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Migration of health workers: key findings from Romania

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Abstract. *The migration of medical staff results in the diminution of human resources in the health sector, undermining the capacity of developing countries' health systems to provide medical services equitably. Various factors, such as economic, professional, political, social, or personal considerations, contribute to the decision of health workers to emigrate. This paper's primary objective is to analyze the prevailing trends in the migration flows and stocks of physicians and nurses, with a focus on identifying the principal pull factors of migration. The preferred destination countries for Romanian health professionals include the UK, Germany, France, and Italy. Notably, Germany stands out as a leader in health care professionals' migration flows, characterized by two distinct migration periods: the first featuring exceptionally high levels of physician migration and the second marked by increasing levels of nurses' migration. Through panel data regression analysis, we have established that the pull factors for physicians differ from those for nurses. For physicians, the presence of a Romanian community of health professionals in the destination countries is crucial, whereas for nurses, the development level of the destination country holds top importance.*

Keywords: migration, health care workers, panel data, principal component analysis, cluster analysis

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Introduction

The migration of healthcare workers is a long-lasting process where trained and skilled healthcare workers move from their home countries to other countries, searching for better opportunities and living conditions. This process creates big challenges for both the origin and destination countries.

On the one hand, the migration of healthcare professionals may result in a shortage of skilled workers in their countries of origin, adversely affecting the delivery of healthcare services to the population (Scheffler et al., 2008; Aluttis et al., 2014; Mullan, 2005). Moreover,

the departure of skilled workers can have significant economic repercussions for the countries of origin, given the substantial costs associated with training and educating healthcare professionals (Hagopian et al., 2009; Ono et al., 2018; Vujicic et al., 2017).

On the other hand, the migration of healthcare professionals can offer crucial support to healthcare systems in destination countries, particularly those grappling with shortages of healthcare workers (Kovács et al., 2021; Labonté, 2015). However, it can also foster competition for jobs and resources in these countries, potentially leading to tensions and inequalities (Wickramasekara, 2014).

Following Romania's accession to the European Union and the implementation of mutual recognition of diplomas under EU Directive 2005/36/EC, the country, along with other Eastern European nations, experienced significant health worker emigration.

Several push factors contribute to the migration of Romanian health professionals, including low salaries, subpar working conditions, limited career opportunities, political instability, and restricted access to technology and equipment (Rohova, 2011). In Romania, health professionals often earn substantially less than their counterparts in other European Union (EU) countries, creating an incentive for them to seek more lucrative opportunities elsewhere. Additionally, these professionals frequently endure long working hours in inadequately equipped facilities with limited resources, leading to burnout and frustration, further motivating their decision to migrate. Political instability in Romania, characterized by corruption scandals and protests against government policies, can instill a sense of uncertainty and insecurity, prompting health professionals to explore opportunities in more stable countries. Many health professionals in Romania report working with outdated technology and equipment, which hinders their ability to provide high-quality care, which serves as a source of frustration and a contributing factor to their decision to migrate.

Overall, these push factors contribute to a challenging work environment for health professionals in Romania, which can make it difficult for them to provide quality care and advance in their careers. But these push factors are only a small part of the factors that influence the emigration decision, which are discussed in detail in many research papers (Apostu et al., 2020; Bach, 2004; Boboc et al., 2011, etc.).

This paper provides an in-depth exploration of the migration patterns of health workers from Romania, focusing on the pull factors influencing the observed trends over the past decade. Commencing with a comprehensive review of literature and data pertaining to health practitioners' migration, with a particular emphasis on pull factors, the study pursues two primary avenues of investigation. The first involves an analysis of the migration trends of Romanian physicians and nurses, examining both stocks and flows. The second avenue focuses on estimating the pull factors that play a pivotal role in driving the migration of healthcare personnel from Romania. In conclusion, the paper discusses the key emigration periods within EU countries and delves into the primary attraction factors in the principal EU destination countries.

Literature review and problem statement

According to recent statistics from the Romanian National Health Insurance House, between 2007 and 2020, a total of 15,070 physicians migrated from Romania to other countries. In 2020 alone, 1,352 physicians left Romania, with the United Kingdom, Germany, and France being the most popular destinations. This represents a significant increase from the previous

year, when 876 physicians migrated. In the case of nurses, between 2007 and 2020, a total of 48,935 nurses migrated from Romania to other countries. The majority of these nurses went to Italy, followed by Germany, Spain, and the UK. In 2020 alone, 3,027 nurses left Romania.

The main reasons cited for Romanian health workers migration are low salaries, poor working conditions, and lack of career opportunities (Séchet and Vasilcu, 2015). The Romanian government has implemented various policies and initiatives to address the issue of health workforce migration, such as: increasing salaries and other financial incentives, improved working conditions, offering incentives for health professionals to work in rural areas, but all these efforts had limited success in retaining physicians.

Healthcare professionals' migration is a complex and multifaceted issue with significant implications for the healthcare system in our country. The main objective of this paper is to understand the patterns and reasons behind Romanian physicians' and nurses' migration, a crucial direction for policymakers and healthcare organizations to address the shortages and imbalances in different regions or medical specializations in Romania.

Our research constitutes a significant contribution to the migration and labor studies domain, providing valuable insights into the intricacies of health workers' migration. The nuanced distinctions in pull factors between nurses and physicians across various destination countries set our work apart from the existing literature. These results fill a gap in current knowledge and add depth to the understanding of the phenomenon of health professionals' migration.

Research questions

Understanding temporal patterns in health worker migration is crucial for policymakers and healthcare institutions to adapt strategies and allocate resources effectively. Therefore, the first research question of this paper is **"RQ1. Do temporal patterns exist in the migration of Romanian physicians and nurses, both in stocks and flows, during the period 2011-2021, categorized by destination country?"**

Moreover, exploring the relationship between migration and development levels provides insights into the factors influencing healthcare professionals' choices. This understanding is essential for creating targeted policies that consider both the needs of the workforce and the socio-economic conditions of destination countries. Therefore, the second research question addressed in this paper is: **"RQ2. Is there a discernible relationship between the migration stocks and flows of Romanian health workers and the development variables levels of the respective destination countries?"**

Moreover, by identifying and addressing the main pull factors behind Romanian health worker migration, policymakers could develop effective retention strategies and create environments that encourage professionals to stay in their home country. Therefore, the concluding research question is phrased as: **"RQ3. What are the primary pull factors influencing the migration of health workers from Romania?"**

Data description

In order to answer to the previous research questions, we analyzed the following variables: the flows and stocks of physicians' and nurses' migration as endogenous variables and Health expenditure in destination country, GDP in destination country, Life expectancy in destination country, Human development index in destination country, Number of physicians

and Number of nurses, Romanian health community in destination country as exogenous variables (Table 1).

All variables were observed within the timeframe of 2010-2020, and the relationship between endogenous and exogenous variables was evaluated with a one-year lag (exogenous variables being observed for the preceding year compared to migration variables, as these are considered to be the driving factors of migration).

Table 1. Variable description and source data

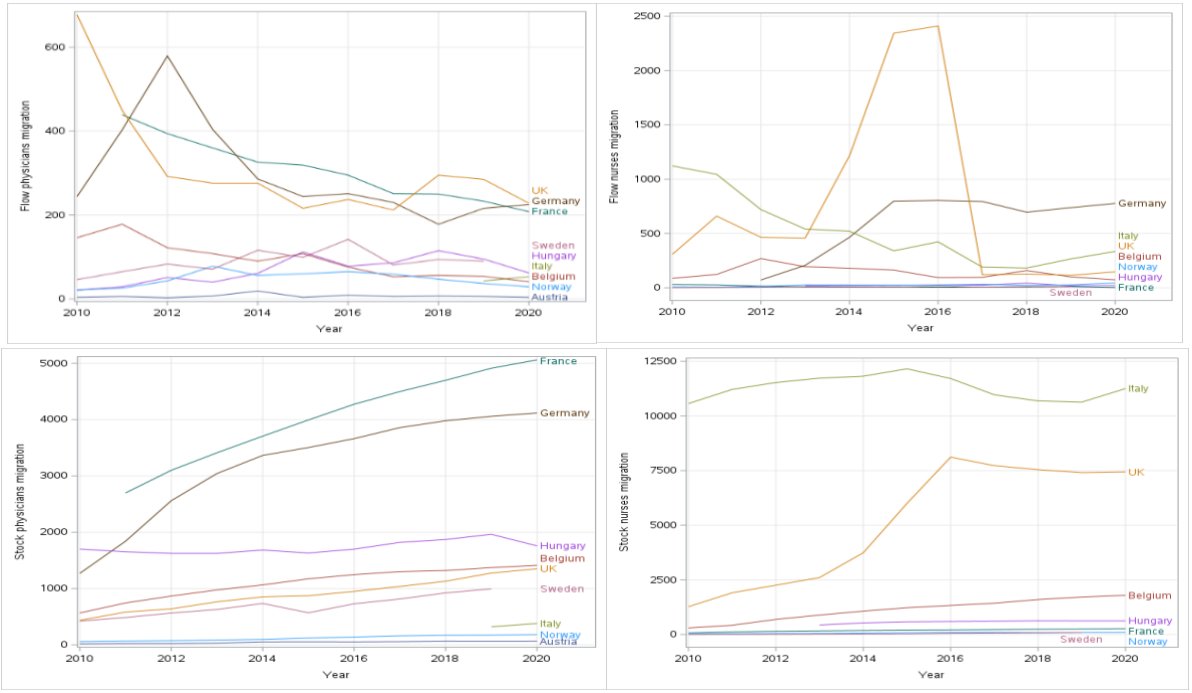
Variable	**Data source**	**Variable description**
The flows and stocks of physicians' and nurses' migration	OECD data https://stats.oecd.org/Index.aspx?DataSetCode=HEALTH_WFMI	Stocks of migrants are measured at the end of the year. Flows of migrants are measured during the reference year. Is considered a Romanian migrant a health professional who has obtained his first medical qualification (degree) in Romania and is receiving a new authorization in a given year to practice in the receiving country.
Health expenditure	Eurostat Dataset Health care expenditure by provider [HLTH_SHA11_HP__custom_6141586]	Health care expenditure quantifies the economic resources dedicated to health functions, excluding capital investment.
GDP per capita	Eurostat Dataset Real GDP per capita [SDG_08_10]	The ratio of real GDP to the average population of a specific year.
Life expectancy	Eurostat Dataset Life table by age and sex [DEMO_MLIFETABLE__custom_6141914]	**Life expectancy** at birth represents the mean number of years to be lived by a new born
Human development index (HDI)	Human development reports https://hdr.undp.org/data-center/human-development-index#/indicies/HDI	HDI is a measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living.
Number of physicians	Eurostat Dataset Physicians by sex and age [HLTH_RS_PHYS__custom_6317353]	Total number of physicians
Number of nurses	Eurostat Dataset Nursing and caring professionals [HLTH_RS_PRSNS__custom_6317385]	Total number of nurses
Romanian health community	Authors' definition	Dummy variable with the value 1 if there is a stock of emigrants greater than 100 physicians or 100 nurses[1] and 0 otherwise

Source: authors' own contribution.

The primary destinations favored by Romanian physicians include France and the UK where a stable trend is observed, and Germany, where a declining trend is evident. Regarding Romanian nurses, their preferred destinations are Germany, Italy, and the UK. A noticeable upward trend is observed for Germany, a declining trend for Italy, and an oscillatory trend for

[1] The dummy variable Romanian Community was constructed according to definitions found in literature (Apostu et al., 2022).

the UK. France and Germany house the largest communities of Romanian physicians, while Italy and the UK host the largest communities of Romanian nurses. (Figure 1).



a. Physicians' migration *b. Nurses' migration*

Figure 1. Stocks and flows of Romanian physicians' and nurses' migration by country, 2011-2020

Source: authors' own contribution.

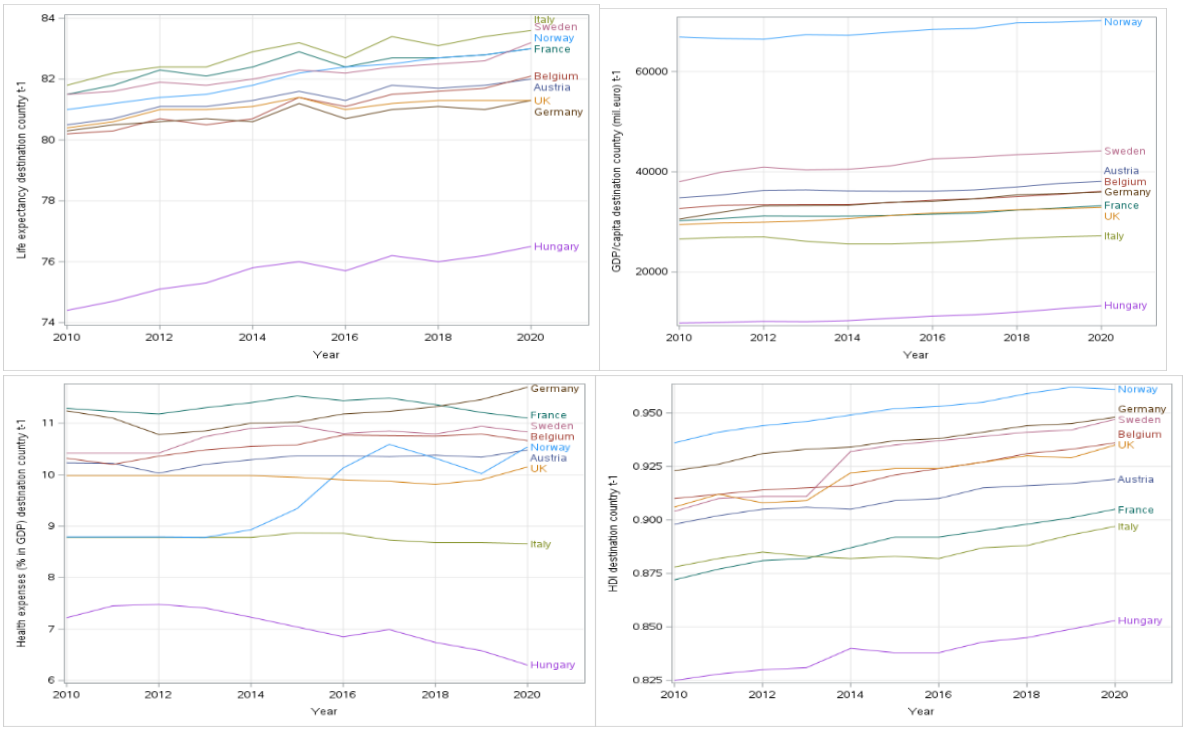


Figure 2. The evolution of exogenous variables, 2010-2020

Source: authors' own contribution.

The exogenous variables from the countries to which most Romanian health workers migrated showed generally favorable developments in the period 2010-2020, being at high levels and more favorable than those in Romania (Figure 2).

Main findings

To respond to the first research question, **"RQ1. Do temporal patterns exist in the migration of Romanian physicians and nurses, both in stocks and flows, during the period 2011-2021, categorized by destination country?",** hierarchical analysis was implemented on our dataset, revealing two or three distinctive periods in the migration of Romanian physicians across key destination countries - Germany, France, Italy, the UK, Belgium, Hungary, Sweden, and Norway - spanning from 2011 to 2021 (see Annex 1).

Germany stands out as the forefront in the migration of physicians, characterized by two distinct migration periods. In the initial period (2012-2014), the migration of physicians witnessed notably high and enduring flows, while nurses' migration commenced on a temporary basis, maintaining an exceptionally low and constant stock of Romanian nurses in Germany. In the subsequent migration period (2015-2020), physicians' migration flows experienced a 50% decrease, juxtaposed with a substantial increase in the migration of medical assistants, surpassing the flows of migrant doctors by a significant margin.

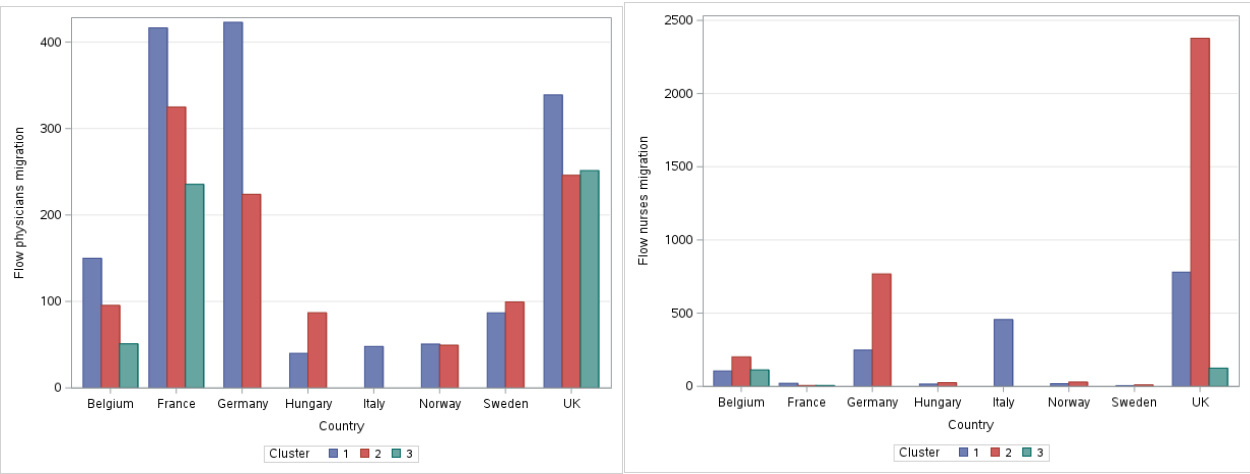
Belgium and France exhibit three distinct migration periods. In France, both physicians' and nurses' migration flows have diminished over time; however, when migration occurs, it is characterized by permanence, with the stock increasing throughout the entire analyzed period. Notably, France serves as the primary destination for Romanian physicians from 2011 to 2016. Belgium initially ranked as the third EU country in terms of physician migration during the first period (2011-2012). Subsequently, these flows experienced a substantial decline, being supplanted by escalating flows of nurses' migration during the second period (2013-2016). Similar to France, migration in Belgium is permanent when it occurs.

In Italy, the migration of health professionals is predominantly temporary, with exceptionally high levels for nurses. The stock of nurses remains relatively stable throughout the entire analyzed period, at an exceptionally high level–the highest among EU countries –indicating a significant influx of nurses into Italy before 2011.

The United Kingdom serves as the primary destination for nurses' migration during the examined period, but this migration is typically temporary, as the rate of stock increase is not as substantial as the migration flows. Additionally, distinct periods are identified, with 2014-2015 exhibiting the highest levels of migration flows and stock increases, followed by a subsequent period of declining migration flow levels. Generally, nurses' migration tends to be for finite periods. Regarding physician migration, the flows show minimal variations from 2012 to 2020, and the stocks increase to a lesser extent than the flow levels, suggesting that a significant portion of these migration flows are temporary.

Norway, Sweden, and Hungary also emerge as significant destination countries for both Romanian physicians and nurses, characterized primarily by two distinct periods (2011-2014 and 2015-2020). Physician migration is more prominent than nurses' migration, with the former being more substantial during the second period. In Norway and Sweden, as in the UK, migration tends to be generally temporary. In Hungary, a noteworthy situation

arises, with the growth rate of migrant stocks significantly surpassing that of migration flows for both nurses and physicians (Figure 3).



a. Physicians' migration *b. Nurses' migration*

Figure 3. The annual average flows by identified migration periods

Source: authors' own contribution.

In the second stage, in order to answer to the second research question **"RQ2. Is there a discernible relationship between the migration stocks and flows of Romanian health workers and the development variables levels of the respective destination countries?"** we have applied the principal component analysis. First of all, we have used all endogenous and exogenous variables to visualize the relationship between them.

By applying the principal component analysis on our standardized endogenous and exogenous variables, the projection of our data on the first two principal component variables explains 69% of the total variance and only the first two eigenvalues are greater than one (Table 2). Therefore, we will keep only two principal components to interpret the relationship between health professional migration and pull factors.

Table 2. The Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	3.34399893	1.13271525	0.4180	0.4180
2	2.21128368	1.24560523	0.2764	0.6944
3	0.96567845	0.21162511	0.1207	0.8151

Source: authors' own results.

From the projection of variables on the first two principal components it could be observed that the migration flows of physicians and nurses are highly and positively correlated with the Number of nurses and Number of physicians from the destination country, Health expenditure as percentage in GDP and the Romanian health professionals' communities from the destination countries (Figure 4).

In terms of pull factors, the conclusion drawn from the projection of variables on the first two principal components indicates that the following factors act as "pull factors," motivating Romanian health professionals to migrate in the destination country:

- number of Nurses and Physicians in the Destination Country: the availability of healthcare professionals in the destination is a significant pull factor, indicating opportunities for employment and career growth;
- Health Expenditure as Percentage of GDP: higher investment in the healthcare sector in the destination country indicates better working conditions, advanced medical technologies, and overall improved healthcare infrastructure;
- Romanian Health Professionals' Communities in the Destination Countries: the presence of a supportive network from their home country can make the transition smoother for new migrants, providing a sense of belonging and assistance in adapting to a new environment.

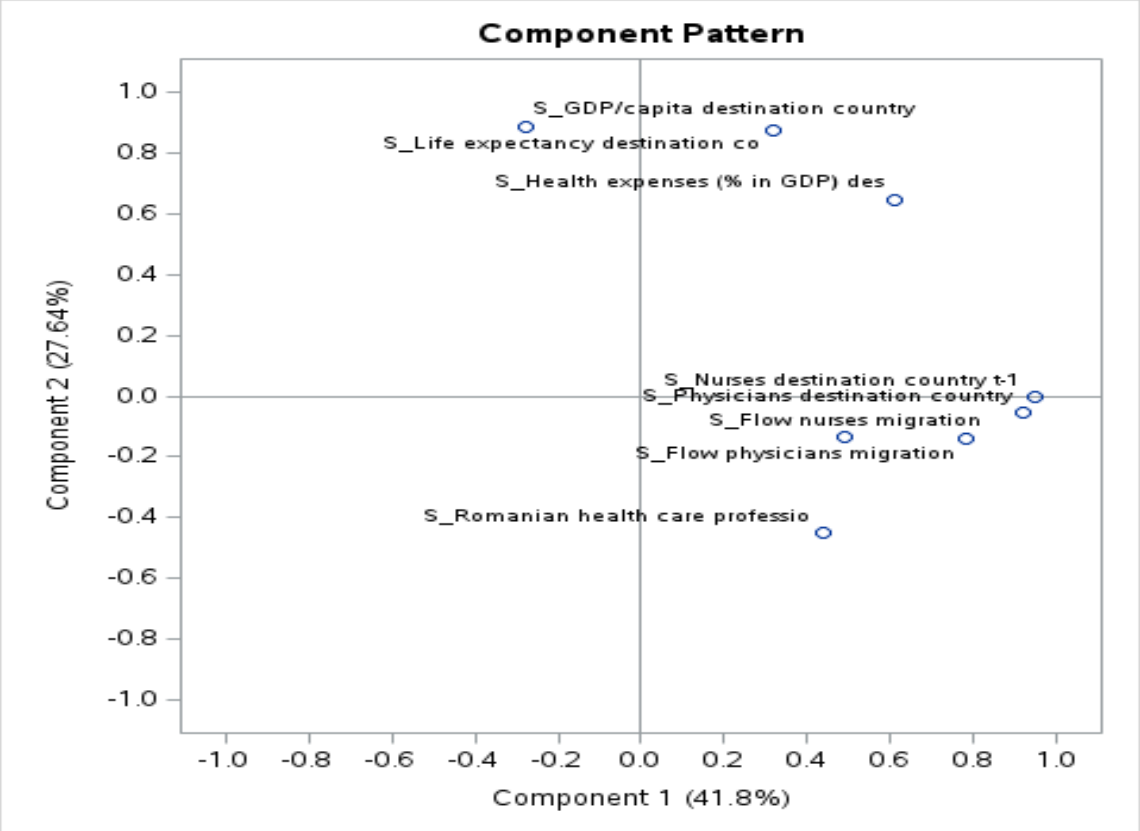


Figure 4. The projection of standardized variables on the first two principal components

Source: authors' own results.

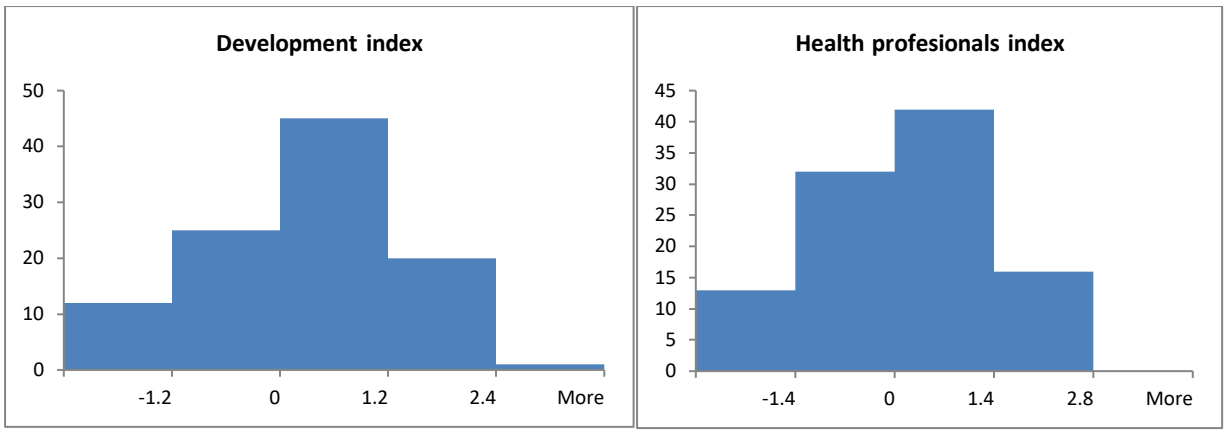


Figure 5. The distribution of the two indexes

Source: authors' own results.

In order to answer to the third research question, **"RQ3. What are the primary pull factors influencing the migration of health workers from Romania?"** we have applied one more time principal component analysis but only on standardized exogenous variables such that to obtain two new uncorrelated components that could be included in the panel data analysis. The projection of our data on the first two principal component variables explains 84,4% of the total variance. The first principal component, denoted by **Development index**, is determined by the variables GDP per capita, Life expectancy, Health expenditure, and HDI and the second principal component, denoted by **Health professionals index,** is determined by the number of nurses and the number of physicians. In Figure 5, we observe that the distribution of these new variables is very close to the normal distribution.

Finally, four distinct panel data regression models (Astuti et al., 2020) were estimated to explain the impact of push factors (two models for initial variables as exogenous variables and two models for Development and Health professionals' indexes as exogenous variables) on the migration flows of physicians and of nurses. The results corresponding to these models are delineated in Table 3. All models include fixed effects, and their statistical significance has been confirmed through the F test for the absence of fixed effects. To address heteroscedasticity, we employed the HCCME0 covariance matrix estimator in the model corrections. The hypotheses related to residuals have undergone a thorough verification, as detailed in Annex 2.

In the first model, we observed that the migration flows of physicians are positively influenced by the developmental disparity between destination and origin countries. Moreover, the migration flows are notably higher in countries where a Romanian health care community is developed. However, the emigration of Romanian physicians is more substantial in countries with a relatively modest allocation from GDP to health expenditure. This suggests that in these countries, the local population may not be attracted by this profession, likely due to a lack of significant national recognition or to a very high difficulty in obtaining a diploma for this profession.

Table 3. Panel data regression models

Equation		**Model 1**	**Model 2**	**Model 3**	**Model 4**
Dependent variable		**Ln(physicians)**	**Ln(nurses)**	**Ln(physicians)**	**Ln(nurses)**
Independent variables	Romanian health care professionals community	0.93^{***}	-0.52^{NS}	0.35^{NS}	$-0,35^{NS}$
	DHDI (destination-origin country) (t-1)	22.96^{***}			
	HDI (destination-origin country) (t-1)	-	-20.71^{NS}		
	Health expenditure_destination country (t-1)	-0.59^{***}	0.98^{***}		
	Life expectancy destination country (t-1)	-	-0.42^{NS}		
	GDP per capita destination country (t-1)	-	0.000279^{*}		
	Development index			-0.33^{***}	0.63^{***}
	Health professionals index			-1.45^{***}	0.99^{***}
	Intercept	8.2^{***}	41.36^{**}	6.44^{***}	
Fixed effects	Austria	-2.49^{***}		-6.83^{***}	
	Belgium	-0.91^{***}	-2.58^{***}	-3.64^{***}	0.58^{NS}
	France	1.52^{***}	-5.50^{***}	1.13^{***}	-5.05^{***}
	Germany	-0.31^{NS}	-1.63^{***}	2.38^{***}	-2.28^{**}
	Hungary	-1.42^{*}	1.83^{NS}	-3.78^{***}	0.36^{NS}
	Italy	-1.64^{***}	2.54^{**}	-1.57^{***}	-0.10^{NS}
	Norway	-2.41^{***}	-12.10^{**}	-5.95^{***}	-0.72^{NS}
	Sweden	-0.95^{***}	-7.45^{***}	-3.93^{***}	-2.79^{***}
	the UK	Ref	Ref	Ref	Ref
R^2		0.93	0.89	0.88	0,87
Number of cross sections		9	8	9	8
Time series length		11	11	12	12
Number of observations		88	82	78	82
Fvalue (fixed effects)		41.23^{***}	36.66^{***}	24.61^{***}	54.56^{***}

Source: authors' own results.

From the third model, it can be deduced that migration flows are inversely correlated with both the Development index and the Health professional index. Consequently, the factors attracting physicians' migration include the presence of Romanian health professionals' communities in the destination country and a lower level of health professionals in the destination countries. The variables included in the Development index do not act as a significant attractor for migration within the EU.

In case of emigration flows of nurses, the situation is different. According to the second model, we note that Health expenditure and GDP per capita exhibit a positive and significant correlation with the emigration flows of nurses. Additionally, from the fourth model, it is evident that the Development index and Health professionals index are positively correlated with emigration flows. Hence, the factors attracting the migration of nurses include the development level and a high presence of health professionals in destination countries. In particular, the existence of Romanian communities of health professionals in the destination country does not appear to be a significant pull factor for nurses' migration.

Conclusions

The main findings of this analysis align with the primary objective of this paper, which is to comprehend the patterns and motivations underlying the migration of Romanian physicians and nurses. This understanding is pivotal for policymakers and healthcare organizations to effectively address shortages and imbalances across various regions or medical specializations in Romania.

The primary countries favored by Romanian physicians are France, the UK, and Germany, while Romanian nurses predominantly prefer Germany, Italy, and the UK. France and Germany host the most significant communities of Romanian physicians, whereas Italy and the UK have the largest communities of Romanian nurses. Across all destination countries, two or three distinct migration periods for Romanian physicians and nurses between 2011 and 2021 are discernible. Each period and country exhibit specificities in terms of migration flows and stocks, as well as in the permanence or temporariness of health professionals' migration. Germany stands out as the leader in health care professionals' migration flows, experiencing two distinct migration periods: the first marked by exceptionally high levels of physician migration and the second characterized by increasing levels of nurses' migration. In France, both physicians' and nurses' migration flows have decreased over time, yet when migration occurs, it tends to be permanent, with stocks consistently increasing throughout the analyzed period. Conversely, health professionals' migration in Italy is predominantly temporary, primarily among nurses.

In terms of pull factors, the most important pull factors are: the opportunities for employment and career growth; good working conditions, advanced medical technologies, and overall improved healthcare infrastructure and also the presence of a supportive network from their home country that could make the transition easier for new migrants, providing a sense of belonging and assistance in adapting to a new environment.

Finally, through panel data regression analysis, we demonstrated that the pull factors for physicians' emigration differ from those for nurses. For physicians, it is crucial to find a Romanian community of health professionals and a low level of health professionals in the destination country to secure desirable employment. The development level of the destination country is of lesser importance, given the high development levels of Western European countries. In contrast, for nurses, the development level of the destination country, in terms of wealth and the health system, plays a significant role.

However, it is essential to acknowledge a limitation in our study, primarily stemming from potential gaps in the availability of comprehensive data. Variations in data reporting practices among different countries may introduce discrepancies or limitations in the accuracy of the information used for the analysis. Future research efforts could benefit from more recent and comprehensive data, potentially addressing any potential gaps and improving the depth of understanding regarding health professionals' migration dynamics.

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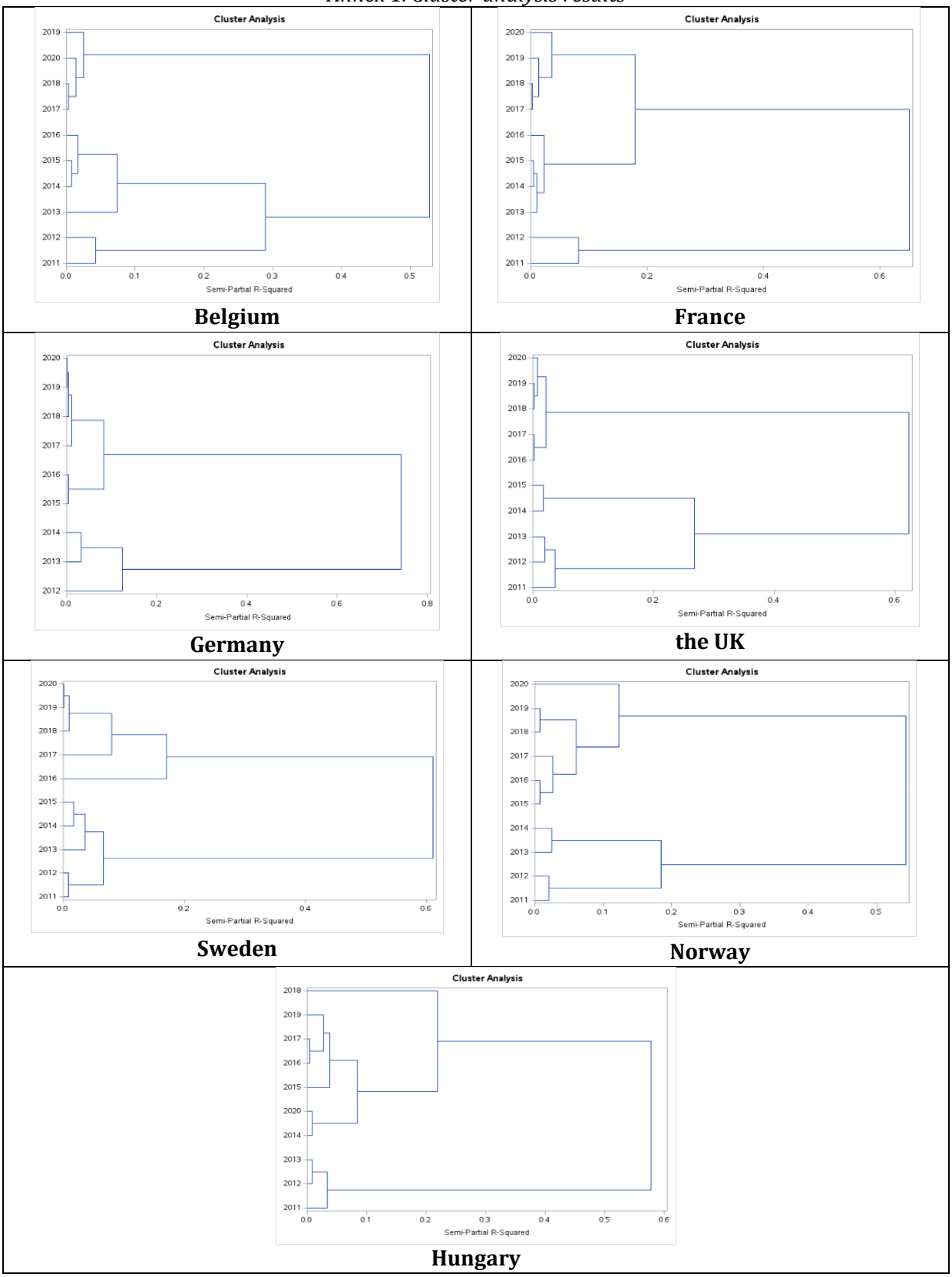
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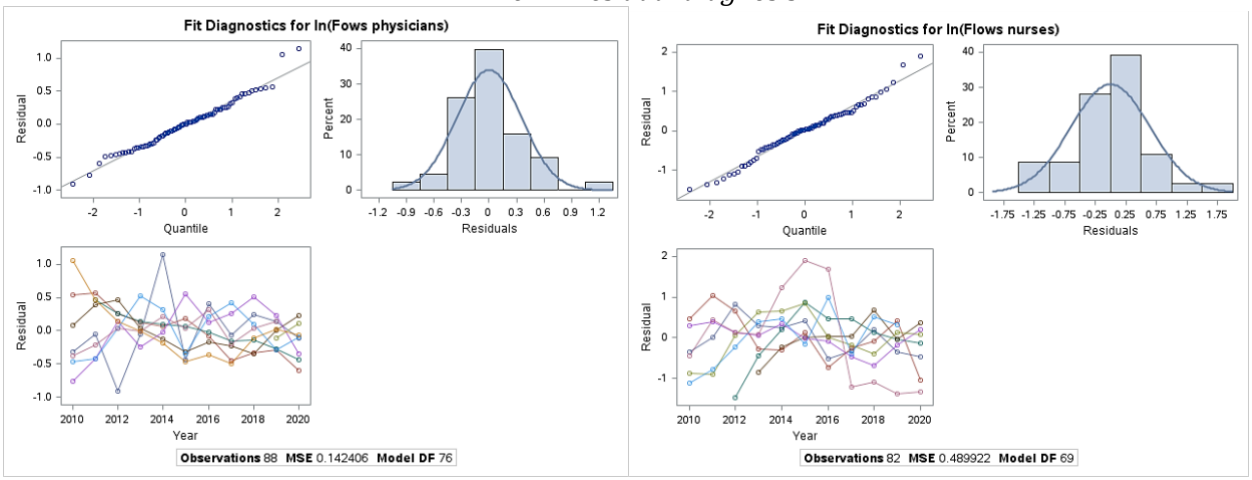
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Annex 1. Cluster analysis results

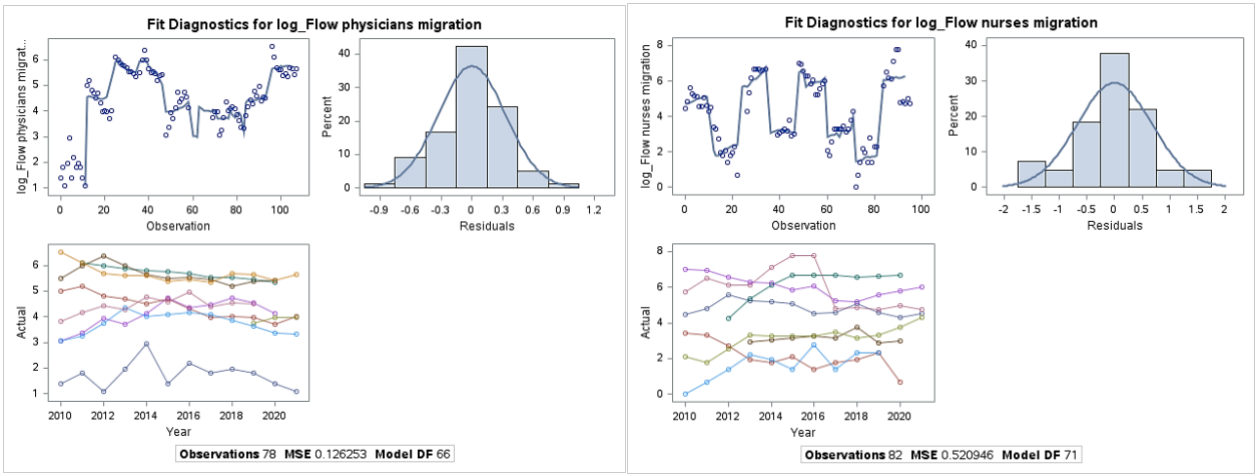


Source: authors' own contribution.

Annex 2. Residual diagnosis



Model 1 **Model 2**



Model 3 **Model 4**

Source: authors' own results.