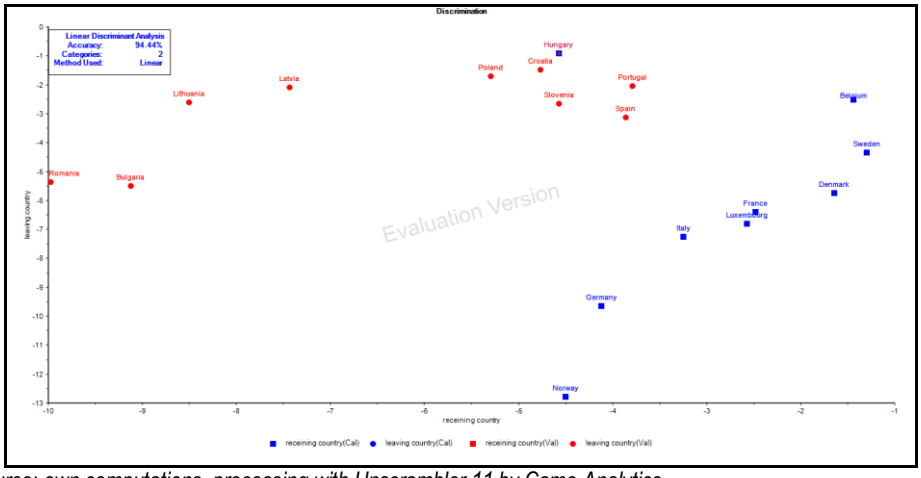
Observation (2017)	Prior	Posterior	leaving country	receiving country
Belgium	receiving country	receiving country	0.074	0.926
Bulgaria	leaving country	leaving country	0.998	0.002
Denmark	receiving country	receiving country	0.006	0.994
Germany	receiving country	receiving country	0.000	1.000
Spain	receiving country	**leaving country**	0.899	0.101
France	receiving country	receiving country	0.007	0.993
Croatia	leaving country	**receiving country**	0.456	0.544
Italy	receiving country	receiving country	0.089	0.911
Latvia	leaving country	leaving country	0.783	0.217
Lithuania	leaving country	leaving country	0.661	0.339
Luxembourg	receiving country	receiving country	0.002	0.998
Hungary	receiving country	**leaving country**	0.944	0.056
Poland	leaving country	**receiving country**	0.040	0.960
Portugal	receiving country	receiving country	0.445	0.555
Romania	leaving country	leaving country	0.871	0.129
Slovenia	receiving country	receiving country	0.295	0.705
Sweden	receiving country	receiving country	0.027	0.973
Norway	receiving country	receiving country	0.000	1.000

Figure 11. ROC Curve (2014 vs. 2017)



Source: own computations, processing with Unscrambler 11 by Camo Analytics

Figure 12. Linear Discriminating Analysis (2014)



Source: own computations, processing with Unscrambler 11 by Camo Analytics

Annex 3 – Logistic Regression Data

Table 17 - Goodness of fit statistics (Variable Type Country 2014;2017))

Statistic	Independent	Full
Observations	18	18
Sum of weights	18.000	18.000
DF	17	12
-2 Log(Likelihood)	24.953	8.341
R²(McFadden)	0.000	0.666
R²(Cox and Snell)	0.000	0.603
R²(Nagelkerke)	0.000	0.804
AIC	26.953	20.341
SBC	27.844	25.684
Iterations	0	14

Test of the null hypothesis H0: Y=0.500 (Variable Type Country 2014):

Statistic	DF	Chi-square	Pr > Chi²
-2 Log(Likelihood)	5	16.612	0.005
Score	5	11.829	0.037
Wald	5	3.988	0.551

Statistic	Independent	Full
Observations	18	18
Sum of weights	18.000	18.000
DF	17	12
-2 Log(Likelihood)	22.915	0.000
R²(McFadden)	0.000	1.000
R²(Cox and Snell)	0.000	0.720
R²(Nagelkerke)	0.000	1.000
AIC	24.915	12.000
SBC	25.805	17.342
Iterations	0	38

Test of the null hypothesis H0: Y=0.667 (Variable Type Country 2017):

Statistic	DF	Chi-square	Pr > Chi²
-2 Log(Likelihood)	5	22.915	0.000
Score	5	10.709	0.057
Wald	5	0.000	1.000

Table 18 - Type II analysis (Variable Type Country 2014;2017))

Source (2014)	DF	Chi-square (Wald)	Pr > Wald	Chi-square (LR)	Pr > LR
GDP	1	0.036	0.849	0.038	0.844
Inflation Rate	1	0.055	0.814	0.054	0.816
Mean and median income	1	1.786	0.181	4.803	0.028
People at risk of poverty or social exclusion	1	0.172	0.678	0.178	0.673
Population by educational attainment level tertiary	1	0.885	0.347	1.508	0.219

Source (2017)	DF	Chi-square (Wald)	Pr > Wald	Chi-square (LR)	Pr > LR
GDP	1	0.000	0.997	0.000	1.000
Inflation Rate	1	0.000	0.995	5.086	0.024
Mean and median income	1	0.000	0.993	360.437	< 0.0001
People at risk of poverty or social exclusion	1	0.000	0.997	0.000	
Population by educational attainment level tertiary	1	0.000	0.994	7.090	0.008

Table 19 - Hosmer-Lemeshow test (Variable Type Country 2014 vs. 2017)

Statistic	Chi-square	DF	Pr > Chi²
Hosmer-Lemeshow Statistic	5.093	7	0.649

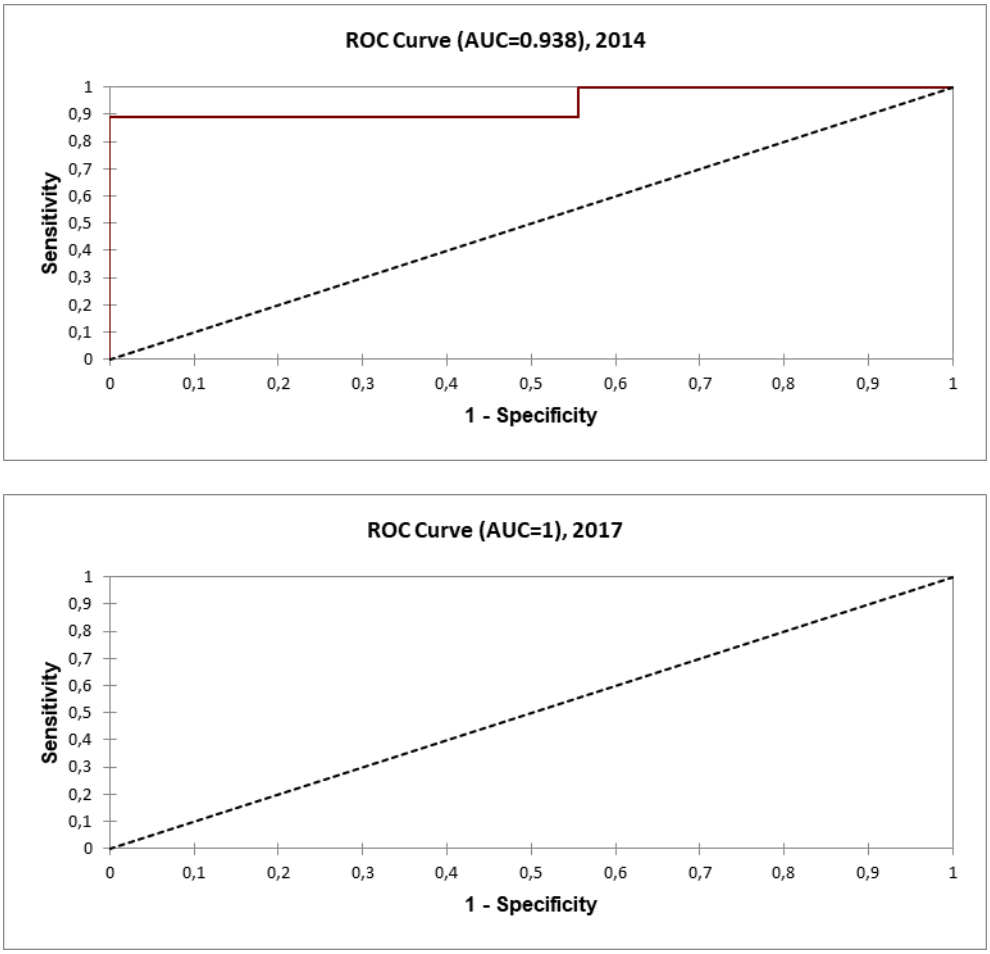
Statistic	Chi-square	DF	Pr > Chi²
Hosmer-Lemeshow Statistic	0.000	5	1.000

Table 20 - Classification table for the training sample (Variable Type Country 2014; 2017))

from \ to	leaving country	receiving country	Total	% correct
leaving country	9	0	9	100.00%
receiving country	1	8	9	88.89%
Total	10	8	18	94.44%

from \ to	leaving country	receiving country	Total	% correct
leaving country	6	0	6	100.00%
receiving country	0	12	12	100.00%
Total	6	12	18	100.00%

Figure 14. ROC Curve (2014 vs. 2017)



Source: own computations, processing with Unscrambler 11 by Camo Analytics