

THE RELATIONSHIP BETWEEN THE HUMAN DEVELOPMENT INDEX (HDI) AND INTERNATIONAL MIGRATION

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Abstract

This research analysis the impact of the human development index on the labour migration. The research focuses on 23 countries, on the last few years. Human Development Index and its components, ranks countries by HDI value and details the values of the three HDI components: longevity, education (with two markers) and income per capita. The last couple of years have proven that uncertainty is a certainty. Because of Covid-19 pandemic and the war in Ukraine, for the first time ever, the value of the Human Development Index has declined for two years straight.

Many countries were going through declines of the Human Development Index in 2021. Even before the pandemic insecurity rose everywhere. Many people are still feeling alienated from their political systems, from each other. This paper tries to discover if the Human Development Index has some influence on labour migration. The paper tries to demonstrate that no country so far, has a high human development index, thus humankind needs to pursue other ways to develop.

Keywords: international migration, human development index (HDI), flow of immigrants, labour migration, increase in population income.

JEL Classification: I 14; I 31; J6; J 61; O15.

1. Introduction

From a multitude of other factors that influence the upward trend of labour migration, we have considered the human development index as a determining factor in the socio-economic evolution of a state. The Human Development Index⁵ (HDI) is a marker developed by the United Nations for Development Program (UNDP) whose main purpose is to measure the level of development for each country according to a series of variables

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⁵ <https://hdr.undp.org/content/human-development-report-2021-2022>

considered standard, namely: education, life expectancy at birth or the personal income of each resident citizen for the analyzed country⁶:

- health / longevity (measured by life expectancy at birth), which can indirectly measure the satisfaction of basic or physiological needs, access to food, health, water, decent housing, good hygiene, and medical care.
- the level of knowledge or children's access to education, which is measured by the average duration of schooling of adults over 25 years.
- standard of living (logarithm of the gross income per capita calculated in the purchasing power parity of the population). This synthetic marker includes aspects related to the quality of life, the level of income, the evolution of the minimum wage in the economy, the increase in labour productivity, the purchasing power, the level of inflation.

The other variable considered in the analyzed model is the number of foreign immigrants permanently settled in countries with a very high human development index (HDI), above 0.9. As stated from the very beginning, we will try to find the direct link between the human development index and the number of immigrants who settle every year in these countries that have a high degree of economic development.

International migration has multiple causes, in addition to economic ones, we can also list socio-political, demographic, religious or environmental factors.

According to data provided by the International Labour Organization, the number of migrant workers, defined as people who migrate for employment, was approximately 164 million people in 2017, accounting for almost two-thirds of international migrants. Almost 70% of them are in high-income countries, 18.6% in upper-middle-income countries, 10.1% in lower-middle-income countries and 3.4% in low-income countries⁷.

On the European continent alone, on 1 January 2019, the number of people residing in an EU country with third-country citizenship was 21.8 million, representing 4.9% of the EU-27 population. In addition, 13.3 million people, residents in an EU-27 country on 1 January 2019 were citizens of another EU country.⁸

In specialized literature, the main factors for which people migrate are divided into Push Pull factors, or in other words, factors of pressure and attraction in another country for the future immigrant.

The Push model consists of a series of internal factors existing in the emigrant's country of origin, which determine and influence him to emigrate to a destination country. The Push-Pull model is considered a more subjective model, which can only be applied to a certain emigrant profile or a certain type of state.⁹

⁶ https://hdr.undp.org/system/files/documents/global-report-document/hdr2021-22pdf_1.pdf

⁷ <https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2022-2023>

⁸ <https://www.europarl.europa.eu/news/ro/headlines/world/20200624STO81906/cauzele-migratiei-de-ce-migreaza-oamenii>

⁹ Cristian Elena Raluca, Iordache Ana Maria Mihaela, Dan Anda Veronica, Population migration in the year of the Covid-19 Pandemic: A case study on Romania, Proceedings of the Journal of

Among the main current socio-political factors, we can mention the persecution of the citizens of some countries for belonging to a certain ethnicity, religion, race, politics or culture.

Another major factor is war or military conflict that may occur on a country's border; these conflicts or political persecution on the part of a government to cause massive departures of many refugees for political and military reasons. People fleeing armed conflicts or major human rights violations are usually humanitarian refugees who leave their country of origin for an indefinite period. This will influence the choice of the place where they settle permanently, because there are some countries that have a more liberal or open policy towards refugee immigrants. Official statistics have shown us that these immigrants are most likely heading to the nearest country they consider safe, and which accepts political asylum seekers.

In recent years, many people flee to Europe due to conflicts, terror and persecution in their country of origin. Of the 295,800 asylum seekers granted protection in the EU in 2019, over a quarter came from war-torn Syria, followed by Afghanistan and Iraq.¹⁰

Demographic and economic migration is correlated with labour standards, unemployment, and the general state of reliability and economic development of a country. Among the pull factors are higher wages, better job opportunities, a higher standard of living and educational opportunities. If economic conditions are not favorable and are still at risk of deteriorating, the likelihood of large numbers of people migrating to countries with a better situation increases.¹¹

Environmental factors have always been a determinant of migration, since ancient times people have fled natural disasters (floods, hurricanes and earthquakes). Specialists predict that in the future, with the climate changes that will occur worldwide, these extreme weather phenomena will increase, which could also cause a greater number of people to move from different continents or countries within the same continent.

The latest official data from the European Commission for 2020 shows that intra-EU mobility continued to grow in 2018, but at a slower pace than in previous years. Thus, in 2018 there were 17.6 million European citizens of all ages, registered as living long-term in a Member State other than the one of citizenship, and of these, 12.9 million were aged between 20 and 64 years, being included in the "labour migration" category, representing 4.2% of the total working-age population quantified in the EU-28. At the same time, in 2018, over half of active intra-EU migrants (6.1 million EU citizens) came from Romania, Poland, Italy, Portugal and Bulgaria, and the most preferred destination countries were Germany, Great Britain, Spain, Italy and France.¹²

Information Systems & Operations Management (JISOM), Vol.15. No.2, 2021, p.96.

<http://jisom.rau.ro/>

¹⁰ <https://www.europarl.europa.eu/news/ro/headlines/world/20200624STO81906/cauzele-migratiei-de-ce-migreaza-oamenii>

¹¹ Idem 14

¹² Buda Daniel, Impactul pandemiei de Covid-19 asupra mobilității forței de muncă, Revista transilvană de Științe Administrative 1 (46), 2020, p.19.

2. Presentation of the analysis between the Human Development Index (HDI) and the number of immigrants

In the study that we will analyze in this article, we will focus on two variables, namely the human development index and the number of foreign immigrants with permanent residence on the territory of the respective countries, the authors considering that there is a direct connection between these variables. These analyzed variables are based on series of real statistical data, obtained from the websites of official institutions. It is very important to specify the fact that for the number of foreign immigrants (for both sexes: male and female), the number of those who live permanently on the territory of the respective countries for a period of more than 1 year, regardless of the country or continent of origin, was considered of them (Asia, Europe, Africa, America or Australia).

The data are valid for the year 2020 that we have presented in the table below, the countries analyzed are those that have a very high or high Human Development Index (HDI):

Country	Human development index (value) x	The number of foreign immigrants on the territory of the countries (Mil. people) y
Switzerland	0.962	883.751 people
Norway	0.961	2.438.702 people
Ireland	0.945	85.400 people
Germany	0.942	15.760.000 people
United States of America	0.921	50.660.000 people
Australia	0.951	6.763.663 people
Iceland	0.959	1.600.000 people
Sweden	0.947	1.639.771 people
Liechtenstein	0.935	1000 people
Netherlands	0.941	1.979.486 people
Denmark	0.948	5.725.200 people
Finland	0.940	315.881 people
Canada	0.936	7.835.502 people
New Zealand	0.937	1.039.736 people
UK	0.929	8.543.120 people
Belgium	0.937	1.387.940 people
Austria	0.916	1.492.374 people
Luxembourg	0.930	249.325 people

Israel	0.919	2.011.727 people
Japan	0.925	2.043.877 people
Spain	0.905	5.852.953 people
France	0.903	7.784.418 people
Slovenia	0.918	237.616 people

Table 1: Human development index (2020) and the number of foreign immigrants in the respective countries for the year 2020¹³

As can be seen from the table above, 23 countries of the world from almost all continents were considered for the analysis, these countries being chosen according to the human development index (HDI) calculated by the UN and provided by the international database Wikipedia. In our analysis we randomly selected the countries with the highest level of HDI development, considered by the UN to be above 0.9.

At the top of the table, the leading country by far is Norway with the highest HDI (0.957), followed by Switzerland with (0.955), followed by Ireland, Germany and the United States of America.

On the right side of the table, for variable Y in our model we have the number of foreign immigrants permanently settled in the countries considered by the UN to have the highest HDI.

The total number of immigrants in the table differs significantly from country to country, not being a constant or fixed figure, this depending a lot on the total population of each country, its territorial distribution, but also the population density in certain areas.

The total number of immigrants also includes the number of refugees from other continents, namely from Afghanistan, Iran, Iraq, China, Pakistan, of different sexes, ages, or nationalities. It is very important to specify that in the total number of immigrants there are both European citizens and those who are part of the EU countries, but also citizens who immigrated for other reasons (political, religious, social) than economic, being called temporarily settled foreign refugees in other countries.

¹³ Source: <http://hdr.undp.org/en/content/2021-human-development-index-ranking>

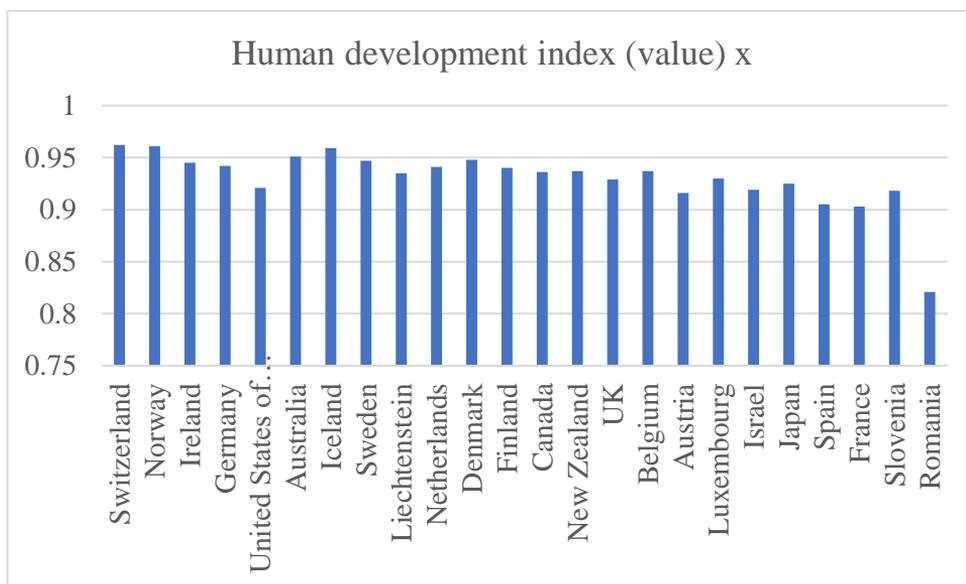


Figure 1. Human development index (2021) including Romania

3. The methodology of the simple regression model used in the research

To be able to determine to what extent there is a cause-effect relationship between the human development index and the number of foreign immigrants, we will build a simple linear regression model between an independent variable that is intended to contribute to changing the dependent variable.

We will determine a simple regression model and analyze its validity, i.e., whether there a relationship between the human development index and the number of foreign immigrants residing in the national territory exists. If it will be valid, we will make a forecast of a future flow of immigrants who will settle on the territory of the respective analyzed countries, characterized by certain values of the independent variable.

An important aspect to specify is the fact that the number of foreign immigrants is the dependent (outcome) variable, while the human development index is the independent (explanatory) variable. Thus, the simple regression model illustrates the relationship between the number of foreign immigrants and the human development index (HDI).

In this situation we have a unifactorial econometric model because we have an influence of the relative variable y – the number of foreign immigrants by a determined factor x – the human development index (HDI).

The form of the analyzed simple regression model is:

$$Y = a + bX + \varepsilon$$

The model variables, for the considered model, are:

Y – The number of foreign immigrants (persons) - the dependent variable,

a – Y intercept (the constant term),

b – the slope of the regression line,

X – Human development index (value) - the independent variable,

ε – a random variable, the variable that sums up the influence of other variables on the number of immigrants, but which are not expressly specified in the model. The variable ε expresses the deviations between the observed values and the values estimated by the model.

The parameters of the simple linear regression model, also called regression coefficients, are:

a – represents the constant or free term of the model and shows the average value of the Y variable when X = 0

b - the slope of the line - represents the average variation of the dependent variable, Y, to an absolute variation of one unit of the independent variable X, i.e., the disparity of the variable Y is relative to the variation of the variable X:

$$b = \frac{dy}{dx}$$

If $b > 0 \Rightarrow$ that there is a direct link between variable X and Y, if $b < 0 \Rightarrow$ that there is an indirect link between variable X and Y and if $b = 0$ then there is no link between X and Y.

Number of foreign immigrants = a + b* human development index + ε

Determining the parameters of the linear simple regression model is mostly done using the Least Squares Method. The use of the method starts from the following relation:

$$\hat{y}_i = \hat{a} + \hat{b}x_i, \text{ Unde „}\hat{a}\text{” și „}\hat{b}\text{” parameters of the regression line.}$$

The actual values of the resulting characteristic are equal to the estimate obtained with the help of the regression model, corrected by the residual value:

$$y = \hat{y}_i + e_i$$

Concretely, the Method of Least Squares consists in minimizing the function $F(\hat{a}, \hat{b}) = \min \sum (y_i - \hat{y}_i)^2$

To be able to determine the two estimators, it is necessary to solve the resulting system of equations:

$$\begin{aligned} n\hat{b} + \hat{a}\sum x_i &= \sum y_i & 23\hat{b} + \hat{a} \cdot 21.284 &= 1886.1 \\ \hat{b}\sum x_i + \hat{a}\sum x_i^2 &= \sum x_i y_i & \hat{b} \cdot 21.284 + \hat{a} \cdot 19.636 &= 1742.786 \end{aligned}$$

4. Descriptive analysis and model results Human Development Index (HDI) and the number of foreign immigrants

The descriptive analysis of each variable considered in the model is done to study the characteristics of each distribution. We previously checked for missing or statistically outlier values and did not consider them in the analysis because these values would have skewed our results.

<i>Human development index (value) x</i>	
Mean	0.923826087
Standard Error	0.003803811
Median	0.925
Mode	0.939
Standard Deviation	0.018242438
Sample Variance	0.000332787
Kurtosis	-0.150571857
Skewness	-0.598009493
Range	0.072
Minimum	0.903
Maximum	0.962
Sum	21.248
Count	23

Table 2 Descriptive statistics for Human development index

<i>Number of foreign immigrants (persons)y</i>	
Mean	85.00434783
Standard Error	0.281334922
Median	82.1
Mode	82.1
Standard Deviation	1.349234888
Sample Variance	1.820434783
Kurtosis	1.383667901
Skewness	-0.687213822
Range	6.1
Minimum	1000
Maximum	50.660.000
Sum	1886.1
Count	23

Table 3 Descriptive statistics for Number of foreign immigrants

In the case of the unifactorial model analyzed above, the most used method consists in the graphic representation of the two series of values with the help of the correlogram. Using the data in Table 1 we exemplified the connection concerning the number of foreign immigrants and the human development index (HDI).

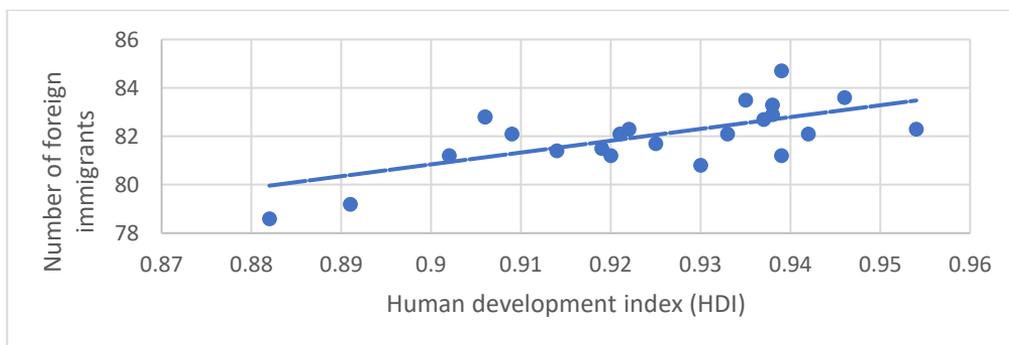


Figure 2. Link between the number of foreign immigrants and the human development index (HDI)

According to the correlogram it can be deduced that between the number of foreign immigrants and the human development index (HDI) there is a direct linear connection according to the relationship below:

$$Y_x = a + bX + \varepsilon.$$

Following the calculations performed using the function of the linear regression model, we have the following parameters $a=36.879$ and $b=48.846$, thus the regression function can be written as follows:

$$y = 48.846x + 36.879$$

<i>Regression Statistics</i>	
Multiple R	0.66042803
R Square	0.436165183
Adjusted R Square	0.409315906
Standard Error	1.036967632
Observations	23

Table 4. Regression statistics

Multiple R is the multiple correlation factor = 0.66042803. we notice that “r” is > 0, which means that between the 2 variables: the number of foreign immigrants and human development index is a strong link. R Square (R^2) expresses how ample is the discrepancy in the frequency of immigrants, explained by the discrepancy or increase in the human development index for the countries analyzed. It can take values in the range between [0,1]. The closer its value is to 1, the greater the part of the variation of Y explained by X, and the stronger the connection between them. In the case presented by us, R Square has the value 0.436165183; meaning 43.61% of the discrepancy in the Human Development Index that can be explained by the flexible number of immigrants.

Adjusted R Square represents the adjusted correlation ratio = 0.409315906, shows that 0.409315906 from the entire variation is due to the regression line, taking into consideration the number of degrees of freedom.

Standard Error is designed as the standard variation of the residuals and is the approximation of the standard variation of the errors ε (assuming their normality). In our case the value is ± 1.036967632 .

Observations (number of observations from the sample) = in our case there are 23 observations in the sample, respectively 23 analyzed countries with a very high Human Development Index (HDI).

At the end, the ANOVA Test is used to validate the regression model used in the research.

The variation explained by the regression model is 17.46823, and the mean variation explained, corrected by the number of degrees of freedom (2), is 17.46823. The residual variation (variation not explained by the regression model) is 22.58133927, and the average of the residual variation corrected by the number of degrees of freedom (21) = 1.075302.

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	17.46822595	17.46823	16.24495077	0.000604044
Residual	22	22.58133927	1.075302		
Total	23	40.04956522			

Table 5. ANOVA

In the table is calculated the F test (Fisher), because $F = 16.24495077$, and Significance F (level of significance) = 6.04044 (much bigger than $\hat{\alpha} = 0,05$) the built regression model is valid for a probability of at most 95% and can be used for the analysis of the dependence between the human development index and the number of foreign immigrants.

df (number of freedom degrees): $k - 1 = 1$, $n - k = 21$, $n - 1 = 22$, where $k = 2$ is the number of model variables (variable x , respectively y), and $n = 23$ is the number of countries analysed in the model.

SS represents the sum of the squares of the deviations: Global sum of squares = Sum of squares due to regression + Residual sum of squares.

MS (the average of the sums of squares): *SS* divided by the respective number of degrees of freedom. The value on the second line (Residual) is the dispersion estimate for the error distribution and is the square of the standard error of the estimate.

F (statistic value *F*) for the test characterized by:

H_0 : the model is not statistically valid.

H_1 : the model is not statistically valid.

Significance *F* (the one-sided critical probability). If the resulting value is less than the fixed significance level, then the unfounded hypothesis is rejected in favour of the alternative hypothesis.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0 %	Upper 95.0 %
Intercept - β_0	36.879017	11.198043	3.293345	0.0034632	13.59141	60.16662	13.59141	60.1666
x_1 – Human development for 23 countries	48.846131	12.119116	4.030503	0.0006040	23.64305	74.04921	23.64305	74.0492

index (HDI)								
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Table 6. Value interpretation t-statistic

Intercept is the free term, so the coefficient $b_1 = 36.879017$. The free term is the point where the explanatory variable is 0. Since the t statistic = 3.293345, and the P-value $0.0034632 < 0.05$, it means that this coefficient is significant. The free term of the regression equation is found with a probability of 95% in the interval: [13.59141; 60.16662]

The coefficient corresponding to the independent variable (b_2) has a value of 48.846131 which means that when the number of foreign immigrants increases by one unit, the human development index will increase by 48.846131, which means that to some extent the flow of the number of foreign immigrants for certain countries is influenced by the human development index (HDI). The significance threshold has the value P-value = $0.0006040 < 0.05$, which means that this coefficient is significantly different from zero. The confidence interval for the analyzed parameter the number of immigrants is [23.64305; 74.0492].

From the analysis of the above coefficients, we deduce that the regression model is of the form:

$$\hat{Y} = 48.846 * X + 36.879$$

In other words, the link between the 2 variables analyzed in the model is a direct and powerful one. As mentioned before, at an increase of 1 unit of variable X (number of foreign immigrants), the Y variable (human development index) increases with 48.846131.

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard Residuals</i>
1	883.751	-1.178226736	-1.162961575
2	2.438.702	0.512542312	0.505901791
3	85.400	-0.792073163	-0.781811027
4	8.543.120	-1.54553477	-1.52551075
5	15.760.000	1.95446523	1.929143087
6	50.660.000	0.603311361	0.595494831
7	6.763.663	0.203311361	0.200677249
8	1600	0.052157492	0.051481737
9	1.639.771	0.949849754	0.937543456
10	1000	-0.352457984	-0.347891522
11	1.979.486	-1.505919591	-1.486408827

12	5.725.200	-0.361688936	-0.357002878
13	315.881	0.384849457	0.379863329
14	7.835.502	0.233695588	0.230667817
15	1.039.736	-0.617458281	-0.609458463
16	1.387.940	-0.26861215	-0.265131999
17	1.492.374	-0.124381495	-0.122770003
18	249.325	0.81984916	0.809227156
19	2.011.727	1.666387553	1.644797758
20	2.043.877	1.666387553	1.644797758
21	5.852.953	0.261772077	0.258380546
22	7.784.418	-1.200920482	-1.185361301
23	237.616	-1.361305303	-1.343668169

Table 7. Residual output

In Table 7 RESIDUAL OUTPUT we will find listed all the observations considered for the 23 countries considered, respectively we will find the values adjusted according to the regression equation, the residual value and the standard residual value.

For each observation made in the initial table for each observation in the initial data table, the following is displayed:

Observation (the observation's sequence number), respectively the 23 analyzed countries with very high HDI.

Predicted \hat{y} value (number of foreign immigrants settled in the 23rd countries) forecast for the specific sequence; (this can be achieved by substituting the observation X values into the estimated model)

Residuals – the difference between the observed value in the model and the forecasted value.

Standard Residuals – the standardized error value which is obtained by dividing the residual to the standard deviation of the residuals.

Below we analyzed the quality of the chosen model using the graphical representation obtained in EViews:

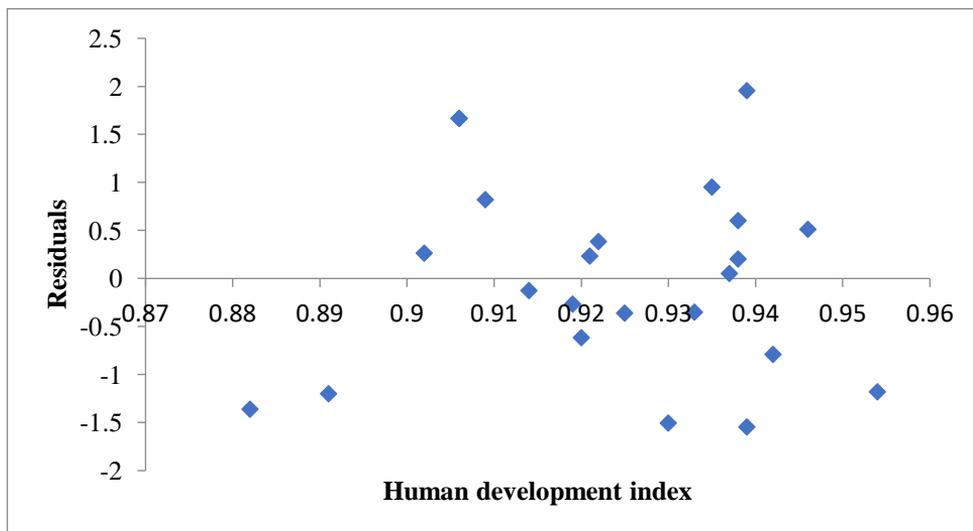


Figure 3. The independent variable versus residuals plot

According to the shape of the points represented in Figure 2, there is no correlation between the independent variable x and the obtained residuals, which indicates that the model, respectively for the two variables analyzed (Y and X) was a well-chosen one.

5. Conclusions

With the intensification of globalization worldwide, labour migration represents an important component in the economy of contemporary society, respectively this leads to the stimulation of the labour force from the national and international market of the states.

Migrant labour, or if we are talking about cheap labour here, can bring a series of benefits and advantages for entrepreneurs in the host or destination countries, namely the increase in the production of goods and services, the increase in labour productivity and consumption.

From the results of the analysis, we can see that there is a strong and direct link between the Human Development Index (HDI) and the number of immigrants for the year 2020, for the 23 selected countries.

We can affirm the fact that if we want to bring in a flow of foreign immigrants, i.e., workforce, it is necessary to increase the human development index, in other words, it is necessary to raise the standard of living for the citizens of a country.

If we were to make a comparison of the HDI between Romania (0.810) and Switzerland (0.962) which occupies the first place, we can see that there is a big gap between them.

Norway ranks second in terms of HDI with 0.961 which means that it has a high standard of living, registering the second GDP/place after Luxembourg among European countries, being fourth (4) in the world registering \$67,987. Norway held first place in the Human Development Index (HDI) for six consecutive years (2001-2006), and then regained this

position in 2009 until 2015. Norway's standard of living is among the highest in the world. Foreign Policy Magazine ranked Norway last in the Failed States Index for the year 2009, considering Norway to be the most functional and stable state.

The data presented by the UN for 2022, reveals that most world states have a slight regression after the Covid-19 pandemic, regarding education, economic development, life expectancy at birth.

Romania's HDI value for 2021 is 0.821— which put the country in the Very High human development category—positioning it at 53 out of 191 countries and territories. Between 1990 and 2021, Romania's HDI value changed from 0.703 to 0.821, a change of 16.8 percent.

Between 1990 and 2021, Romania's¹⁴ life expectancy at birth changed by 4.5 years, mean years of schooling changed by 2.8 years and expected years of schooling changed by 2.3 years. Romania's GNI per capita changed by about 125.9 percent between 1990 and 2021.

UN warns world States, that the most affected countries will be poor countries and the ones in development, that have an HDI bellow 0.7 compared to 0.9. As we stated before, in most countries the economic growth markers have made null all economic progress registered worldwide in the last 5 years (GDP/place, unemployment level, inflation rate, life expectancy in the last few years, income level).

All these transformations are due to Covid-19 pandemic, along with the Ukraine war, climate change, energy crisis and economic recession. They impact every labour market in each country.

If we were to analyse from an economic point of view the labour market for countries that receive an important migratory flow of people every year, we can say with certainty that these immigrants who do not find a stable job in a certain period or cannot integrate in the long term on the labour market will end up increasing the number of unemployed in that country, contributing decisively to the increase in unemployment.

This equation includes foreign immigrants of other nationalities - national citizens resident in the analysed countries (23), of course some are winners and losers alike, all are equally affected by the decrease in GDP/place, the standard of living and the decrease in income.

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