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**The relationship between country characteristics,
development levels and brain drain**

- A quantitative analysis -

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Abstract

Brain drain refers to the international migration of highly skilled people. It can affect countries of all development levels, but it is the brain drain from developing countries that has garnered the most attention. There are two purposes with this study, the first is to find the relationship between brain drain and unemployment, GNI per capita and political stability. The second purpose is to see if these relationships differ depending on a country's development level. Studying brain drain from countries of all development levels may bring more insights to the phenomenon that could help countries trying to mitigate their brain drain. The theory of push- and pull-factors state that different factors within a country work to either retain and attract people, or push people away. Whether or not a factor is working to push people or pull people depends on the level of the factor, and also the perception of it by different individuals. This study conducted linear, nonlinear and dummy variable regressions using data from 133 countries from 2015 and 2016. The measurement used for brain drain was a country's capacity to retain talent, and the independent variables used were unemployment, GNI per capita and political stability. The results showed that unemployment is negatively related to the capacity to retain talent while GNI per capita and political stability are positively related to the capacity to retain talent. These relationships differ depending on if a country is developing or is developed. Comparisons between countries regarding determinants of brain drain are possibly more significant if the countries are more homogenous than simply their development levels, further studies are thus needed in order for countries to know what they need to do to mitigate their brain drain.

Keywords: Brain drain, development levels, high-skilled migration, push- and pull-factors

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1 Introduction

1.1 Background

International migration has occurred for as long as people have existed. One form of international migration is “brain drain” which Docquier et. al. defines as the international migration of skilled and educated labor. Brain drain can affect both developing and developed countries, but it is generally the brain drain from developing countries that has garnered the most attention. The brain drain from developing countries is often viewed as a hinder to their economic development because skilled labor is a scarce resource in these countries (Docquier, Lohest, & Marfouk, 2007, p. 193). Todaro and Smith writes that brain drain resulted in more than a million highly educated people migrating from developing countries to Canada, the United Kingdom and the United States between the years of 1960 and 1990. This resulted in a lot of countries losing a great number of their human resources, with Sudan losing 30% of their engineers for example (Todaro & Smith, 2011, p. 75).

Even though the term “brain drain” mostly gives a negative tone, there are instances where potential benefits of the migration of human capital are highlighted. As Todaro and Smith points out, international migration will have a positive effect on migrants’ finances, as well as for their families staying in the country of origin. Such financial support, also called remittances, were as high as 200 billion US dollars in the world in 2006. These remittances work as a way to reduce poverty in the origin countries and are thus very important (Todaro & Smith, 2011, p. 75). Beine et. al. notes that another possible benefit is that the incentive to get an education increases when migration is allowed. In poor and developing countries the benefits of getting an education are likely to be low, leading to low incentive to pursue one. But since skilled labor is of high demand in other parts of the world, the incentive to pursue higher education increases if migration is allowed. If there is an increase in the amount of people accruing a higher education, and not all of them migrate, then it will be a positive net-effect for the developing country (Beine, Docquier, & Rapoport, 2001, pp. 275-276). Castro-Palaganas et. al.’s study confirmed this duality of brain drain in a study of brain drain’s determinants in the Philippines. They showed that it is a debatable phenomenon where some claim it to be a natural consequence of globalization, unpreventable, and in fact positive as it reduces unemployment in the country of origin. Others claim it to be a forced decision stemming from limited opportunities and that the discourse has normalized migration to be a sign of success (Castro-Palaganas, et al., 2017, pp. 6-7).

1.2 Purpose and statement of problem

Brain drain is a disputed phenomenon and is often times referred to as something negative for the country of origin through stagnating development. For countries wanting to mitigate brain drain it is necessary to understand the causes of it. Expanding the view of brain drain and studying it from countries of all development levels could bring more insights to the phenomenon.

The purpose of this thesis is to study how three different variables are related to brain drain and if these relationships are expressed differently for different levels of development. The research questions are as follows:

- What is the relationship between a country's capacity to retain talent and its unemployment, GNI per capita and political stability?
- Do the relationships between a country's capacity to retain talent and its unemployment, GNI per capita and political stability differ depending on the country's development level?

1.3 Delimitations and clarification

This study focuses on the relationship between a country's capacity to retain talent and its unemployment, GNI per capita and political stability. This is done in order to see how these characteristics predict the brain drain from a country. Due to insufficient and unreliable data regarding brain drain, the measurement "capacity to retain talent" is used, as opposed to data of high-skilled migration (see *data* for further information). Many other characteristics could also possibly predict the capacity to retain talent, but this study focuses on unemployment, GNI per capita and political stability. The other focus of this study is to see if these relationships differ depending on a country's development level. Therefore, the study used data of 133 countries of different development levels in order to make comparisons. The terms "country of origin" and "destination" or "destination country" will be used to refer to a migrant's native country, and the country that he or she might migrate to. This study will focus on the determinants of brain drain and not the possible consequences of it. This is done in order to shed light on what possibilities a country has if it wants to mitigate its brain drain.

1.4 Disposition

In chapter 2 an explanation of the theories used are laid out. The theories used for this study is the theory of push- and pull factors published in 1966 by Lee and the New Economics of Labor Migration published in 1985 by Stark and Bloom. Chapter 3 presents previous empirical research on the determinants of brain drain. Chapter 4 outlines the data used for the study. It is divided into sampled countries, dependent variable and independent variables. Chapter 5 contains the explanation of the method used in the study. It starts with the linear regressions and continues to outline the method for non-linear regression using squared variables and dummy variable regression. Chapter 6 will show the regression results. In chapter 7 the results are discussed and chapter 8 concludes.

2 Theory

2.1 Push- and pull-factors

The theory of push- and pull-factors is a classical theory of international migration. Introduced by Lee in 1966 who stated that all migration, no matter if it is domestic or international, includes a place of origin, a destination and obstacles that interfere. If a person migrates or not will be the result of an individual decision that is based on different sets of factors. The factors are divided into four sets, the first set are factors related to the place of origin, the second set are factors related to the destination, the third set are interfering obstacles and the fourth set are factors related to the individual. In all places there are factors that influence persons to stay where they are and that also attracts new people, and there are factors that push people away. The factors are mostly perceived in a similar way by all people, but some factors can be perceived differently depending on the individual. A good school system is probably perceived as a pull-factor for parents, while it is perceived as a push-factor for homeowners because it will increase the taxes on real estate, lastly an adult with no children and no taxable real estate will probably be indifferent to the good school system. Even so, there are factors that on general are perceived in a similar way resulting in either pushing people away or keeping and pulling them in. There are vital differences between the factors related to the place of origin and the factors related to the place of destination. Living in a place gives a person close contact to the place's push- and pull-factors, and the contact is often times long-term, making a person well aware of the factors and thus enables a well-informed and unhurried opinion. This is not the case when it comes to the factors related to the destination. Awareness of the destination is often times to some extent flawed because many factors can only be perceived if you live in the place. The decision to migrate comes from comparing the factors at origin with the factors of the destination, but passivity always exists meaning that the side which favors migration has to outweigh the side which favors staying. In addition to the factors related to origin and destination are the interfering obstacles, including distance between origin and destination, psychical obstacles and immigration restrictions. The factors related to the individual will affect a person's perception of push- and pull-factors, how willing they are to migrate and thus either enable migration or impede it. The individual's sensitivity, intelligence and awareness of the factors elsewhere will impact the perception of the origin place. And the knowledge of the factors at destination depends on where the information is coming from, resulting in different perceptions of the destination. Thus, it is not the push- and pull-factors

per say that results in migration decision, it is the perception of them. Deciding to migrate is thus not fully rational with a simple calculation of push- and pull-factors, but instead it is to some extent irrational where it is the perception of the push- and pull-factors that inform the decision (Lee, 1966, pp. 49-51).

Below is a modified chart (figure 1) of Lee's chart regarding factors related to the place of origin and destination (Lee, 1966, p. 50). The chart shows that push-factors (-), pull-factors (+) and factors being insignificant to some people (0), exist in both the place of origin and the destination. The modification shows that the factors related to the destination has to outweigh the factors in the origin in order for a person to choose to migrate.

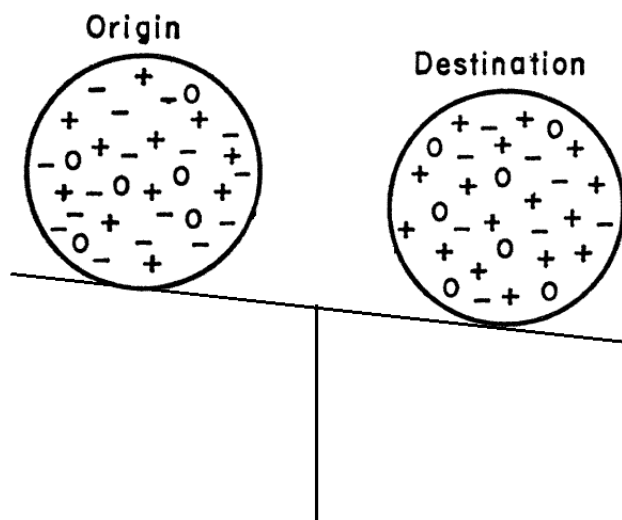


Figure 1. Decision to migrate. Modified chart from (Lee, 1966, p. 50)

2.2 The New Economics of Labor Migration

Stark and Bloom (1985) published the theory New Economics of Labor Migration (NELM). As opposed to the theory of push- and pull-factors the NELM does not start from an individual's standpoint, but instead from a group such as a household or family. The decision to migrate is therefore not an individual one, but instead something decided within a group. This happens because the costs and benefits from migrating are shared within the group, and the choice to migrate is a strategy of the group with the goal of higher income and managing risks. The group decides which family member or members should migrate and which should stay. One benefit of migrating is higher income. This will logically benefit the migrant, but it will also benefit the part of the group that is still in the country of origin through remittances. The risks that are managed through migration are the risks of the loss of earnings. By letting some family members migrate the group is insured against income-losses due to the earnings in the destination country being uncorrelated, or negatively correlated to the earnings in the origin country. This is a form of spreading risks, and explains the reason why some group members will migrate and some group members will stay in the country of origin. Thus, both parties benefit from the migration because income increases through remittances, and the risk of income-loss is managed. It is therefore a collective, voluntary and strategic choice made within the group (Stark & Bloom, 1985, pp. 173-175).

3 Previous empirical research

There are countless articles and studies conducted on the phenomenon of brain drain focusing on the causes, the consequences, different occupational fields, different geographical areas etc. It is a broad and complex phenomenon and that is probably why it has garnered so much literature. In this chapter the review is therefore focused on previous research that has studied the causes and determinants of brain drain, since that is the focus of this study.

Iacob (2018) published a study concerning brain drain in Romania. One of the goals of the study was to identify the determinants of brain drain, specifically in Romania. The study was quantitative and based on an online survey aimed at highly educated migrants from Romania working abroad. The study was conducted during 2018 and the survey garnered 370 responses. Respondents were to answer different statements and estimate the different reasons for them leaving Romania according to a scale from 1= not true to 5=very true. Iacob found that corruption was the determinant factor rated the highest in terms of the respondents' decision to leave Romania, with a mean of 4,53. After that came economic instability (mean = 4,37) and unsatisfying salary level (mean = 4,35) (Iacob, 2018).

Ngoma and Ismail (2013) also conducted a study concerning the causes of brain drain. The purpose was to examine causes effecting skilled migration from developing countries to developed countries. They used a linear regression analysis with cross-sectional data from 1990 for 102 developing countries. The authors found that wage differentials are significantly positive, showing that the difference in wages affect skilled migration. When wages in destination countries are higher than in the countries of origin there is an incentive to migrate. But as this gap shrinks through increased wages in origin countries, combined with peoples' preference to stay in their country of origin, the skilled migration rates fall. They also found that population size in country of origin is significantly negative, implying that higher population size results in lower skilled migration rates. This is due to many destination countries' immigration policies where a quota exists for immigration from countries, no matter their size. Further, political stability was significantly negative, indicating that a push-factor of brain drain is political instability. The distance between destination and origin country was also significantly negative, showing that for countries far away from destination countries, the skilled migration is lower than for countries closer to the destination countries (Ngoma & Ismail, 2013).

Castro-Palaganas et. al. (2017) did a mixed method study of the causes of health care workers' migration from the Philippines (amongst other topics in the study). The methods used were literature review, interviews with main stakeholders (i.e. professional educators, representatives for public and private organizations, etc.) and surveys targeting people who studied to become health workers (i.e. nurses, midwives, doctors). The authors found that a push-factor for migrating were poor wages and pull-factors were the possibility of better social, economic and career opportunities overseas, a belief that their occupation would garner higher respect abroad than at home and to reunite with already migrated family members. They also identified factors offsetting skilled migration, such as the desire to stay with the family in the Philippines, dedication to the community through health care work, concerns about cultural differences and discrimination overseas, loss of social support and concerns for the negative consequences of family separation. There has been an increase in nursing programs, which the authors label as commercial programs with the intent of exporting the skills abroad. But due to the global market's stagnation it has resulted in a supply surplus of nurses in the Philippines and consequently unemployment. Because of that, many educated nurses were forced to take lower skilled work in other countries. Brain drain and its causes are debatable. On the one hand there were stakeholders representing government claiming that migration is a natural consequence of globalization, and not something that can be prevented. Some claimed that it is positive because it reduces unemployment and oversupply of labor at home. On the other hand there were stakeholders arguing that the migration is a forced consequence of limited opportunities, colonization and the normalization of migration as a positive thing reflecting success. Further, the authors state that globalization opened the country up for foreign recruitment of health care professionals where the government has systems created to facilitate the migration and encourage remittances. One informant from a migrant advocacy group said "We [the Philippines] are the role model. Remittances are used to pay debt. (...) Migration is our best industry" (Castro-Palaganas, et al., 2017).

Docquier et. al. (2007) performed a study using data from OECD-countries of individuals 25 years and older who are born in a foreign country, are post-secondary educated and live in an OECD country. The study focused on brain drain from developing countries to the OECD-countries. They used a regression with four sets of independent variables that are common in the empirical literature regarding brain drain and its determinants. The sets used were country size at origin, development level of the country of origin, sociopolitical stability in the country of origin and geographical and cultural distance between the country of origin and the OECD countries. The brain drain is deconstructed into two multiplicative components. The first is the openness of the country of origin, measured by total emigration rate. The second is the schooling gap, measured by the ratio of education level in emigrants with the education level of natives remaining in the country of origin. The two components are negatively correlated indicating that a developing country suffering from large brain drain is doing so either because of high openness leading to high emigration rates, or because there is a high schooling gap between the emigrants and the natives. The authors found that the size of the country of origin is a vital determinant of the country's openness, but not its schooling gap. Average emigration rates are higher for smaller countries and largest for developing small island countries. Level of development impacts since higher level of schooling in the origin country leads to higher average emigration rates. This is because educated people can pay for the costs of emigrating, and they are also more likely to be approved by destination countries which have quality selective immigration policies (for example United States, Canada and Australia). However, higher education level in the country of origin has a negative impact on the schooling gap. This effect is greater than the effect on average emigration rates, i.e. the higher level of schooling in the country of origin, the lower brain drain. The authors also found that the distance between the country of origin and the destination reduces the emigration rates and increases the schooling gap, showing that highly educated emigrants are less sensitive to distance. For former colonies, the openness is higher due to better information about the destination, while the schooling gap was insignificant, indicating that brain drain is higher for former colonies. The authors' main conclusion is that brain drain is more robust for countries that are closer to the OECD countries and where the average education level of the people remaining in the country of origin is low (Docquier, Lohest, & Marfouk, 2007).

Kazlauskienė and Rinkevičius (2006) conducted a study analyzing the causes of brain drain in Lithuania using an online survey between the years 2004 to 2005. The survey was aimed at high skilled Lithuanians living abroad, resulting in 416 responses used in the analysis. The authors found that professional realization abroad due to more opportunities was a pull-factor for migrating, while a person's socio-economic status in Lithuania was a push-factor for migrating *if* the person evaluated his or her status as unsatisfactory. The academic system in Lithuania was shown to be a push-factor due to it being conservative and hierarchical, while education systems abroad served as pull-factors. Lastly, the economic situation for Lithuania was shown to be a push-factor for individuals unsatisfied not with their personal situation, but with the general situation of the country. The professional realization was the strongest factor and the authors found that brain drain from Lithuania is mostly due to pull-factors from other countries rather than push-factors within the country. They state that this confirms that migration flows are generally targeted towards richer countries, but not necessarily from the poorest countries. This is further supported by the finding that most high skilled migrants from Lithuania considered their social and economic status as satisfactory before they migrated, thus it was not the characteristics in Lithuania that were undesirable, but that the characteristics in other countries were more attractive. The authors conclude that even as conditions in Lithuania improve the brain drain may continue as long as better opportunities exist abroad (Kazlauskienė & Rinkevičius, 2006).

The studies all focus on the causes of skilled migration. Three focus on specific countries, where two are developed (Romania and Lithuania) and one is developing (Philippines). The other two studies focus on brain drain from multiple developing countries. This difference in focus, combined with different methods leads to some differences in the conclusion of which factors determine brain drain. This study will contribute by analyzing brain drain from countries of three different development levels. This will hopefully show if there are differences between the determinants of brain drain depending on the development level of the country of origin. Below in table 1 is a summary of most of the factors stated in the previous empirical studies as either increasing or decreasing brain drain. Some of the factors would be either a push- or a pull-factor depending on the level of the factor. For example, "high" population size decreases brain drain, while "low" population size increases brain drain. Where the threshold is between a factor being a push- or a pull-factor probably depends on the country of origin and the individual's perception of the factor. The table also highlights the fact that there are multiple determinants of brain drain.

Factors related to	Increasing brain drain	Decreasing brain drain
Country of origin	Corruption Economic instability Unsatisfying salary Political instability Unemployment Former colony	High population size Preference to stay in the country Community dedication Higher average education level
Destination country	Better social opportunities Better economic opportunities Family reunification Professional realization	Concerns for cultural differences and discrimination Loss of social support
Both	Wage differentials (origin vs. destination)	Long distance between origin and destination

Table 1. Factors related to the country of origin, the destination country or both that either increase or decrease brain drain. Summary from previous empirical studies by (Iacob, 2018) (Ngoma & Ismail, 2013) (Castro-Palaganas, et al., 2017) (Docquier, Lohest, & Marfouk, 2007) (Kazlauskienė & Rinkevičius, 2006).

4 Data

The data used for this empirical study is from the World Economic Forum, the World Bank, the Worldwide Governance Indicators and the United Nations Development Programme. All data is publicly available through each organization's website which are provided in the references. The data for the dependent variable was from 2016, therefore the data for the independent variables was retrieved for the year 2015.

4.1 Sampled countries

Data for the dependent variable is available for 137 countries. For the independent variables there were no data for 4 of the 137 countries, the remaining 133 countries were used in this study.

The countries are studied partly in a single group and also divided into their corresponding development levels. Group *developing* consists of 83 countries, group *in transition* consists of 13 countries and group *developed* consists of 37 countries. A full list of all the countries and their development classification is provided in the appendix.

The grouping of the countries into developing, in transition and developed is from the UN's The World Economic Situation and Prospects report. The report states that the classifications of countries into these three broad groups is done to display basic economic conditions of the countries. The exception to this classification is the establishment of the group "in transition". This group is characterized by countries formed by socialism, but that are now moving towards a market economy (UN 2015).

The United Nations Conference on Trade and Development (UNCTAD) released a handbook on statistics where they provided a map showing the world by development status, as seen below (figure 2) (UNCTAD 2018). This map gives an overview of the geographical position of the three groups. Note that the map also show the least developed countries, but they are not included as a separate group in this study, they are included in the group developing.

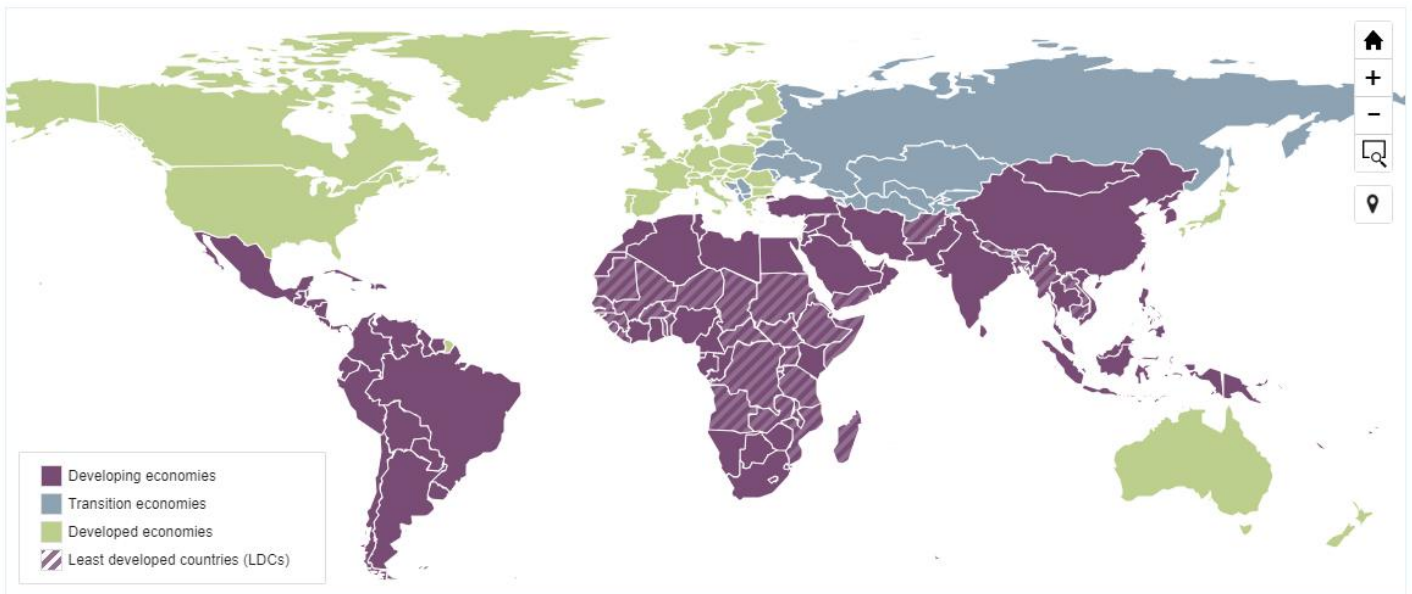


Figure 2. Countries classified by development level. Source: (UNCTAD 2018)

4.2 Dependent variable

The dependent variable in this study is data of countries' capacity to retain talent (*CapacitytoRetain_i*). It is a measurement included in the World Economic Forum's competitiveness report. It is measured through a survey called "the Executive Opinion Survey". The survey is answered by business executives from micro companies, small and medium-sized enterprises, and large companies. The survey is used to measure matters where there is no reliable or current statistics, or where statistics do not exist at all for most countries (weforum 2017a).

The measurement used for this study is a weighted average of the answers 2016-2017. In 2016 there was a total of 13,340 responses retained from 135 countries (weforum 2016). In 2017 there was a total of 12,775 responses retained from 133 economies. Testing is done in order to assess the reliability of the data from the Survey, together with empirical tests such as interviews with local experts, comparisons with the trends from past five years etc. As a result of these tests four countries' Survey data was not used from 2017, instead the data from the previous year's Survey was used. The weighted average of the 2017 results combined with a discounted average of the 2016 results gave the results of the capacity to retain talent used in this study (weforum 2017a). The respondents were asked the following question:

“To what extent does your country retain talented people? [1 = not at all—the best and brightest leave to pursue opportunities abroad; 7 = to a great extent—the best and brightest stay and pursue opportunities in the country]” (weforum 2017b).

Using data from a survey targeting different countries can be problematic since cultural differences can result in different interpretations of the question and different perceptions of the situation that the respondent is asked to assess. This is one of the disadvantages with using such a survey. The reliability tests conducted by the World Economic Forum are a good step in decreasing this eventual problem. An advantage with this kind of survey is that it can capture information that there are no statistics of, or where the statistics are unreliable.

Below are three histograms of the capacity to retain talent. The histograms show the distribution of the variable for the three different development groups, developing (figure 3), in transition (figure 4) and developed (figure 5). The x-axis represent the different possible values for the capacity to retain talent, ranging from 1-7 and the y-axis show the frequency. From figure 3 we can see that almost half of the developing countries have a capacity to retain talent between 3 and 3.75 points, while the rest of the countries are spread out up to 6 points and down to 1.75 points. The spread is thus large, but with a concentration of countries just around the middle points of the capacity to retain talent (3.5).

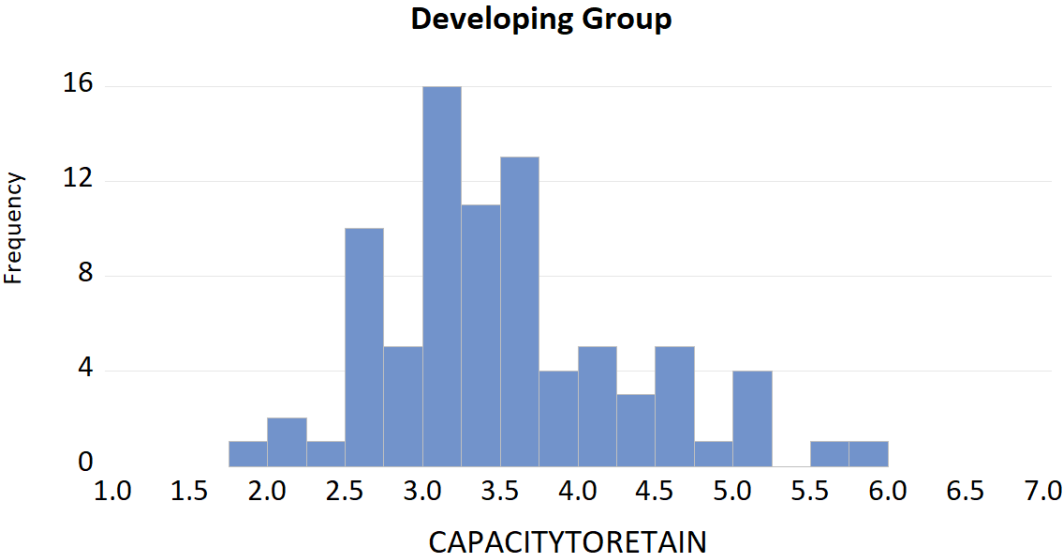


Figure 3. Distribution of capacity to retain talent for the developing group consisting of 83 countries.

From figure 4 we can see that the spread of the in transition countries is smaller compared to the developing countries. 10 out of 13 countries have less than 3.5 points. One country has 4.5 points while 3 countries have 1.5 to 2 points.

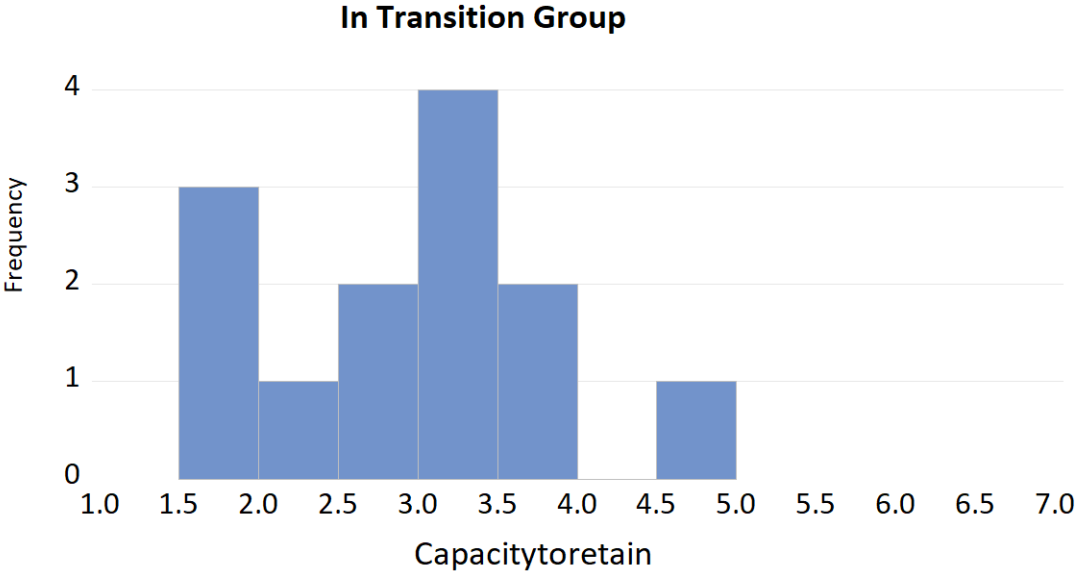


Figure 4. Distribution of capacity to retain talent for the in transition group consisting of 13 countries.

Figure 5 shows the distribution for the developed group. The spread between the top and bottom points is four points, same as for the developing group. However, the spread within these points is different. Almost half of the countries (18 out of 37) have between 2 and 4 points of capacity to retain talent. Out of these countries, almost one third have between 2.5-2.75 points, and one third have between 3.25-3.75 points. The other half of the countries (19 out of 37) have between 4.25 to 6.25 points. Out of these countries five have between 4.5-4.75 points and five have between 5-5.25 points. The spread within this group is thus the largest out of the three groups.

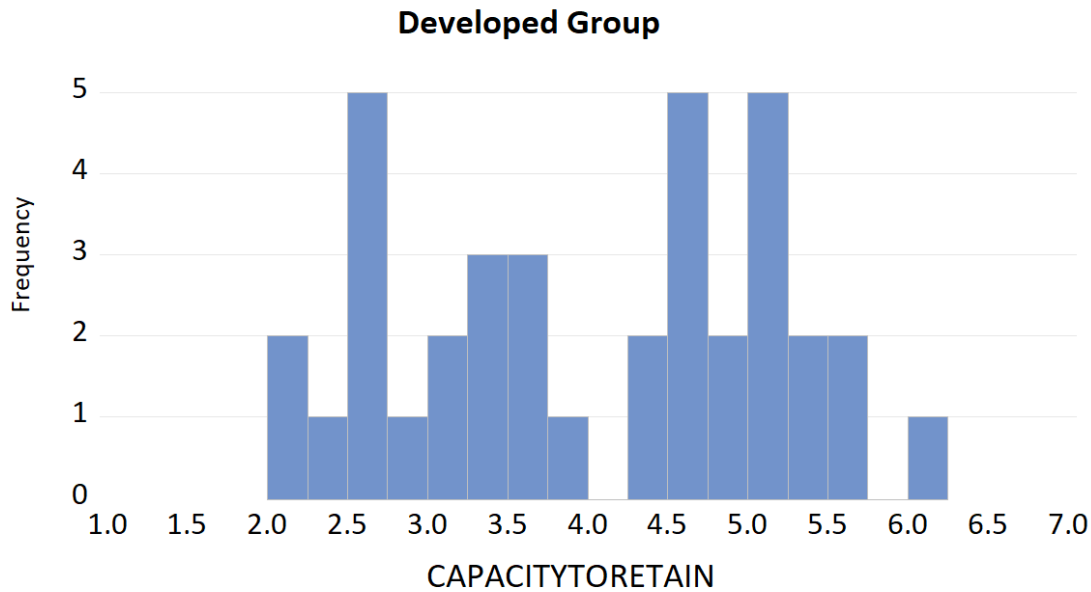


Figure 5. Distribution of capacity to retain talent for the developed group consisting of 37 countries.

4.3 Independent variables

Below are the outlines of four independent variables believed to explain the capacity to retain talent.

a) Unemployment

The first independent variable is unemployment and is denoted by *Unemployment_i*. The data is gathered from the World Bank. Unemployment is defined as the share of the total labor force that does not work but that is able to and is looking for employment. The data of unemployment is presented as the percentage of the total labor force (World Bank 2019a). The unemployment data for this study is from 2015.

b) PPP-adjusted GNI per capita

The second independent variable is PPP-adjusted GNI per capita, denoted as *GNI/capita_i*. The data is from the World Bank. GNI stands for gross national income and is the sum of output produced domestically or internationally, by residents of a country. GNI is presented with annual periodicity. GNI per capita is the calculated GNI for a country divided by the

population of the country the same year. PPP-adjusted GNI per capita means that the value is based on purchasing power parity (PPP). GNI is converted by the use of PPP-rates into international dollars, meaning that an international dollar has the same purchasing power as a U.S. dollar has in the United States (World Bank 2017). For this study the data is rescaled to 1000 international dollars. The variable will here forth be referred to as “GNI per capita”. The data used is from 2015.

c) Political stability

The third independent variable is political stability, denoted as *PoliticalStability_i*. The data is retrieved from the Worldwide Governance Indicators, which is a dataset produced by Daniel Kaufmann and Aart Kraay, financially supported by the World Bank. The data is calculated through summarizes of information from over 30 different data sources. The data is calculated from four different types of sources; household- and firms-surveys (including the Global competitiveness report), information from commercial businesses (including the Political Risk Services), non-governmental organizations (Freedom House, Reporters without Borders etc.) and public sector organizations (the World Bank among others). The data is an aggregate from the four sources and is reported in their standard normal units which ranges from approximately -2,5 (weak performance) to 2,5 (strong performance). The measurement political stability is defined as “(...) perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism” (World Bank 2019b). This data is also from 2015.

d) Human Development Index

The last independent variable is the human development index (HDI). The data is retrieved from the United Nations Development Programme (UNDP). The HDI is an aggregate of three indices for long and healthy life, knowledge, and standard of living. The indicators for the corresponding indices are life expectancy at birth, expected years of schooling and mean years of schooling, and PPP-adjusted GNI per capita. It is reported as a value between 0-1 (UNDP 2019). The data used in this study is from 2015.

5 Method

All data analysis is done with cross-sectional data for 133 countries from the year 2016 (dependent variable) and the year 2015 (independent variables). The regressions are computed using Ordinary Least Squares (OLS) in the software program EViews University Edition.

5.1 Choice of independent variables

The analysis started out with four independent variables; unemployment, GNI per capita, political stability and Human Development Index. In order to see if all independent variables fit the model, four linear regression analyses were made adding each variable last. To check for explanatory value, the adjusted R-squared between these analyses were compared. The variables unemployment, GNI per capita and political stability all added explanatory value when they were added last to a regression, meaning that when they were added the adjusted R-squared increased. When HDI was added last, the adjusted R-squared decreased, meaning that HDI did not add much explanatory value. This is probably due to GNI per capita being a part of the HDI, creating correlation between the two. For this reason, HDI will here forth be excluded from the analysis.

5.2 Linear regression

The aim of the linear regression is to find in which way unemployment, GNI per capita and political stability predicts countries' capacity to retain talent. The regression used is:

$$CapacitytoRetain_i = \beta_1 + \beta_2 * Unemployment_i + \beta_3 * GNI/Capita_i + \beta_4 * PoliticalStability_i + \varepsilon_i$$

In this regression $CapacitytoRetain_i$ is country i's capacity to retain talent, $Unemployment_i$ is country i's unemployment, $GNI/Capita_i$ is country i's GNI per capita, $PoliticalStability_i$ is country i's political stability and ε_i is country i's error term.

In this regression capacity to retain talent is believed to be linearly explained by unemployment, GNI per capita and political stability. β_1 is the intercept and β_2 , β_3 and β_4 are the coefficients of the independent variables. β_2 is the marginal effect of unemployment on capacity to retain talent, and the same corresponds to β_3 and GNI per capita and β_4 and political stability.

The linear regression is run for all 133 countries labeled as “all countries”. In order to make quantitative comparisons between the development groups the linear regression is also performed for the developing group (83 countries), the in transition + developed group (50 countries) and the developed group (37 countries). The reason for putting the in transition countries together with the developed countries is that the sample of the in transition group is only 13 countries. This sample is too small for analyzing in a regression alone. Therefore the comparison will be between the group developing, the group in transition + developed and the group developed.

5.3 Nonlinear regression – squared variables

In order to see if there is nonlinearity in the relationship between the capacity to retain talent and the three independent variables, a nonlinear regression using squared variables is performed. The regression used is:

$$CapacitytoRetain_i = \beta_1 + \beta_2 * Unemployment_i + \beta_3 * GNI/Capita_i + \beta_4 * PoliticalStability_i + \beta_5 * Unemployment_i^2 + \beta_6 * GNI/Capita_i^2 + \beta_7 * PoliticalStability_i^2 + \varepsilon_i$$

In this regression, capacity to retain talent is believed to be nonlinearly explained by unemployment, GNI per capita and political stability. Since the squares of the independent variables are included in the regression, the marginal effects of the independent variables are no longer constants. Instead, the marginal effects depend on the value of their corresponding variable. The marginal effect of unemployment is $\beta_2 + 2\beta_5 * Unemployment_i$. The marginal effect of GNI per capita is $\beta_3 + 2\beta_6 * GNI/Capita_i$. The marginal effect of political stability is $\beta_4 + 2\beta_7 * PoliticalStability_i$.

5.4 Dummy variable regression

Dummy variables and interactive dummy variables are used in order to make significant comparisons between countries of different development statuses. The aim is to see whether different development levels generate different relationships between capacity to retain talent and unemployment, GNI per capita and political stability.

The countries were divided into three groups: developing group, in transition group and developed group. The developing group was used as the base group. Two dummy variables were used, denoted as d_1 and d_2 . The groups coding is provided in table 2 below.

Group	d_1	d_2
Developing	0	0
In transition	1	0
Developed	0	1

Table 2. Coding of dummy variables

Dummy variables are used to investigate if there are different intercepts of capacity to retain talent between the groups. If they have different intercepts it means that even if the independent variables have the same value for all the groups, there is a difference in the capacity to retain talent between the three groups. Interactive dummy variables, i.e. dummy variables multiplied with independent variables, are used to discover if there are differences in the marginal effects of the independent variables, depending on countries' development levels. The regression used included the two dummy variables d_1 and d_2 as well as six interactive dummy variables; d_1 and d_2 interacting with each independent variable.

The regression used is:

$$\begin{aligned}
 CapacitytoRetain_i = & \beta_1 + \beta_2 * Unemployment_i + \beta_3 * GNI/Capita_i + \beta_4 * PoliticalStability_i \\
 & + \delta_1 * d_{i,1} + \delta_2 * d_{i,2} + \gamma_1 * d_{i,1} * Unemployment_i + \gamma_2 * d_{i,2} * Unemployment_i + \\
 & \gamma_3 * d_{i,1} * GNI/Capita_i + \gamma_4 * d_{i,2} * GNI/Capita_i + \gamma_5 * d_{i,1} * PoliticalStability_i + \\
 & \gamma_6 * d_{i,2} * PoliticalStability_i + \varepsilon_i
 \end{aligned}$$

Since the developing group is coded 0,0, the dummy variables will be zero, resulting in an intercept of β_1 . The in transition group on the other hand is coded 1,0 and the intercept will

therefore be $\beta_1 + \delta_1$, i.e. in transition group will have δ_1 more or less capacity to retain talent compared to the developing group, all else equal. The developed group, coded 0,1, will have an intercept of $\beta_1 + \delta_2$, i.e. δ_2 more or less capacity to retain talent than the developing group, all else equal.

Since the developing group was the base group all interactive dummy variables will be zero, so the marginal effects of the independent variables for the developing group are the β_2 - β_4 coefficients. The marginal effects of the independent variables for all groups is provided below in table 3. The in transition group, coded 1,0, will have γ_1 extra marginal effect of unemployment compared to the developing group. The developed group, coded 0,1, will have γ_2 extra marginal effect of unemployment compared to the developing group. The same relationship goes for γ_3 and γ_4 in terms of GNI per capita, and γ_5 and γ_6 in terms of political stability.

Marginal effect of:	Unemployment	GNI/capita	Political stability
Developing	β_2	β_3	β_4
In transition	$\beta_2 + \gamma_1$	$\beta_3 + \gamma_3$	$\beta_4 + \gamma_5$
Developed	$\beta_2 + \gamma_2$	$\beta_3 + \gamma_4$	$\beta_4 + \gamma_6$

Table 3. Marginal effects of the independent variables for the three different development groups

5.5 Hypothesis testing

In order to compare the intercept and marginal effects of the independent variables between the in transition group and the developed group, hypothesis testing is required. The developed group will have $\delta_2 - \delta_1$ more or less capacity to retain talent compared to the in transition group, all else equal. $\gamma_2 - \gamma_1$ is the extra marginal effect of unemployment for the developed group compared to the in transition group, the same relationship goes for γ_3 and γ_4 in terms of GNI per capita, and γ_5 and γ_6 in terms of political stability. In order to state this with significance hypothesis testing is done using the Wald test. The Wald test computes a test statistic that measures how close the estimated coefficients are to satisfying the null hypothesis. If the calculated p-value is significantly low then the null hypothesis can be rejected. The following null hypotheses are tested:

- $\delta_1 = \delta_2$. If rejected, the intercepts of the in transition group and developed group can be compared with significance.
- $\gamma_1 = \gamma_2$. If rejected, the marginal effect of unemployment can be compared with significance between in transition group and developed group.
- $\gamma_3 = \gamma_4$. If rejected, the marginal effect of GNI per capita can be compared with significance between in transition group and developed group.
- $\gamma_5 = \gamma_6$. If rejected, the marginal effect of political stability can be compared with significance between in transition group and developed group.

6 Results

6.1 Overview of variables

To get an overview of the variables used the descriptive statistics for all variables are shown below in table 4.

Variable	Mean	Maximum	Minimum	Std. deviation
Capacity to retain talent	3.58	6	1.8	0.96
Unemployment	7.73	27.69	0.16	5.94
GNI/Capita (1000 PPP\$)	21.96	124.83	0.76	21.84
Political Stability	-0.06	1.53	-2.68	0.91

Table 4. Descriptive statistics of dependent and independent variables for 133 countries

Below in table 5 is the capacity to retain talent with the bottom five countries and top five countries, labeled with development level D=developed, D.ing=developing and T=in transition. As can be seen there are both developing and developed countries in the top five. In the bottom five there are developing, developed and in transition countries. The table is intended to show the two ends of the spectrum of the capacity to retain talent and which development levels the countries have in these two ends. In the bottom end four of the five countries are geographically located in Eastern Europe with Moldova bordering Romania, which borders Serbia which in turn borders Bosnia and Herzegovina. On the other end the five countries are geographically located in Central Europe, Western Asia, North America, Northern Europe and Southeast Asia. The geographical spread of the top countries is thus bigger than that of the bottom countries.

Top countries			Bottom countries		
D	Switzerland	6	D.ing	Haiti	1.8
D.ing	United Arab Emirates	5.8	T	Bosnia and Herzegovina	1.8
D	United States	5.7	T	Serbia	1.8
D	Norway	5.5	T	Moldova	1.9
D.ing	Singapore	5.5	D	Romania	2

Table 5. Top and bottom countries' capacity to retain talent, D=developed, D.ing =developing, T=in transition

In table 6 the means of the capacity to retain talent, unemployment, GNI per capita and political stability are presented for the different development groups. The developed group has the highest mean of the capacity to retain talent, GNI per capita and political stability and the middle mean of unemployment. The lowest mean for the capacity to retain talent is for the in transition group which also has the highest mean of unemployment, lowest mean of GNI per capita and lowest mean of political stability.

Development group	Capacity to retain talent	Unemployment	GNI/capita	Political stability	Observations
Developing	3.5	6.71	15.82	-0.36	83
In transition	2.8	12.05	12.05	-0.48	13
Developed	4.0	8.50	39.21	0.74	37

Table 6. Means of the dependent and independent variables by development group

Below are scatterplots of all three independent variables; unemployment (figure 6), GNI per capita (figure 7) and political stability (figure 8). The scatterplots are intended to give a visual representation over how capacity to retain talent and each independent variable are related. From figure 6 we can see that there are big disparities between the capacity to retain talent for unemployment up to approximately 10 percent. For example, for unemployment of 4 percent there are some countries with capacity to retain talent of close to 6 points, while some countries are as low as below 2 points. These disparities get smaller as unemployment increases. At approximately 28 percent unemployment the disparities are only around 1,5 points. Note also that low points of capacity to retain talent (below 2 points) exists for all unemployment levels, while higher points (between 5-6) only exists for unemployment of up to approximately 10 percent.

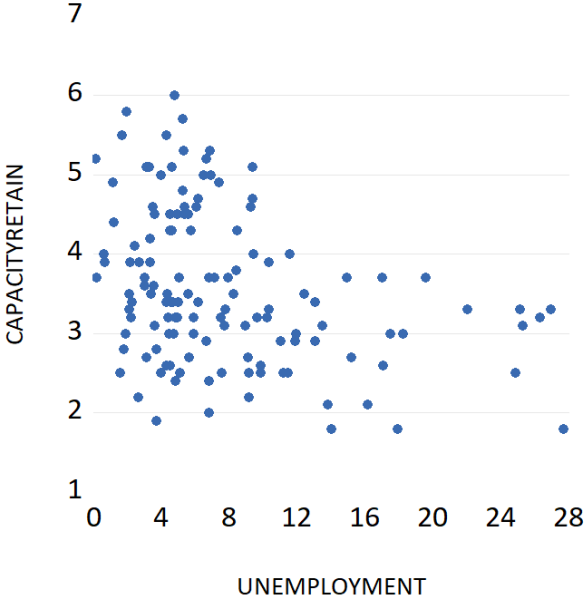


Figure 6. Scatterplot of unemployment and capacity to retain talent for 133 countries

In figure 7 we can see a trend of increasing capacity to retain talent as the GNI per capita increases. Again however there are disparities, especially of the three countries to the right that stand out the most from the trend. At GNI per capita up to 20.000 international dollars there are countries between below 2 points up to 5 points, showing the biggest disparities for this variable.

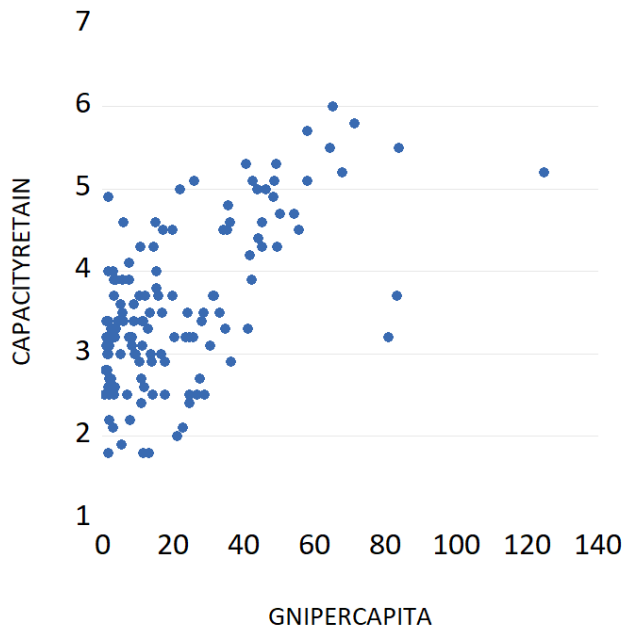


Figure 7. Scatterplot of GNI per capita and capacity to retain talent for 133 countries

In figure 8 the relationship between political stability and the capacity to retain talent is displayed, showing the variable with the least signs of a trend. Increasing political stability does seem to increase the capacity to retain talent, but there are big disparities throughout the sample. The biggest disparities seem to be from approximately -1 to 1 point political stability, which are the majority of the countries.

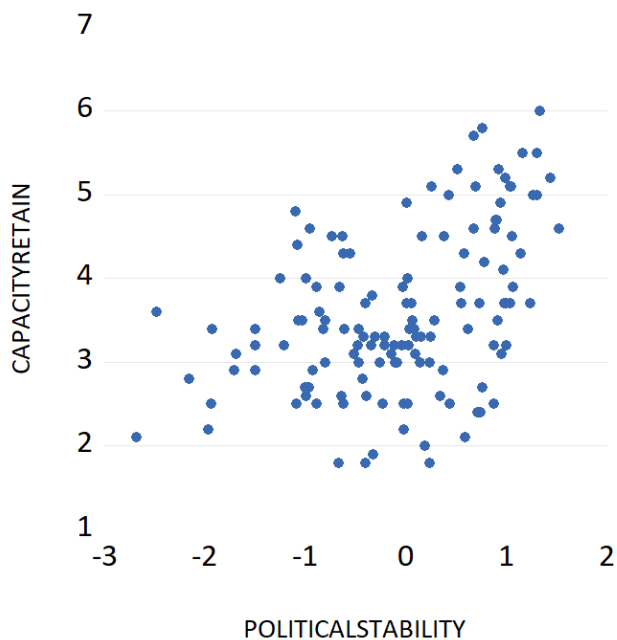


Figure 8. Scatterplot of political stability and capacity to retain talent for 133 countries

6.2 Linear regression

The aim of the linear regression is to find the linear relationship between the capacity to retain talent and the independent variables. The estimated coefficients for the intercept and the independent variables can be seen below in table 7. The results are reported for the regression analyses of the four groups “all countries”, “developing”, “in transition + developed” and “developed”. Unemployment is significantly negative for all groups, GNI per capita is significantly positive for all groups and political stability is significantly positive for the groups all countries and developing. Quantitative comparisons can be made between the groups, the intercept of the developing group is the highest and the developed group has the lowest intercept. The marginal effect of unemployment and GNI per capita is the highest for the developed group, and lowest for the developing group. The marginal effect of political stability is only significant for all countries and the developing group, with the developing group having higher marginal effect than the group all countries.

	All countries	Developing	In transition + Developed	Developed
Intercept	3.463377 ***	3.509933 ***	2.382013 ***	1.786480 ***
Unemployment	-0.043431 ***	-0.022166 *	-0.050551 ***	-0.056410 **
GNI/Capita	0.020928 ***	0.014664 ***	0.059127 ***	0.070563 ***
Political stability	0.174383 **	0.247245 ***	-0.267093	-0.107650
R-squared	0.460134	0.397570	0.723405	0.787715
Adjusted R-squared	0.447579			
Observations	133	83	50	37

Table 7. Linear regressions. Note: *p<0.1, **p<0.05, ***p<0.01

6.3 Nonlinear regression - squared variables

The nonlinear regression using squared variables was performed with the whole sample of 133 countries. The estimated coefficients (β_1 - β_7) for the intercept, the independent variables and the squared independent variables can be seen below in table 8. The adjusted R-squared increased when the squared variables were added, when compared to the linear regression for all countries. This indicates nonlinear relationships between the capacity to retain talent and the independent variables. Unemployment is significantly negative and squared unemployment is significantly positive. GNI per capita is significantly positive and squared GNI per capita is significantly negative. Lastly, political stability is significantly positive and the squared political stability is positive, with a p-value of 0.3021.

Coefficient	Estimation
β_1	3.599253 ***
β_2 , Unemployment	-0.129077 ***
β_3 , GNI/Capita	0.036892 ***
β_4 , Political Stability	0.184075 *
β_5 , Unemployment ²	0.003347 **
β_6 , GNI/Capita ²	-0.000206 **
β_7 , Political Stability ²	0.068941
R-squared	0.498375
Adjusted R-squared	0.474488
Observations	133

Table 8. Nonlinear regression, squared variables. Note: *p<0.1, **p<0.05, ***p<0.01

As shown in the method chapter 5.3 “Nonlinear regression – squared variables”, the marginal effect of unemployment is $\beta_2 + 2\beta_5 \cdot \text{Unemployment}_i$. Since β_2 is significantly negative and β_5 is significantly positive, this indicates that the marginal effect of unemployment on the capacity to retain talent is diminishing. As unemployment increases, the negative marginal effect on the capacity to retain talent decreases. This can be seen to some extent in the scatterplot for unemployment and capacity to retain talent (figure 6), as unemployment increases the capacity to retain talent decreases, but not in a linear way. The marginal effect of

GNI per Capita is $\beta_3 + 2\beta_6 * \text{GNI/Capita}_i$. β_3 is significantly positive and β_6 is significantly negative, indicating that the marginal effect of GNI per capita on the capacity to retain talent is diminishing. When GNI per capita increases, the positive marginal effect on the capacity to retain talent decreases. This can be seen to some extent in the scatterplot for GNI per capita and capacity to retain talent (figure 7), as GNI per capita increases the capacity to retain talent increases, but not linearly. The marginal effect of political stability is $\beta_4 + 2\beta_7 * \text{PoliticalStability}_i$. β_4 is significantly positive and β_7 is positive but nonsignificant. This indicates increasing marginal effect of political stability on the capacity to retain talent. But since β_7 is nonsignificant, this conclusion cannot be drawn. The scatterplot of political stability and capacity to retain talent (figure 8), seems to show sign of increasing marginal effect, but again since β_7 is nonsignificant this conclusion cannot be drawn with significance.

6.4 Dummy variable regression

The regression using dummy variables and interactive dummy variables is performed with the whole sample of 133 countries divided into three groups with different development levels. The developing group is the base group coded 0,0, the in transition group is coded 1,0 and the developed group is coded 0,1. There are two objectives with this regression, the first is to see if different development levels lead to different intercepts of the capacity to retain talent. As shown in the method chapter 5.4 “Dummy variables”, the intercept of the developing group is β_1 . The in transition group’s intercept is $\beta_1 + \delta_1$, and the developed group’s intercept is $\beta_1 + \delta_2$. Interactive dummy variables are used for the second objective, which is to see if the marginal effect of unemployment, GNI per capita and political stability on the capacity to retain talent are different depending on the countries’ development levels. The results of the regression is shown below in table 9.

Coefficient	Estimation
β_1 , intercept	3.509933 ***
β_2 , Unemployment	-0.022166 *
β_3 , GNI/capita	0.014664 ***
β_4 , Political stability	0.247245 ***
δ_1 , d_1	-0.664236
δ_2 , d_2	-1.723454 ***
γ_1 , d_1 *unemployment	-0.019988
γ_2 , d_2 *unemployment	-0.034243
γ_3 , d_1 *GNI/capita	0.022554
γ_4 , d_2 *GNI/capita	0.055899 ***
γ_5 , d_1 *PoliticalStability	-0.356376
γ_6 , d_2 *PoliticalStability	-0.354895

Table 9. Dummy variable regression. Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

From table 9 we can see that the developing group has an intercept of approximately 3.51. The extra intercept of the in transition group (δ_1) was insignificant. However, the estimated δ_2 is highly significant showing that the developed group has an intercept that is approximately 1.72 less than the developing group, all else equal. This confirms the result of the linear regression when comparing the intercepts of the developing group and the developed group.

As shown in the method chapter 5.4 “Dummy variable regression”, the marginal effect of unemployment, GNI per capita and political stability could differ depending on the countries’ development levels. As we can see from table 9, the only extra marginal effect with significance is γ_4 . The marginal effect of GNI per capita for the developing group is approximately 0.015 (β_3). The marginal effect of GNI per capita for the developed group is approximately 0.056 (γ_4) more than for the developing group. This confirms the result of the linear regression when comparing the marginal effect of GNI per capita of the developing group and the developed group. This means that if GNI per capita increases with the same amount for a country in the developing group and a country in the developed group, the positive marginal effect on the capacity to retain talent will be greater for the developed country, all else equal.

Figure 9 below shows a scatterplot of the capacity to retain talent and GNI per capita for the developing group and the developed group. The scatterplot shows the same result of marginal effect of GNI per capita as the regression. We can see that the developed group has a more linear relationship between the capacity to retain talent and GNI per capita than the developing group. The developing group has great disparities of the capacity to retain talent for very low levels of GNI per capita, with the different countries' capacity to retain talent ranging from below 2 points all the way up to almost 5 points capacity to retain talent. A majority of the developing countries have a GNI per capita of up to 20.000 international dollars, and then there are some 14 countries that diverge from the group with higher GNI per capita with differing increases in the capacity to retain talent. The three countries to the right below the trendline stand out from the rest of the developing group, decreasing the overall marginal effect of GNI per capita for the group. Even though the relationships between capacity to retain talent and GNI per capita for the two groups are not linear, the linear trendlines give a visual representation of what the regression analysis showed; the marginal effect of GNI per capita on the capacity to retain talent is higher for the developed group compared to the developing group.

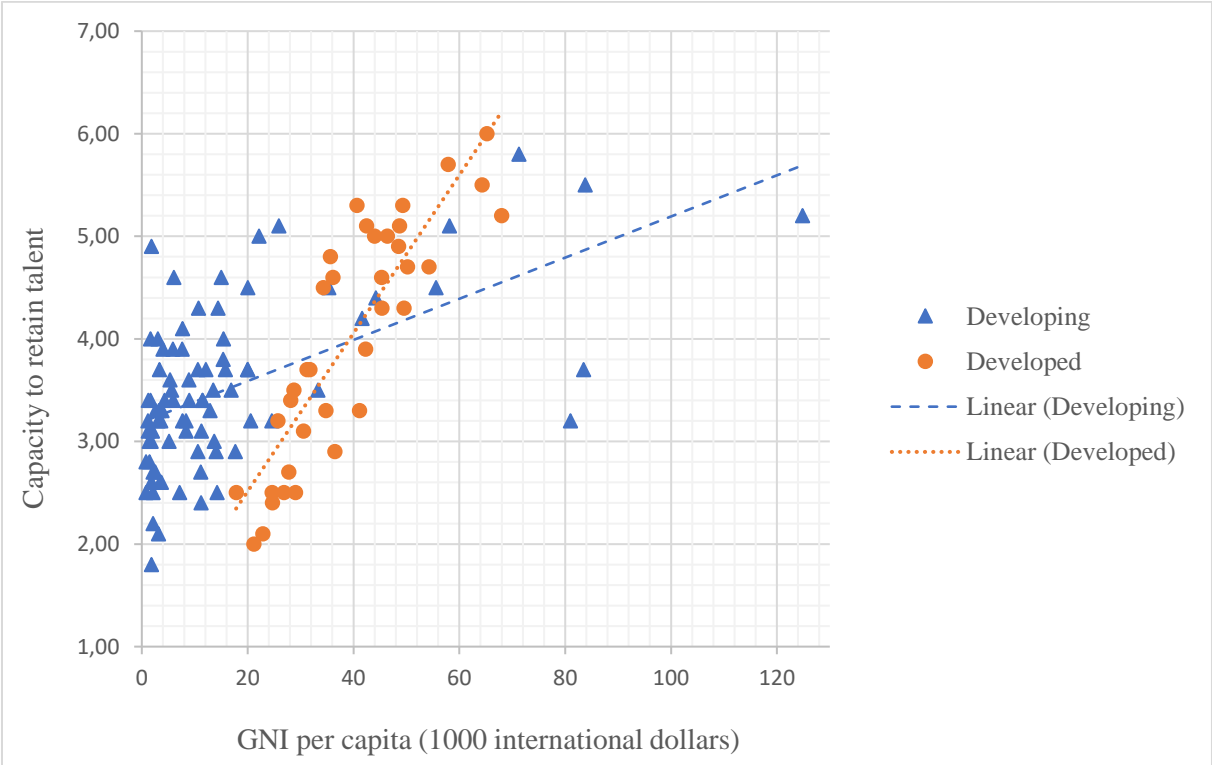


Figure 9. Scatterplot showing the relationship between capacity to retain talent and GNI per capita for the developing group and the developed group.

In order to make significant comparisons between the in transition group and the developed group, hypothesis testing was performed. The results are shown below in table 10. As can be seen the p-values are all too high, none of the null hypotheses could therefore be rejected. It was thus not possible to state with significance that there are differences between the in transition group and the developed group, neither regarding the intercept nor the marginal effects of the independent variables.

Null hypothesis	P- value
$\delta_1 = \delta_2$	0.1991
$\gamma_1 = \gamma_2$	0.7089
$\gamma_3 = \gamma_4$	0.2644
$\gamma_5 = \gamma_6$	0.9971

Table 10. Results of hypotheses testing, no null hypotheses are rejected

7 Discussion

The first research question was “What is the relationship between a country’s capacity to retain talent and its unemployment, GNI per capita and political stability?”. The first step in the attempt to answer this question was to run a linear regression with the capacity to retain talent as the dependent variable and unemployment, GNI per capita and political stability as independent variables. The results showed that all three variables significantly predicts the capacity to retain talent with unemployment being negative and GNI per capita and political stability being positive. This means that as unemployment increases, the capacity to retain talent decreases. The opposite is true for GNI per capita and political stability, when those variables increase the capacity to retain talent also increases. This result was expected since similar results were presented in the previous empirical studies (Jacob, 2018), (Ngoma & Ismail, 2013), (Castro-Palaganas, et al., 2017) and (Docquier, Lohest, & Marfouk, 2007). The results are in accordance with the theory the New Economics of Labor Migration since the theory suggests that group decisions regarding migration are made within a household or family in order to insure against income loss (Stark & Bloom, 1985). As unemployment increases the incentive for the group to decide for a member to migrate increases, thus decreasing the capacity to retain talent. And as GNI per capita increases the group’s incentive to have a member migrate decreases, thus increasing the country’s capacity to retain talent.

Running the regression with the independent variables squared showed higher explanatory value, indicating nonlinearity in the relationships. This nonlinear regression also showed that the marginal effects of unemployment and GNI per capita are both diminishing, as could be seen to some extent from their scatterplots (figure 6 and 7). Although political stability showed signs of increasing marginal effect, the results were insignificant. The diminishing marginal effects mean that as GNI per capita increases, the marginal effect will decrease. For low values of GNI per capita an increase will thus result in a higher increase in capacity to retain talent, compared to an increase in GNI per capita that is already high. The same goes for unemployment, an increase in unemployment will result in a higher decrease of the capacity to retain talent when the starting point of unemployment is low compared to when it is higher. Since GNI per capita and unemployment have opposite effects on the capacity to retain talent, the diminishing marginal effects could result in a country to focus more on one factor in order to retain their talent. If a country for example has high unemployment and low GNI per capita its capacity to retain talent is probably also low. Because of the diminishing marginal effects, decreasing unemployment will only have a small marginal effect on the

capacity to retain talent. Contrary, if the country's GNI per capita increases it will have a high marginal effect on the capacity to retain talent. For a country in this situation looking to increase its capacity to retain talent, the incentive might be higher to focus on increasing GNI per capita rather than decreasing unemployment.

The second research question was "Do the relationships between a country's capacity to retain talent and its unemployment, GNI per capita and political stability differ depending on the country's development level?". The linear regression was run for all countries, but also for the groups developing, in transition + developed and developed. Comparing the estimated coefficients of the independent variables showed that all groups had the same prediction in regards to being negative for unemployment and positive for GNI per capita and political stability. For unemployment and GNI per capita the developed group had higher estimated coefficients than the in transition + developed group and the developing group. Political stability was only significant for the developing group, this could be due to the sample size of the group.

In order to study significant differences between the groups, a regression analysis using dummy variables and interactive dummy variables was done. There were two significant results. The first was that the developed group had approximately 1.72 points less in intercept compared to the developing group and the second was that the marginal effect of GNI per capita was approximately 0.056 points more for the developed group compared to the developing group. According to the theory of push- and pull-factors it is the perception of the factors that will determine how people respond to them. Some people might decide to migrate at a certain level of unemployment, GNI per capita and political stability, while some people will choose not to (Lee, 1966). The results of the comparisons between the developing and the developed group might be explained by the perceptions of the individuals living in these countries. It seems as though residents of the developed group are more prone to migrating at low levels of unemployment, GNI per capita and political stability, since their intercept is lower than the developing group's intercept. It also seems as though they are more sensitive to GNI per capita levels since the marginal effect of GNI per capita is higher for the developed group compared to the developing group.

The in transition group has on average the lowest capacity to retain talent and on average highest unemployment, lowest GNI per capita and lowest political stability (table 6). It is also the group with three countries in the bottom five of the capacity to retain talent (table 5). Since the group consists of only 13 countries no regression could be run with the group alone

and the results of the regression using dummy variables were insignificant for the in transition group, as well as the hypothesis testing. No significant comparisons could therefore be done between the in transition group and the other two groups. As can be seen in the map of different development levels (figure 2) some of the in transition countries are in close proximity to the developed countries. The three in transition countries in the bottom five of the capacity to retain talent (Bosnia and Herzegovina, Serbia and Moldova) are all in close proximity to OECD-countries. This is consistent with the results of Docquier et. al. which showed that countries that are closer to OECD-countries have higher brain drain (Docquier, Lohest, & Marfouk, 2007).

The division of countries into developing, in transition and developed can be helpful for economic analysis, and it is often times the brain drain from developing countries specifically, that has garnered the most focus of researchers. This study found significant differences between the developing group and the developed group regarding intercept and marginal effect of GNI per capita, which can possibly be explained by the perceptions of individuals living in these countries. However, there are great disparities within these two groups regarding all the variables and the most apparent similarities within the two groups is their geographic position (figure 2). Meanwhile, the in transition group that has on average the lowest capacity to retain talent is too small for significant analysis. Since brain drain can affect countries of all development levels and push- and pull-factors such as unemployment, GNI per capita and political stability are all significantly related to brain drain no matter a country's development level, the division of countries by development level might not be fruitful. Comparisons between countries regarding determinants of brain drain are probably more significant if the countries are more homogenous than simply their development levels.

8 Conclusion

As stated in the theory of push- and pull-factors due to passivity, factors within the destination have to outweigh the factors within the origin in order for a person to decide to migrate (Lee, 1966). Or as stated in the study conducted by Ngoma and Ismail (2013) and the study conducted by Castro-Palaganas et.al., (2017) people generally prefer to stay in their country of origin. Both unemployment, GNI per capita and political stability could be viewed as push- and pull-factors within a country of origin. The reason for this is showed in this study; when unemployment is low, GNI per capita is high and political stability is high, they operate as pull-factors increasing the capacity to retain talent in the country of origin. But when unemployment is high, GNI per capita is low and political stability is low, they operate as push-factors making it harder for a country to retain its talent. Where the thresholds for the different variables are between being a push- or a pull-factor depends to some extent on the individual's perception, in accordance with the theory of push- and pull-factors. The thresholds could probably be generalized, at least for unemployment and GNI per capita since their marginal effects are diminishing. The study further showed that there are differences between the relationship of the capacity to retain talent and unemployment, GNI per capita, political stability depending on the level of development of a country. The developed group had lower intercept and higher marginal effects of GNI per capita compared to the developing group. Even though differences between the groups could be shown, the generalization of countries into developing, in transition and developed does not seem to be valid regarding brain drain. To further the insights of brain drain, studies could instead divide samples into groups with low, middle and high capacity to retain talent to see if push-and pull-factors are similar between the countries.

In conclusion it can be stated that unemployment is negatively related to the capacity to retain talent while GNI per capita and political stability are positively related to the capacity to retain talent. Both unemployment and GNI per capita have diminishing marginal effects. It can also be stated that these relationships differ depending on if a country is developing or is developed, leading to different intercepts and marginal effects of GNI per capita. Further, divisions of countries into development levels, mostly dependent on geographic positions, for brain drain study might not be as fruitful as other divisions. Further studies of determinants of brain drain and individuals' perceptions, using more homogenous samples, could bring more significant results of the phenomenon of brain drain.

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10 Appendix

Developing, 83 countries

Algeria	Guinea	Oman
Argentina	Haiti	Pakistan
Bahrain	Honduras	Panama
Bangladesh	Hong Kong SAR	Paraguay
Benin	India	Peru
Bhutan	Indonesia	Philippines
Botswana	Iran, Islamic Rep.	Qatar
Brazil	Jamaica	Rwanda
Brunei Darussalam	Jordan	Saudi Arabia
Burundi	Kenya	Senegal
Cambodia	Korea, Rep.	Sierra Leone
Cameroon	Kuwait	Singapore
Chad	Lao PDR	South Africa
Chile	Lebanon	Sri Lanka
China	Lesotho	Tanzania
Colombia	Liberia	Thailand
Congo, Democratic Rep.	Madagascar	Trinidad and Tobago
Costa Rica	Malawi	Tunisia
Dominican Republic	Malaysia	Turkey
Ecuador	Mali	Uganda
Egypt	Mauritania	United Arab Emirates
El Salvador	Mauritius	Uruguay
Eswatini	Mexico	Viet Nam
Ethiopia	Mongolia	Yemen
Gambia, The	Morocco	Zambia
Ghana	Mozambique	Zimbabwe
Guatemala	Namibia	
	Nepal	
	Nicaragua	
	Nigeria	

In transition , 13 countries

Albania
Armenia
Azerbaijan
Bosnia and Herzegovina
Georgia
Kazakhstan
Kyrgyz Republic
Moldova
Montenegro
Russian Federation
Serbia
Tajikistan
Ukraine

Developed, 37 countries

Australia
Austria
Belgium
Bulgaria
Canada
Croatia
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Japan
Latvia
Lithuania
Luxembourg
Malta
Netherlands
New Zealand
Norway
Poland
Portugal
Romania
Slovak Republic
Slovenia
Spain
Sweden
Switzerland
United Kingdom
United States