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DOCTOR MIGRATION: UNPACKING ECONOMIC AND SOCIAL IMPACTS

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Abstract: *Health expenditures are vital indicators of a nation's social and economic progress, playing a key role in welfare and sustainable development. A well-functioning healthcare system relies on an adequate and skilled workforce, yet many countries face shortages, prompting reliance on international labor migration. This study investigates the economic and social drivers of health labor migration, focusing on doctors in 15 high-income countries from 2011 to 2019. Using panel data analysis, we found that lower wages significantly drive migration, with a 1% increase in wages reducing health worker migration by 0.08%. The results underscore the importance of fair remuneration in retaining healthcare professionals within their home countries. Moreover, destination countries with better training infrastructure and career advancement opportunities create additional pull factors, compounding the challenges faced by source countries. Globalization further facilitates migration by lowering barriers and harmonizing professional standards. These findings highlight the urgent need for policy interventions to address wage disparities and mitigate brain drain while ensuring global health workforce equity.*

Keywords: *Health, Reasons for Migration, Panel Data Analysis*

1. Introduction

Health expenditures are one of the important indicators of social and economic development. Additionally, expenditures on the health sector are among the most basic elements of welfare and sustainable development. For a health system to achieve its primary purpose, which is to provide health services, it must have a sufficient number and quality of healthcare workforce capacity. Building the necessary capacity is possible by employing appropriate health workers at the right place and at the right time. This capacity can be created from domestic resources as well as through the employment of foreign resources (Diallo, 2004, p. 603). International migration of healthcare professionals has become an increasingly important issue on the international health policy agenda in recent years. Brain drains of highly qualified human capital are an important social phenomenon. When we look at the causes of migration in general, external migration is made from low-income countries to higher-income

countries to improve working conditions and economic conditions. The top-level factors that determine the general dynamics of the free movement of healthcare workers are globalization, technological developments, aging of the population, economic and political factors, increasing societal expectations, changing disease patterns, EU dynamics, and international organizations. According to this, the factors in the upper plan are mainly composed of factors other than families and individuals (WHO, 2023).

This study aims to contribute to the literature by examining the top-level factors, econometrically, for developed economies and supporting them with empirical practice. In this way, this migration movement of health workers will be examined and tried to be better understood. To better understand the dynamics of the econometric model, the 7 top factors that explain the reasons for migration, as identified by WHO (2000), will be detailed. First, when we consider the concept of globalization, it is a dynamic process that covers the mobility of the workforce through its structure and nature. Thus, globalization is highly intertwined with the international movement of the health workforce. Free trade agreements are an important dynamic of globalization, and this affects the health sector significantly by accelerating international migration and reducing the barriers to the movement of goods and services, people, and even health workers (Bundred, Matineau, and Kitchiner, 2004, p. 77-78; Martineau, Decker et al., Kitchiner, 2002, p. 3-4). In addition, with the increasing global trade, specialized institutions dealing with the employment of international health workers are also increasing, thus maintaining international migration mobility (WHO, 2006).

Another important development related to globalization in health workforce migration is that various occupational groups, including health professions, have achieved common standards in certain areas. Another factor is that the decreasing barriers between borders with international agreements have led to the emergence of new legal frameworks that control the circulation and production of the health workforce. When it comes to the technological innovation factor, it is a factor that increases and offers alternative opportunities in the supply and structuring of health services. It is the dynamics in the light of new technologies by keeping the scientific knowledge skills and usability in the health workforce. Development in technology determines the type of work to be performed or the services to be provided, the environment, and the structure of the practices, and its impact on the health workforce is very important. With the development of technology, new service areas have emerged, leading to a change in the form of supply and professional talent components in the service structure, bringing the demand for healthcare professionals who will work in these areas (OECD, 2008).

However, access to information on opportunities and gaps in relevant positions on global migration has been facilitated by the widespread use of the Internet, that is, job search processes are simplified and accelerated with the Internet. Developments in technology cause the migration of the health workforce in two different ways. First, new business areas and increased specialization increase the need and demand for healthcare professionals. Secondly, the fact that the countries have underdeveloped technology is a factor that increases the health workforce migration to countries with better technology, to countries with higher technology to get education and even to work (OECD, 2007).

Demographic trends are another crucial component of health workforce optimization, influencing both the makeup and delivery of the health workforce directly and indirectly thro

ugh thedemand for goods and services (Dubois, Mckee et al., Rachel, 2006). Considering the population dynamics, while life expectancy at birth increases, the fertility rate decreases and the population is getting older, especially in developed countries (Dubois, Mckee, & Rechel, 2006; RAND, 2005; Lanzieri, 2008). With the increasing elderly population in population dynamics, health needs and disease structures are also changing (WHO, 2008). This change increases the demand for a larger healthcare workforce by increasing the need for healthcare services. In addition, with the increasing number of elderly people in the population dynamics, the health workers in that country are both aging and decreasing in number. Therefore, the need for a health workforce increases bilaterally, with both the decreasing health workforce in that country and the increase in the elderly population in the changing population dynamics.

In developed countries such as Norway, Sweden, France, Denmark and Iceland, the effects of changes in population dynamics on the health workforce are quite clear. Since the average age of nurses is in the 41-45 age band, aging nurses are experiencing labor force problems (WHO, 2007). Similarly, these problems apply to doctors. In New Zealand, the average age of physicians is 44, while nurses are 43, and allied health workers are over 40. In France, 55% of physicians were under the age of 40 in 1985, but this rate decreased to 23% by 2000 (Dubois, Mckee and Rechel, 2006; Bagat and Sekelj, 2006, p. 378). Between this demand and supply in healthcare, the workforce is met by the imported labor force, rather than policies aimed at encouraging participation in the workforce, especially by developed countries. Developed countries especially do not produce the unhealthiest workforce and consciously prefer imported workforce (WHO, 2006). Because by policy makers, eliminating the health workforce gap is seen as a situation that needs to be solved urgently. This is because it takes 3 to 5 years to train a nurse, while it takes 15 to 20 years to train a senior doctor, similarly. Therefore, when the imported health workforce is preferred, the health workforce shortage problem can be solved urgently, without training costs (Buchan, 2007, p. 10).

Economic conditions also play a crucial role in driving health worker migration. Research indicates that migration often flows from less affluent nations to more prosperous ones. However, movement also occurs among developed countries, driven by opportunities for improved quality of life and professional benefits. Furthermore, rising societal expectations, fueled by advancements in education, globalization, and technology, have made populations more aware and demanding. With these heightened expectations, healthcare professionals strive to enhance their expertise and seek environments offering advanced education, cutting-edge technology, and efficient administrative systems. This pursuit of better prospects significantly influences health workforce migration patterns.

This paper addresses a critical gap in the literature by focusing on the economic and social drivers of doctors' migration within developed economies, an area that remains under-explored. It provides empirical insights using panel data analysis to uncover how factors like wages, globalization, and human development influence the migration of health workers. The structure of the paper is as follows: the next section reviews the relevant literature, followed by an analysis of the key factors driving health worker migration and their implications.

2. Literature Review

When the international migration literature of healthcare professionals is examined, it is possible to encounter many different studies. The international migration of health workers,

which is frequently on the agenda today, is not the first time that it has come to the fore. It is seen that researchers studied the reasons for the migration of health workers such as physicians and nurses to another country in 1962 (Seale 1962). In previous years, it is seen that the most important reasons for migration are from countries with lower economies to countries with higher welfare. Here, the occupational group that has the largest share of health migration is doctors compared to nurses. However, the number of nurses emigrating after doctors is quite high (Mej'ia et al., 1979). Physicians are a more attractive profession group compared to nurses in terms of immigration country. Because physicians receive more training compared to nurses and this causes a higher cost (Bezuidenhout et al., 2009; Saluja et al., 2020).

Medicine is one of the highly skilled professions in Europe. It is also quite inadequate in terms of workforce (Becker and Teney, 2020, Botezat and Ramos, 2020). In this respect, it has been subjected to serious criticism in the public due to the immigration of doctors who have completed their specialization to a better European country due to free movement in Europe (Żuk et al., 2019). The reasons for migration vary from country to country. A better career and quality of life has been on the main causes of migration in countries in the southern part of Europe (Becker and Teney, 2020). Some of the doctors working in the United Kingdom stated that the working hours are too much and this situation disrupts the balance between work and life, and they want to migrate because they cannot get enough help from their colleagues (Brugha et al., 2020). 34% of doctors who immigrated from Poland stated that high earnings and better working conditions were among the reasons for their migration (Dubas-Jakonczyk et al., 2020). Health workers in Ireland, on the other hand, stated that they had to migrate because they were not satisfied with their working conditions and thought that their career prospects would be bad (Brugha et al., 2020).

Martineau et al. (2002), examined the international migration of healthcare professionals from historical, contemporary, and future perspectives. While some of the world's wealthiest countries have benefited from international migration, some of the world's poorest countries have said it has had an overall negative impact on healthcare. However, they added that the responsibilities of both source and recipient countries need to be clarified, saying that the effects on international migration are often more complex than portrayed. They underlined that despite the development of codes of practice regarding ethical international recruitment, the increase in the demand for healthcare professionals is inevitable, and they stated that more radical strategies are needed to protect the health systems of the world's poorest countries.

Võrk et al. (2004), analyzed the size and determinants of potential migration flows of Estonian health professionals using a 2003 opinion survey. According to the results of the analysis, it has been reached that about half of the Estonian health workers, about 5% of them want to work abroad, either permanently or temporarily. The results of the logistic regression models show that the intention to migrate depends on the usual socio-demographic and economic variables such as age, gender, marital status, living area, risk of losing a job, and dissatisfaction with current wages.

Mcelmurry et al. (2006), argue that international nurse migration is a natural and expected situation. Migration flow models have stated that it occurs largely from developing countries to developed countries, and in their study, they examine nurse migration using primary health care (PHC) as an ethical framework. While PHC principles state to bring

healthcare as close as possible to where people live and work, nurse migration often moves nurses away from where they are most needed, and this conflicts with the principles of health for all. They stated that nurse migration policies and procedures should address nurse workforce migration, and that fair financial arrangements and PHC ethical criteria could be met and improved.

Henderson and Tulloch (2008), show that there is no global model for improving the retention and performance of health workers. While economic factors play an important role in workers' decisions to stay in the health sector, the evidence shows that they are not the only ones, saying that this is a critical issue that needs to be addressed through the policy, planning and implementation of innovative strategies such as incentives to retain and motivate healthcare workers in Pacific and Asian countries. Based on research findings from the Asia-Pacific region, they concluded that salaries and benefits, along with working conditions, supervision and management, and education and training opportunities, are important. They underlined the offering of financial and non-financial incentives in the form of packages.

Bradby (2014), pointed out that the widely estimated reason for the shortage of skilled health personnel in Africa is the widespread belief that rich countries are stealing trained health professionals from poor countries. They have criticized this widespread notion that it promotes medical professional interests and ignores historical patterns of underinvestment in health systems and structures. In response to the global debt crisis of the late 1970s, African countries had to prioritize investment in their social sectors, including health and education, in favor of promoting an export currency, and poor working conditions in areas where HIV spread led to a migration of medical personnel. pointed out that it exacerbated the famine. They also said that together with globalization, the means and most importantly the motivation to migrate between nations and continents causes the unavoidable desire for migration and it is very difficult to regulate.

Gruber et al. (2020), investigated the immigration of Croatian doctors after Croatia acceded to the EU. According to their study there are both economic and non-economic factors that affect the choice of individuals to migrate. For Croatian physicians, the benefits of immigration are expressed in higher satisfaction with standard of the living, income, professional development and better working conditions. However, they also point out that there are some clear psychological costs, such as being away from family members, friends and familiar surroundings, mastery of another language, which hinder immigrants and their families and make it difficult to establish a social network and integrate into society. They say that high-income countries should strive for self-sufficiency by training, retaining and maintaining sufficient numbers of doctors to staff their health systems.

Hagopian et al. (2005), investigated the immigration of West African-trained doctors to rich countries, especially the USA and England. In their study, qualitative data were collected from six medical schools in Africa to investigate the magnitude, causes and consequences of migration. According to the results of the research, they concluded that there is a developed medical migration culture. They also concluded that this culture is firmly rooted and even encourages immigration, and that they are proud of their students who migrated as role models in medical school.

When the literature is evaluated in general, international migration movements of health workers have been examined from different perspectives. When the literature is considered

from a broad perspective, it is generally deduced that countries that migrate their health workforce should protect their health workforce by regulating their migration policies.

3. Methodology

In this study, we analyzed a group of 15 high-income countries, estimating coefficients using both random effects and fixed effects models through panel data analysis. These countries were chosen based on their high Human Development Index (HDI) rankings. Additionally, they are classified as middle- or high-income economies under the European Union's economic classification system. The primary reason for selecting developed countries is the availability of comprehensive data and evidence from the literature indicating significant health worker migration occurring between developed nations. The selected countries are as follows:

Table 1. Developed Countries Group

Belgium	Estonia	Germany	Ireland	Slovenia
Czech Republic	Finland	Holland	Italy	United Kingdom
Denmark	France	Hungary	Norway	

This study utilized the Stata-17 software package for data analysis, following a methodology similar to that employed by Rutten (2009). Panel data analysis was chosen as it enables multiple observations to be gathered from the same sample over time. The functional model applied in this analysis is structured as follows:

$$Y_{it} = \alpha_{0it} + \beta_{1it}X_{1it0} + \beta_{kit}X_{kit} + \varepsilon_{it} \quad (1)$$

$$i = 1, 2, 3, \ldots, N \;\; t = 1, 2, 3, \ldots \;, T$$

In equation (1) shown above i cross sections, t represents the unit of time. In this equation, there are individual effects that cannot be observed in terms of independent variables, do not change over time, but include cross-section-specific features. It is also included in the error term of the different effects of the units (Baltagi 2005, p. 11-12).

There are two basic approaches used in regressions with panel data. The first of these is the "Fixed Effects Model" while the other is the "Random Effects Model". In the fixed effects model, a different fixed value occurs for each cross-section. It is assumed that the slope coefficients in the model (β) do not change, however, the constant coefficients can vary only between cross-section or time data, or even within both. If differentiation is only time-dependent, it is called a one-way fixed effects model. However, if the differentiation between data depends on both cross-section and time, it is called a two-way fixed effects model.

However, in panel data analysis, the cross-section effect is considered rather than the time effect, so panel data models appear as one-way models (Hsiao 2002, p. 30). The fixed effects model can be shown as equation (1) and equation (2) as one and two-sided, respectively, as follows;

$$Y_{it} = (\alpha_{it} + \mu_{it}) + \beta_{1it}X_{1it} + \beta_{kit}X_{kit} + \varepsilon_{it} \quad (2)$$

$$Y_{it} = (\alpha_{it} + \mu_{it} + \lambda_{it}) + \beta_{1it}X_{1it} + \ldots + \beta_{kit}X_{kit} + \varepsilon_{it} \quad (3)$$

There εit $\approx$ iid $(0, \sigma 2)$ is an assumption here. In other words, ε_{it} It is assumed to have a white noise feature. In addition, the independent variables are independent of the error term (Baltagi 2005, p. 12). In the fixed effects model, different constants are estimated for each cross-section, ensuring that the constant coefficient is different for the cross-sections.

In the random effects model, changes in sections or time-dependent changes in sections are included in the model as a component of the error term. Compared to the fixed effects model, its prominent feature is that there is no loss of degrees of freedom. It also allows the inclusion of out-of-sample effects in the model. The random effects model can be shown as follows;

$$Y_{it} = \alpha_{it} + \beta_{1it}X_{1it} + \ldots + \beta_{kit}X_{kit} + (\mu_{it} + \lambda_{it} + \nu_{it}) \quad (4)$$

$$Y_{it} = \alpha_{it} + \beta_{1it}X_{1it} + \ldots + \beta_{kit}X_{kit} + (\mu_{it} + \lambda_{it} + \nu_{it}) \quad (5)$$

Equations (4) and (5) represent the one-way and two-way random effects models, respectively. The error term in these models consists of two distinct components. $\nu_{it} \approx$ iid $(0, \sigma 2)$ and $\mu_i \approx$ iid $(0, \sigma 2)$there is an assumption. μ_i error term,$i = 1, 2, 3, \ldots, N$ The first component represents the value of a cross-section that remains constant across the time dimension. Conversely, the second component accounts for the remaining parts that vary over time but are interconnected within the time dimension. This component is independent of the section effect within the model. Additionally, both components are uncorrelated with any independent variable. Consequently, these components, along with the overall model, are consistent and unbiased when estimated using the least squares method.

3.1.Data Description and Variables

The model includes the following variables: GERD [a high GERD/GDP ratio can be used to measure a country's success in technological advancement and knowledge creation (R&D intensity), migration of specialist doctors, wages of health workers (in US dollars), and the population aged 65 and over (percentage of the total population).Data on R&D expenditures as a percentage of GDP, the Human Development Index (HDI), and the Globalization Index (KOF) were gathered annually for 15 nations between 2011 and 2019. Globalization (KOF) from the Swiss Institute of Economics, HDI from the UNDP, migration of specialist doctors (MIG), wages of health workers (WAGE), population aged 65 and over (POP), and GERD were all sourced from the OECD. The following is a summary table that provides the sources and explanations for the variables.

Table 2. Table of Variables

Variables	**Explanation**	**Resources**
mig	Migration of specialist doctors	OECD
wage	Wages of health workers (us dollars),	OECD
hdi	Human Development Index	UNDP
pop	The population aged 65 and over (percentage of the total population)	OECD

gerd	The high GERD/GDP ratio can be used to measure a country's success in a technological advancement and knowledge creation (R&D intensity).	OECD
kof	Globalization index	OECD

In the study, 15 groups of developed countries were chosen between 2011 and 2019, and with the aid of panel data analysis, the coefficients were attempted to be estimated using the fixed effects model and the random effects model. The model uses logarithmic form for the wage and mig variables. The following is the econometric model that was developed.

$$(Inmig)_{it} = \beta_0 + \beta_1(In\text{wage})_{it} + \beta_2(\text{hdi})_{it} + \beta_3(\text{pop})_{it} + \beta_4(\text{gerd})_{it} + \beta_5(\text{kof})_{it} + \varepsilon_{it} \quad (6)$$

In equation (6), **lnmig** serves as the dependent variable, while **lnwage**, **hdi**, **pop**, **gerd**, and **kof** are the independent variables. The constant term coefficient of the model is denoted by β_0, while β_1, β_2, and subsequent terms represent the coefficients of the explanatory variables. The model's error term, denoted by ε, captures unexplained variability not accounted for by the independent variables.

3.2.Empirical Strategy

The descriptive summary statistics of the variables used in the model are as follows.

Table 3. Summary Statistics

Stat.	lnmig	lnwage	hdi	pop	gerd	kof
Mean	10.71	11.52	0.91	17.7	2.23	85.3
Median	10.40	11.77	0.92	18.1	2.14	85.8
Maximum	12.92	12.41	0.96	22.9	5.14	91.1
Minimum	8.54	9.99	0.83	10.1	1.17	75.7
Std. Dev.	1.26	0.64	0.03	2.82	0.84	3.85

The variables utilized in the Table 3 are summarized statistically. There are no outliers in the data set when the statistics are analyzed generally. Furthermore, the variables employed in the summary are also used to extract a priori information from their correlation links. The variables utilized in the model have the following correlation table.

Table 4. Correlation Statistics

Corr.	lnmig	lnwage	hdi	pop	gerd	kof
lnmig	1.00					
lnwage	0.29	1.00				
hdi	0.06	0.79	1.00			
pop	0.41	-0.23	-0.03	1.00		
gerd	-0.05	0.39	0.36	-0.27	1.00	
kof	0.41	0.40	0.41	0.41	-0.21	1.00

It is evident from examining the correlation relations via demonstrating in Table 4 that there are strong relationships between the variables. Wages and health migration have a positive correlation of 0.29, the population over 65 has a positive correlation of 0.41, and the globalization index has a positive correlation of 0.41. Gerd, which represents high technology, is negatively correlated with health migration.

Table 5. Panel Data Regression Estimates

Model	LnWAGE	HDI	KOF	POP	GERD
Fixed Effects	-0.078(0.007) ***	5,997(0.000) ***	0.011(0.097) *	-0.005(0.460)	0.018(0.148)
Random Effects	-0.076(0.009) ***	5,919(0.000) ***	0.011(0.080) *	-0.005(0.500)	0.018(0.149)
Hausman		10,934 (0.052)*			

1- *, ** and *** indicate critical values at 10%, 5% and 1% significance levels, respectively.
2- Values in parentheses indicate probability values.
3- According to the Hausman test, the Fixed Effects Model was found to be preferable.

In Table 5, we may observe Fixed and Random effects throughout the independent predictors. When the coefficients in the fixed effects model are interpreted; As expected, a negative and significant relationship was found between the migration of health workers and the wages of health workers. A 1% increase in wages reduces the migration of health workers by 0.08%.

As anticipated, a positive and significant relationship was identified between health worker migration and globalization. Specifically, a one-unit increase in globalization leads to a 0.01-unit rise in healthcare worker migration. Similarly, a significant connection was observed between health worker migration and human development, with a one-unit increase in the human development index resulting in a 5.9-unit rise in migration. However, in the current model sample, no significant relationship was found between the proportion of the population aged 65 and over, GDP expenditures on R&D, and the migration of health workers.

4. Conclusions

This study aims to contribute to the literature by supporting the top-level migration reasons of health workers, for developed economies, by modeling them econometrically and supporting them with empirical practice. In our study, 15 high-income country groups were selected, and the coefficients were tried to be estimated using the random effects model and fixed effects model with the help of panel data analysis. This country group has been selected according to countries with a high human development index. In addition, this group of countries is classified as middle or high-income economies according to the economic classification of the European Union.

According to panel data regression estimations, lnwage and HDI variables were significant in 1% and of variable in 10% in both fixed and random effects models. Pop and GERD variables are not statistically significant. According to the Hausman test, the Fixed

Effects Model was found to be preferable. When the coefficients in the fixed effects model are interpreted; As expected, a negative and significant relationship was found between the migration of health workers and the wages of health workers. A decrease in wages due to the desire to increase welfare from one country to another is a factor that increases health workforce migration. In this analysis for developed economies, a 1% increase in wages reduces the migration of health workers by 0.08%.

A clear and significant positive relationship was observed between globalization and the migration of health workers. Globalization, as a dynamic process, inherently facilitates workforce mobility by breaking down barriers and establishing common professional standards across borders. Consequently, health professionals are less inclined to work in countries with lower welfare levels if the nature of their work remains unchanged. Furthermore, international agreements have introduced legal frameworks to regulate the movement and production of the health workforce. In the context of developed economies, a one-unit rise in globalization correlates with a 0.01-unit increase in healthcare worker migration.

Similarly, a strong positive relationship was identified between migration and human development. This is unsurprising given that the countries examined in this study are developed nations. Literature suggests that migration often occurs between developed nations, driven by factors such as wage differentials. The Human Development Index (HDI), comprising health, education, and income components, highlights that income changes play a significant role in influencing labor migration. In this analysis, a one-unit increase in HDI corresponds to a 5.9-unit rise in healthcare worker migration. However, no significant relationship was found between migration and variables such as the proportion of the population over 65 years or GDP expenditure on R&D in this sample, rendering them uninterpretable.

Health workforce migration poses a significant loss of human capital for emigrant countries and presents challenges to national economies. Policymakers must adopt diverse strategies to protect the welfare of health workers at international standards and retain this skilled workforce domestically, ensuring sustainable human capital through harmonized standards.

REFERENCES

1. Bagat, M., & Sekelj Kauzlarić, K. (2006). Physician Labor Market in Croatia. *Croatian Medical Journal*, *47*(3), 376-384.
2. Baltagi, Badi. H., (2005). Econometric Analysis of Panel Data, Third Edition, John Wiley & Sons Ltd., West Sussex, England.
3. Becker, R., & Teney, C. (2020). Understanding High-Skilled intra-European Migration Patterns: The Case of European Physicians in Germany. *Journal of Ethnic and Migration Studies*, *46*(9), 1737-1755.
4. Bezuidenhout, M. M., Joubert, G., Hiemstra, L. A., & Struwig, M. C. (2009). Reasons for Doctor Migration from South Africa. South African Family Practice, 51(3).
5. Buchan, J. (2007). Health Worker Migration in Europe: Assessing the Policy Options. *EUROHEALTH-LONDON-*, *13*(1), 6.
6. Bundred, P., Martineau, T., & Kitchiner, D. (2004). Factors Affecting the Global Migration of Health Professionals. *Harvard Health Policy Review*, *5*(Fall), 77-78.

7. Bradby (2014). "International Medical Migration: A Critical Conceptual Review of the Global Movements of Doctors and Nurses**",** Health, Vol. 18(6)**.**

8. Brugha, R., Cronin, F. M., Clarke, N., Conroy, R., & Hendrick, L. (2020). Factors Influencing Specialty Choice and the Effect of Recall Bias on Findings from Irish Medical Graduates: A Cross-Sectional, Longitudinal Study. *BMC Medical Education*, *20*, 1-11.

9. Botezat, A., & Ramos, R. (2020). Physicians' Brain Drain-a Gravity Model of Migration Flows. *Globalization and Health*, *16*(1), 1-13.

10. Diallo, K. (2004). Data on the migration of health-care workers: sources, uses, and challenges. *Bulletin of the World Health Organization*, *82*(8), 601-607.

11. Dubas-Jakóbczyk, K., Domagała, A., Kiedik, D., & Peña-Sánchez, J. N. (2020). Exploring satisfaction and migration intentions of physicians in three university hospitals in Poland. *International Journal of Environmental Research and Public Health*, *17*(1), 43.

12. Dubois, C. A., McKee, M., & Rechel, B. (2006). Introduction: critical challenges facing the health care workforce in Europe. *WHO Regional Publications, European Series*, 2-18.

13. Europe, R. A. N. D. (2005). Population implosion? Low fertility and policy responses in the European Union. *RAND Research Brief, available at:www.rand.org/pubs/research_briefs/2005/RAND_RB9126.pdf*.

14. Grossman, Gene M. (1991). Elhanan Helpman, Innovation and Growth in the Global Economy, MIT Press, Cambridge, Mass.

15. Gruber, E., Sarajlic Vukovic, I., Musovic, M., Moravek, D., Starcevic, B., Martic Biocina, S., & Knez, R. (2020). Migration of Croatian physicians in the global context. *Medicina Fluminensis: Medicina Fluminensis*, *56*(2), 88-96.

16. Hagopian, A., Ofosu, A., Fatusi, A., Biritwum, R., Essel, A., Hart, L. G., & Watts, C. (2005). The flight of physicians from West Africa: views of African physicians and implications for policy. *Social science & medicine*, *61*(8), 1750-1760.

17. Henderson, L. N., & Tulloch, J. (2008). Incentives for retaining and motivating health workers in Pacific and Asian countries. *Human resources for health*, *6*, 1-20.

18. Hsiao, C. (2022). *Analysis of panel data*, Cambridge University Press, Second Edition, No:64.

19. Lanzieri, G. (2008). Statistics in Focus: Population and social conditions. Long-term population projections at national level. 2006.3.

20. Martineau, T., Decker, K., & Bundred, P. (2002). Briefing note on international migration of health professionals: levelling the playing field for developing country health systems. *Liverpool: Liverpool School of Tropical Medicine*, 3-4.

21. McElmurry, B. J., Solheim, K., Kishi, R., Coffia, M. A., Woith, W., & Janepanish, P. (2006). Ethical concerns in nurse migration. *Journal of professional nursing*, *22*(4), 226-235.

22. Mej'ia, A., Pizurki, H., & Royston, E. (1979). *Physician and Nurse Migration: Analysis and Policy Implications, Report on a WHO Study*. World Health Organization.

23. OECD (2007). Immigrant health workers in OECD countries in the broader context of higly skilled migration. International Migration Outlook SOPEMI.

24. OECD (2008). The looming crisis in the health workforce: How can OECD countries respond?. OECD Health Policy Studies.

25. Rutten, M. (2009). The economic impact of medical migration: a receiving country's perspective. *Review of International Economics*, *17*(1), 156-171.
26. Saluja, S., Rudolfson, N., Massenburg, B. B., Meara, J. G., & Shrime, M. G. (2020). The Impact of Physician Migration on Mortality in Low and Middle-Income Countries: An Economic Modelling Study. *BMJ Global Health*, *5*(1), e001535.
27. Seale, J. (1962). Medical Emigration from Britain, 1930-61. *British Medical Journal*, *1*(5280), 782.
28. Võrk, A., Kallaste, E., & Priinits, M. (2004). Migration intentions of health care professionals: the case of Estonia. *Cluj Napoca: Public Policy Center*.
29. WHO. (2023). *WHO report on global health worker mobility*. World Health Organization.
30. WHO. (2006). Working together for health: the World health report 2006: policy briefs. World Health Organization.
31. WHO (2006c). Migration of health workers. Fact Sheet. No: 301, World Health Organisation, Genava.
32. WHO (2007). Regional Office for Europe. Investing in the health workforce enables stronger health systems". Fact sheet 06/07 Belgrade, Copenhagen, www.euro.who.int/Document/Mediacentre/ fs0607e.pdf.
33. WHO (2008). The Kampala Declaration and Agenda for Global Action. World Health Organization Global Health Workforce Alliance, Genava.
34. Żuk, P., & Lisiewicz-Jakubaszko, J. (2019). Labour Migration of Doctors and Nurses and The Impact on the Quality of Health Care in Eastern European Countries: The Case of Poland. *The Economic and Labour Relations Review*, *30*(2), 307-320.