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MIGRATION IN THE CONTEXT OF INNOVATION: RESEARCH ON POLICIES TO ATTRACT SCIENCE AND TECHNOLOGY HUMAN RESOURCES IN ASIAN COUNTRIES AND EXPERIENCES FOR VIETNAM

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Abstract. *The migration wave is increasingly becoming the focal point of international discourse amid the rapid globalization. Consequently, the authors conducted a study on the impacts of migration in the context of innovation, specifically focusing on talent attraction in the Asia-Pacific region, particularly within the realm of Science and Technology. This article succinctly summarizes key theories regarding labor migration in the context of innovation, providing an overview of high-skilled labor exchange through the attraction of scientific and technological personnel across nations. Additionally, the article reflects on how migration influences the development of Science and Technology, as well as its economic implications. To conduct this research, the authors employed two primary research methods, including qualitative research through in-depth interviews with experts and*

quantitative research by analyzing composite indices from reputable organizations specializing in migration and innovation. The article emphasizes three Asian countries: South Korea, China, and Japan, all of which have excelled in advancing and enhancing their levels of scientific and technological expertise, along with their strategies for attracting skilled personnel. Policies focusing on recruiting high-quality labor with advanced knowledge are identified as pivotal factors determining their progress in this field. Consequently, in collaboration with expert consultations, the authors propose insights into policies for attracting quality human resources in the field of Science and Technology in Vietnam. This is intended to provide essential information for the government, businesses, educational institutions, and civil society.

Keywords: *innovation, migration, science and technology, human resources, talents*

Introduction

Innovation is recognized globally as a pivotal driver of national development and a fundamental asset for countries transitioning into knowledge-based economies. A prerequisite for fostering innovation lies in cultivating a highly skilled workforce endowed with creativity and innovative capabilities. Extant literature underscores the role of high-skilled migration in augmenting labor force quality and innovation potential. Investigating the nexus between high-skilled migration and innovation within Europe [1] demonstrate a positive association between a well-educated workforce and innovation outcomes, which holds true for both native high-skilled individuals and migrants, albeit to a lesser degree. Overall, research suggests a generally positive influence of skilled migration on innovation endeavors, albeit with certain exceptions, attributing this effect to the direct contribution of skilled migrants to research and innovation activities. Notably, empirical studies conducted on Science and Engineering (S&E) workers in the United States reveal a marked increase in the number of inventions attributable to immigrant inventors [2–6].

Migration, whether internal or international, remains a salient concern for countries worldwide. In Asia, internal migration trends are pronounced, with an estimated 280 million individuals, comprising over 6% of the population, engaging in interregional mobility [7]. Moreover, international migration has emerged as a prominent feature of contemporary globalization, with Asia witnessing a substantial influx of migrant workers. Authors[1] report a robust recovery in migrant worker numbers post-pandemic, with Bangladesh emerging as a key contributor to the migrant labor pool. The globalization process, as highlighted in the 2020 World Migration Report, fosters migration activities, particularly the mobility of scientific and technological human resources and entrepreneurs. Consequently, countries aspiring to foster innovation and develop knowledge-based economies are compelled to leverage highly skilled immigrant workers to drive sustainable economic growth.

The escalation of international migration, particularly in the Asian region, is well-documented [8; 9]. Notably, the International Labor Organization reports a steady rise in the number of workers migrating abroad, with China experiencing a notable increase in international migrants, a substantial proportion of whom migrate to Japan [10].

The nexus between migration and labor resource quality in the context of innovation is highlighted by Stojcic et al. (2015) [11] who stated manifold ways in which immigration movements can shape the labor force structure, fostering the emergence and success of new products and services. Moreover, research [12] emphasized a positive relationship between innovation and the influx of highly skilled immigrants, reaffirming the consensus that skilled migration bolsters innovation. Regions endowed with creativity and productivity are more likely to attract human talent, thereby fostering innovation and enhancing productivity levels.

[1] Migrant workers in Asia approach pre-pandemic levels // Nikkei Asia : [site]. 06.07.2023. URL: https://asia.nikkei.com/Spotlight/Work/Migrant-workers-in-Asia-approach-pre-pandemic-levels (accessed on 15.02.2024).

Recognized as pivotal for development, S&T human resources drive innovation and knowledge dissemination, essential for a knowledge-based economy. Adaptations in S&T human resource policies are crucial to meet evolving development needs. Notable efforts to innovate policies have been seen in Asian nations, like Vietnam, addressing modernization and industrialization demands. However, further efforts are needed to develop comprehensive solutions for training, recruitment, and utilization of S&T human resources, fostering their growth and integration into the workforce.

Literature review

Overview of migration and innovation

The theory of innovation development is still being formed in the absence of a single definition of this phrase. For the purpose of this research article, the research team will use the concept of innovation, which can be understood as the introduction of any new or significantly improved product or process using new methods. Previous research articles have had results related to the relationship between migration and innovation in regions with labour migration. Accordingly, the causal effect of immigration on innovation may exist for many reasons because there are a number of factors by which immigration can positively or negatively impact innovation [13]. According to J. Schumpeter [14] and R. Solow [15], the impact of immigration on innovation is mediated by the enhanced human capital base in "endogenous growth" theory. In this theory, migrants enhance local human capital, leading to the development of new technology, new knowledge and innovation. Additionally, in the neoclassical economic model which indicates that the main effect of immigration on innovation stems from the distribution of skills [16], workers of different cultures can generate different perspectives and ideas, more diverse in abilities and knowledge, thereby potentially stimulating innovation [17–19] and helps improve productivity in that country [20]. Furthermore, the diversity of geographically proximate industries promotes innovation and growth in cities [21], while diversity in urban environments also contributes to innovation at the regional level [22]. Research by A. Alesina and E. La Ferrara [19] has shown that cultural and demographic diversity facilitates the consideration of a large set of potential solutions and thus helps solve problems more quickly and flexibly, from which it can be seen that a more culturally diverse workforce will increase the ability to innovate. On the other hand, some studies have shown that labour migration can have a negative impact on innovation in the region. N. DiTomaso, C. Post, and R. ParksYancy [23] summarize that there appears to be a dilemma because while innovation and creativity are more likely to occur in heterogeneous groups, the ability to execute and integrate different ideas can decrease as heterogeneity increases. Within the framework of regional innovation systems, studies on the impact of migration on innovation can be found in other articles [24–26].

In addition to the impact of migration on innovation in the region with labour mobility, innovation in that region can promote and help increase labour migration. One of the reasons for attracting migrants is the comfortable living conditions, attractive business environment and strong production infrastructure along with modernization in the country's regions, at the same time the innovativeness of an area can encourage university graduates to seek jobs in that area [27] and technological innovation or the emergence of new industries will create new jobs and absorb more labour from other industries with lower labour productivity. Some other reasons for changes in labour productivity and labour restructuring are the level of investment, the level of research and development to create innovation, the degree of freedom of the labour market and increased short-term

employment [28].

Thus, there is various evidence through scientific research articles that have shown the related impacts between migration and innovation, through which the formation of new knowledge and innovation also contributes to promoting labour productivity along with subsequent growth.

Overview of brain exchange

Brain power is understood as intellectual work along with knowledge in various fields such as culture, art, scientific research, and technology. J. Salt [29] even defines brain power as a form of national asset. In this research, the research team will study the process of brain power exchange in the context of migration and innovation.

The process of brain exchange consists of two components: brain drain and brain gain [30; 31]. Brain drain refers to the phenomenon where highly skilled individuals move to another country to study, train, and build their careers, bringing their knowledge and talents to contribute to the development of the host country [32–34]. Brain gain, on the other hand, represents the positive values that migration brings not only to the host country but also to the home country [35]. The process of gray matter exchange occurs with the presence of both brain gain and brain drain, in both the home and host countries. Additionally, there is a concept of brain waste, which refers to high-skilled individuals moving to jobs that do not require the application of their skills and experience from their previous work – though this is not the focus of this study.

Most previous studies have shown that brain exchange impacts innovation. Immigration is associated with higher levels of innovation in the host country, and the short-term consequences for native residents are minimal. High-skilled immigrants drive the flow of knowledge and make direct investments in their home country, but it is not clear whether these benefits are sufficient to compensate for the potential downsides of brain drain [36]. Furthermore, return migration (re-migration) is an important source of creativity and entrepreneurship for their home country [37; 38] due to research-based innovation and the demand for high-level expertise in science and technology, as well as the application of foreign technologies [39].

In addition, the influence of innovation on the demand for brain exchange has also been affirmed in studies of globalization trends. The rapid process of globalization and changes in political, economic, and cultural conditions [40] are making the world flatter and lacking in innovation [41], increasing the demand for brain exchange. However, studies also indicate that this exchange is leaning more toward the brain drain aspect. Many developing countries are facing increasing emigration of people, especially those with talent who are dissatisfied with local economic, political, and social conditions [42]. The combined impact of brain drain and brain gain seems to be positive in countries with low emigration rates.

Overview of science and technology policy

In the context of globalization, creativity and innovation have expanded the framework for evaluating the economic effectiveness of science and technology policies. According to R. B. Freeman [43], adjusting immigration policies and providing scholarships for students working on advancing science and technology into new inventions is essential to enhance trade and innovation efficiency for nations. Rapid technological changes and global economic competition have led to a significant increase in the demand for high-skilled human resources in the fields of science and technology. Many countries are seeking ways to enhance their capacity to adopt new technology and have established education and research policies in science and technology to better meet the needs both domestically and

internationally [44].

Apart from attracting science and technology human resources from other countries to work for their benefit, countries also face losses of high-skilled labour emigrating to other developed nations. The United Nations recognized brain drain as a one-way migration that benefits only industrialized and developed nations. However, in the early 1990s, the return of highly skilled scientists to their home countries reinforced national science and technology systems in many places [45]. Furthermore, the emergence of Internet networks has created new methods of collaboration to connect foreign scientists with their national communities [46]. Thus, the mobility of science and technology human resources over time has taken new directions, but the importance of policies to attract these human resources remains a top concern for both developing and developed nations.

Research Methodology

Qualitative research method: Expert opinion methods

Following the formulation of the questionnaire, the researcher sought input from (number) experts within the domain of Social Science in Hanoi, enhancing the robustness of the evaluation process. The insights and feedback provided by these experts serve as a foundational framework for the research team, enabling them to validate the extent of the migration policy's impact on highly qualified migrants. Additionally, this expert consultation offers valuable input for the potential inclusion of new factors, if deemed necessary, thereby contributing to the refinement and completeness of the research instrument.

Quantitative research method

This research uses the quantitative research method, a method that involves the systematic collection, interpretation, and presentation of data. In this study, the data are secondary data taken from reputable sources such as The International Organization for Migration (IOM), the International Labor Organization (ILO), the United Nations (UN), the Migration Data Portal, the International Institute for Management Development (IMD), The United Nations Department of Economic and Social Affairs (UN DESA), the Center for China and Globalization, and many reputable research articles. The above data sources achieve significant diversity and ensure the data's reliability. In addition, many sources, documents, and research articles of previous scholars related to the study, which added some academic perspective and implications to the study, were also used as reference for this study. By carefully selecting secondary data sources, the study ensures that the research results are based on credible information and data, while strengthening the certainty and validity of the analysis of the study. The research used descriptive statistics, which includes basic statistical measures to describe and summarize the collected data.

The situation of attracting high-quality talent migration to Asian countries

The situation of attracting migrants to Asian countries in recent years

With the chart beneath, which has selected data from some typical countries in the world from different regions, it can be seen that the number of migrants to countries in Asia is much lower than in other continents such as Europe or America, in which the United States has the largest number of migrants worldwide with 50.6 million people. According to the International Labor Organization (ILO)[2], more than two-thirds of workers migrating

[2] Global labour migration increases by five million // International Labour Organization : [site]. 30.06.2021. URL: https://www.ilo.org/resource/news/global-labour-migration-increases-five-million (accessed on 10.03.2024).

abroad are concentrated in high-income countries. Of the total 169 million workers migrating abroad, 63.8 million (37.7%) work in Europe and Central Asia, 43.3 million people (25.6%) work in the Americas. Thus, out of the total number of international migrants, the proportion of migrant workers in Europe, Central Asia and America accounts for 63.3%.

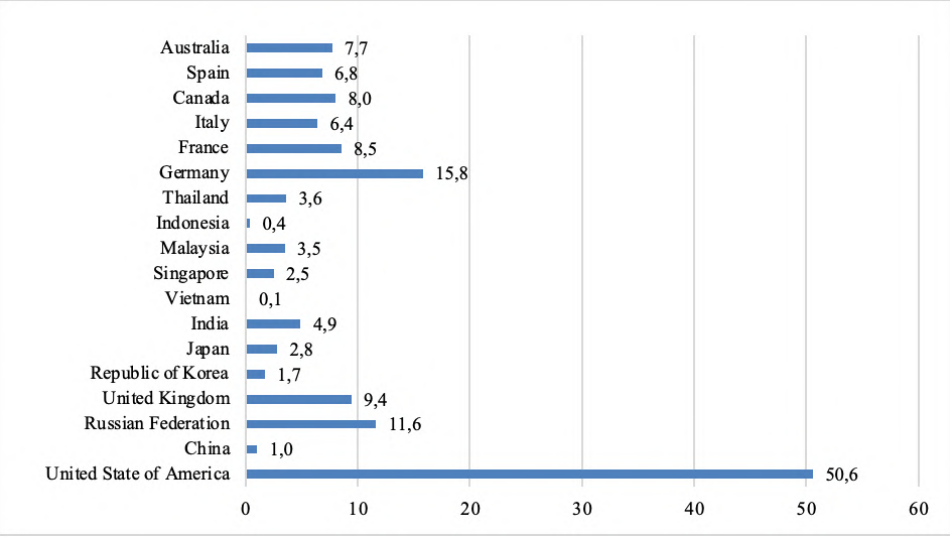

***Fig 1.* Number of international migrants at mid-year 2020, million**
Source: Migration Data Portal (IOM)[3]

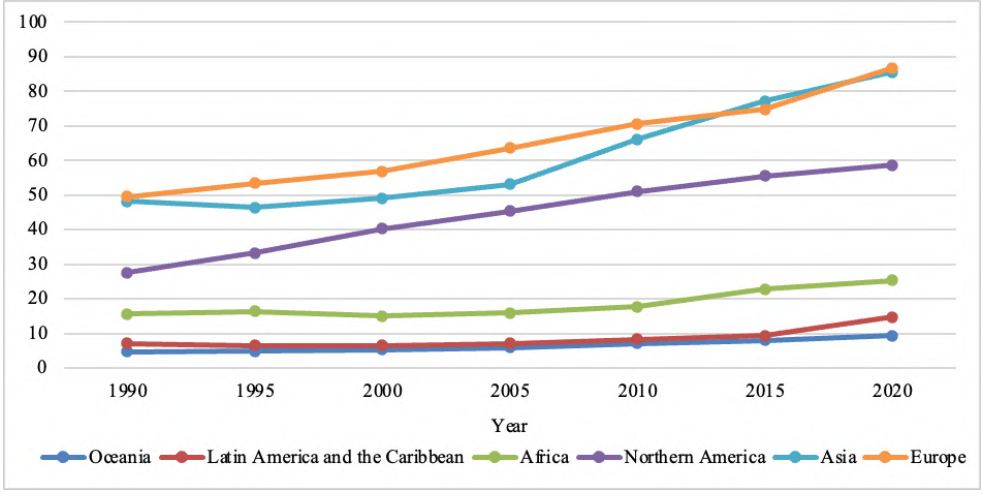

***Fig 2.* The number of international migrants in all UN regions, million**
Source: Migration Data Portal (IOM)[4]

The number of migrants to countries in Europe and Asia is the largest compared to other regions such as America, Africa, etc. At the same time, the rate of increase in international

[3] International Data // Migration Data Portal : [site]. URL: https://www.migrationdataportal.org/international-data?i=stock_abs_&t=2020 (accessed on 10.03.2024).

[4] Ibid.

migrants in the two continents is also significantly higher than other continents. According to the United Nations report on migration 2022 [48], the number of international migrants increased in all United Nations regions, but in Europe and Asia it increased to a greater extent than in other areas. According to this report, Europe and Asia each host about 87 and 86 million international migrants, respectively, accounting for 61% of the total number of global international migrants.

Based on M. Piore's Dual Labor Markets theory, international migration appears because developed countries have a need for long-term, regular immigrant workers, so growth in the number of international migrants in these areas can be explained by the need for workers to find jobs and job opportunities increasing over time.

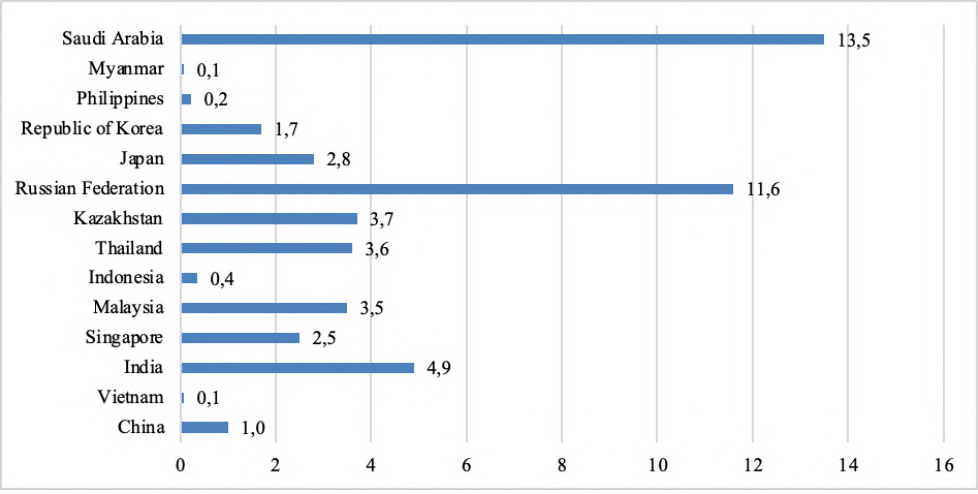

Fig 3. **Number of international migrants at mid-year 2020 in Asia, million**
Source: Migration Data Portal (IOM)[5]

The Asian region has a very large number of international migrants. In 2020, about 69 million people were residing in other countries in Asia, a significant increase compared to 2015, when there were an estimated 61 million people living on this continent. Countries such as the Russian Federation, Saudi Arabia, India, Thailand, Malaysia, Singapore, Japan, South Korea, and China have a significant number of migrants in the Asian region, the reasons include: Countries in Asia need to attract a large number of labor resources to serve production and develop domestic industries. Thailand has a very large number of migrants to these countries with 3.6 million people, the largest in the ASEAN region, this can be explained by the country's need to compensate for the shortage of labor resources with foreign workers. In addition, the service sector is the main sector attracting migrant workers. According to the ILO [48], 66.2% of migrant workers work in the service sector, 26.7% in the industrial sector and 7.1% work in agriculture.

In recent years, the number of international migrants in Asia has grown strongly, especially countries such as China, Japan, and Korea are among the countries attracting strong labor sources. Many countries have policies to attract international migrants due to labor needs and economic development goals by loose legal regimes, facilitating immigration

[5] International Data // Migration Data Portal : [site]. URL: https://www.migrationdataportal.org/international-data?i=stock_abs_&t=2020 (accessed on 10.03.2024).

and re-immigration policies, and at the same time the globalization trends also promote international migration [48]. New economic theory believes that migration activities are also accompanied by the desire to develop more and diversify economic capabilities.

For Vietnam, according to data from Migration Data Portal in 2020[6], the number of immigrants to Vietnam mainly includes Thailand, Cambodia, Bangladesh, Myanmar and Malaysia, in which the ratio between men and women is quite balance, on the contrary, the number of workers migrating to other countries is more than the number immigrating, in which Malaysia is the destination of the majority of Vietnamese workers, with the male ratio nearly double the number of female migrants. According to Vietnamese authorities[7], Vietnam has actively and proactively implemented the GCM Agreement with synchronous and close coordination with the view of always supporting an open, inclusive and equitable approach about migration as well as international cooperation. Therefore, migration in Vietnam has gradually become more developed in recent years.

The situation of attracting high-quality talent migration to Asian countries

The substantial growth in Asia's immigrant population, highlighted in the World Migration Report 2022 by IOM [48], underscores the region's increasing global prominence. In response to this demographic shift, Asian nations are proactively exploring strategies to not only accommodate the rising numbers but also to secure and cultivate a high-caliber workforce. Figure 4 illustrates the trends in attracting and retaining talent in several Asian countries during the 5-year period from 2019 to 2023.

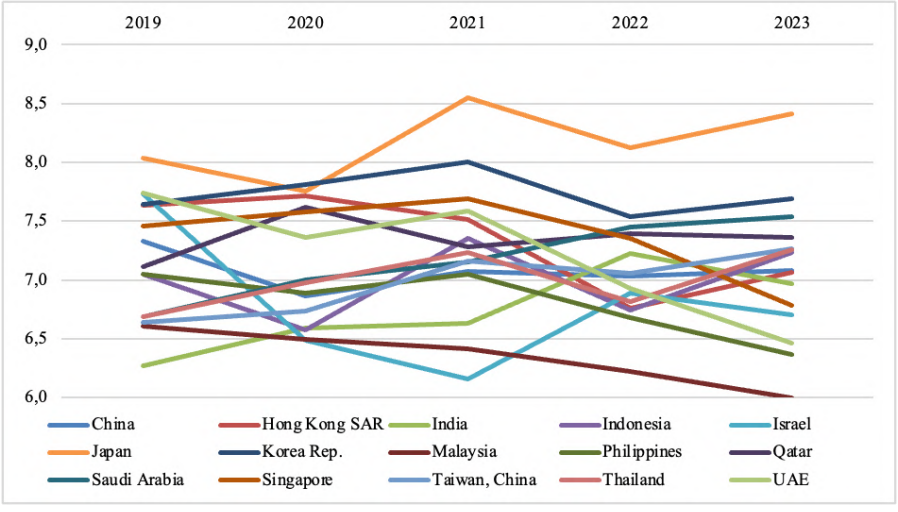

***Fig 4.* Attracting and retaining talents in Asia countries from 2019 to 2023**

Source: World Talent Ranking 2023[8]

[6] International Data // Migration Data Portal : [site]. URL: https://www.migrationdataportal.org/international-data?i=stock_abs_&t=2020 (accessed on 10.03.2024).

[7] Khoảng 281 triệu người di cư quốc tế trong năm 2020 [About 281 million people migrated internationally in 2020] // Nguoi Lao Dong Newspaper : [site]. 09.12.2022. URL: https://nld.com.vn/thoi-su/khoang-281-trieu-nguoi-di-cu-quoc-te-trong-nam-2020-20221209141731053.htm (accessed on 10.03.2024). (In Viet.).

[8] World Talent Ranking 2023 // IMD Business School for Management and Leadership Courses : [site]. URL: https://www.imd.org/centers/wcc/world-competitiveness-center/rankings/world-talent-ranking/ (accessed on 10.03.2024).

Overall, these nations have maintained their levels of talent attraction. However, according to IMD criteria, Malaysia is exhibiting a downward trend, as its attraction levels have not matched those of previous years. Japan is leading with a considerable margin compared to other countries in talent attraction, followed closely by South Korea and China. These nations have implemented attractive policies to facilitate the arrival, residence, and employment of high-quality talent.

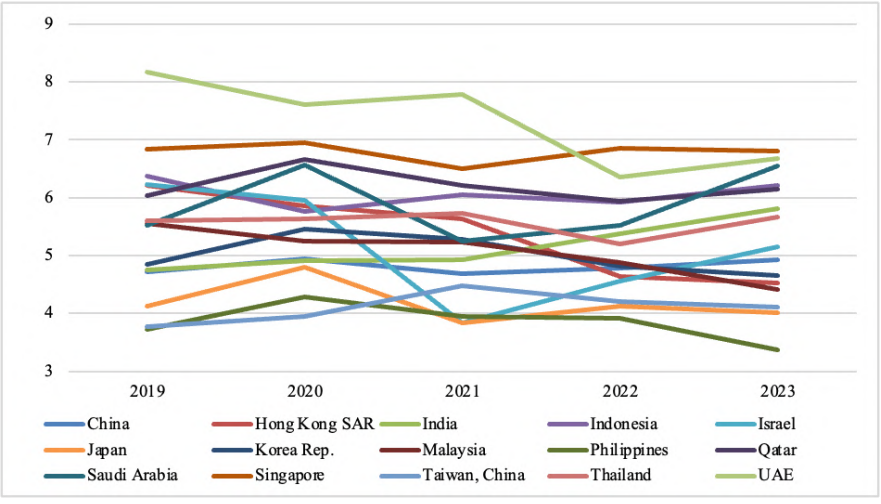

***Fig 5.* Brain drain in Asia countries from 2019 to 2023**
Source: World Talent Ranking 2023[9]

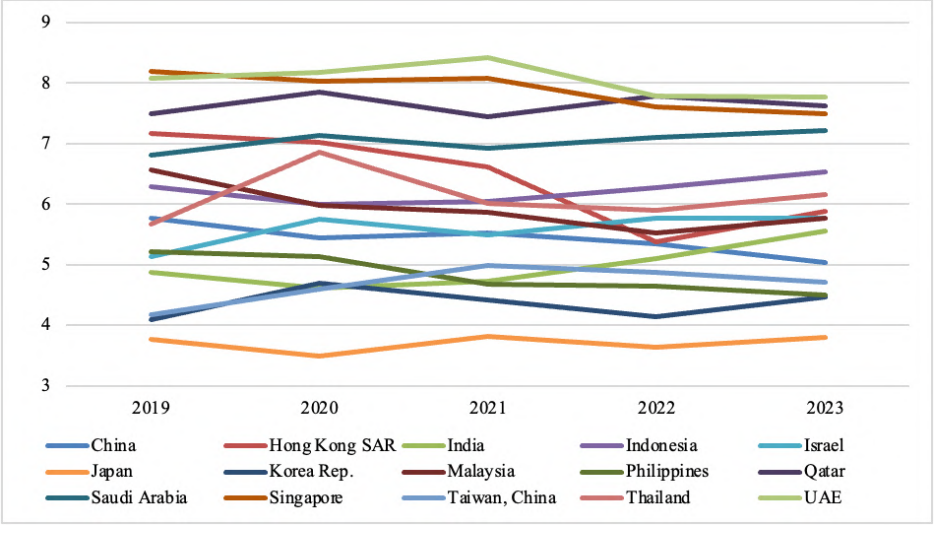

Fig 6. Foreign highly skilled personnel in Asia from 2019 to 2023
Source: World Talent Ranking 2023[10]

[9] World Talent Ranking 2023 // IMD Business School for Management and Leadership Courses : [site]. URL: https://www.imd.org/centers/wcc/world-competitiveness-center/rankings/world-talent-ranking/ (accessed on 10.03.2024).

[10] Ibid.

Figure 5 depicts the brain drain situation in Asian countries, revealing that nations with high attractiveness for high-quality talent also experience relatively low levels of brain drain. Specifically, South Korea, China, and Japan consistently perform well in preventing brain drain, as indicated by the IMD index, with their brain drain levels ranging from 4.0 to 5.0.

However, in Figure 6, the index of highly skilled foreign workforce in Asia during the same 5-year period from 2019 to 2023 is highest for the United Arab Emirates (UAE) and Singapore. Contrarily, South Korea, China, and Japan rank at the bottom in this index. This phenomenon may be explained by the fact that, despite being attractive destinations for talent globally, Japan and South Korea are also countries with aging populations, facing a shortage of workforce in both low and high-skilled domains. Meanwhile, China, with its vast and diverse territory encompassing highly developed regions like Beijing and Shanghai as well as remote areas with a majority of low-skilled labor, presents a different demographic landscape.

Government's policy to influence the level of documented immigration into the country

The data provided by UN DESA shows how government policies influence recorded migration levels by different countries. It is obvious that in Asia, the government's policies in Korea and China have positively influenced the level of documented immigration into these two countries in 2015, which shows that Korea and China's policies contribute to attracting labor sources from abroad.

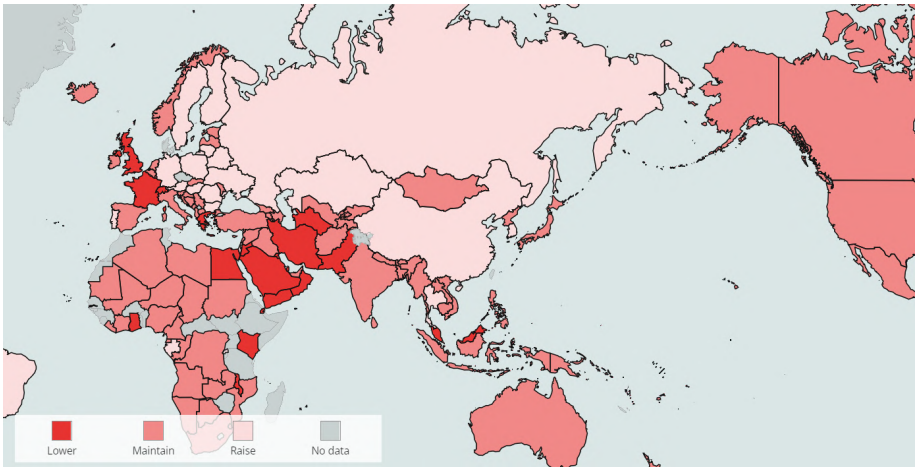

Fig 7. **Government's policy to influence the level of documented immigration into the country in 2015**

Source: UN DESA[11]

According to Chung [49], this can be explained by the South Korean government enacting a series of sweeping immigration and citizenship reforms that opened its borders to unskilled immigration, extended local voting rights to permanent foreign residents, and allowed people to hold dual nationality, which are the key reasons for the increase in immigrant labor in this country. According to an ILO Report [48], China urgently needs to upgrade its industrial structure and reorient itself towards services and knowledge-

[11] International Data // Migration Data Portal : [site]. URL: https://www.migrationdataportal.org/international-data?i=policy_immig&t=2015 (accessed on 10.03.2024).

based activities. Because China will need a large pool of well-educated and skilled talents, the Chinese government began introducing a series of policies for attracting educated and skilled foreign talent to China, including a policy trial of the "Green Card" system in Beijing and Shanghai in recent years. By contrast, according to the chart, policies to attract immigrant workers in Japan are still maintained in 2015. This is easy to understand because Japanese immigration policy[12] is known for its restrictiveness and the acceptance of foreigners workers, especially of the unskilled, is very limited in this country, leading to the share of foreign workers in total labor force is still only 2.5 percent in 2015. Although Japan has a restrictive immigration policy, with a focus on highly skilled workers and professionals, the government has made some changes in policy to address labor shortages, such as expanding the number of statuses of residence (2019), introducing training programs for low-skilled workers, extending the length of stay from three to five years (from 2017) that allows unskilled workers to enter the country.

In summary, high-quality human resources play a crucial role in fostering innovation and development in a country, driving its economic and social progress, especially in the fields of science and technology. Therefore, attracting and retaining talented immigrants from other countries requires effort and flexible policies from the government, making it a top priority for many nations to seek immigrants with extensive expertise, advanced skills, and a spirit of creativity. These measures may include scholarship programs, attractive career opportunities, settlement support, and other benefits to attract and retain talented individuals. Additionally, creating favorable conditions for living and working is also a key factor, helping to establish an environment that promotes development and innovative creativity.

The impact of migration and innovation on science, technology and the development of Asian countries

The impact of science and technology on innovation

According to the Commissioner of the National Intellectual Property Administration of China, China has made significant progress in independent innovation over the past decade, as evidenced by the country's increasing ranking in the Global Innovation Index published by the World Intellectual Property Organization. China is ranked 11th on the index worldwide and tops among middle-income economies in 2022.

Science and technology (S&T) reform has been effective in promoting universities and research institutes (URIs), building enterprise innovation capacity, and promoting URI links with industry [49].

In the early 1960s, South Korea was a typical developing country with poor resources and manufacturing facilities, a small domestic market, and much of the population dependent on foreign powers for national security. Korea has begun efforts to develop S&T and transform itself into one of the most dynamic economies in the world. South Korea's success is largely due to investing heavily in human resource development and forcing companies to compete in the global market. However, in that process, scientific research capacity only plays a secondary role in industrial development. Today, South Korea recognizes that it must strengthen its underlying innovation system to maintain and build its prosperity. By continuously and massively investing in human resource development

[12] Saito, Jun. Historical Background of the Japanese Restrictive Immigration Policy // Japan Center for Economic Research : [site]. 15.07.2022. URL: https://www.jcer.or.jp/english/historical-background-of-the-japanese-restrictive-immigration-policy (accessed on 10.03.2024).

and R&D, Korea has succeeded in building a unique innovation system.

According to data from the GII Global Innovation Index 2022, South Korea performs best in human resources and research. With positive impacts from investing in science and technology, Korea ranks 6th out of 132 economies listed in GII 2022.

Table 1

South Korea's ranking on the global innovation index, innovation inputs and outputs from 2020–2022

Year	GII	Innovation inputs	Innovation outputs
2020	10	10	10
2021	5	9	5
2022	6	16	4

Source: Global Innovation Index 2022[13]

In 1995, the Japanese government established an integrated science and technology policy and a five-year basic science and technology plan. For this plan to succeed, Japan needs to build a strong organization to manage science and technology policy. As part of the administrative reform mission in 2001, the Council for Science and Technology Policy (CSTP) was established. Compared with the previous science and technology council, the Japan Science Council, the CSTP addressed a broader range of science and technology policies and projects and had stronger decision-making authority than before. According to H. Odagiri [50], Japan aims at advancing science-based industries, accordingly, Japan's national innovation system is changing. In 2022, Japan ranks 13th among the 132 economies.

Table 2

Japan's ranking on the global innovation index, innovation inputs and outputs from 2020–2022

Year	GII	Innovation inputs	Innovation outputs
2020	16	12	18
2021	13	11	14
2022	13	11	12

Source: Global Innovation Index 2022[14]

According to the 2022 Global Innovation Index (GII) ranking report, Vietnam continues to rank 48nd out of 131 countries/economies. Related to GII, Viet Nam ranks 2nd among the 36 lower-middle-income group economies and ranks 10th among the 17 economies in South East Asia, East Asia, and Oceania.

Table 3

Development and ranking of Vietnam's GII index (2016–2020)

Year	GII	Innovation inputs	Innovation outputs
2020	42	62	38
2021	44	60	38
2022	48	59	41

Source: Global Innovation Index 2022[15]

[13] Global Innovation Index 2022 // World Intellectual Property Organization : [site]. URL: https://www.wipo.int/global_innovation_index/en/2022/ (accessed on 10.03.2024).

[14] Ibid.

[15] Ibid.

Vietnam has always had innovation results higher than its level of development, showing efficiency in converting input resources into innovation outputs [51].

The impact of migration on the development of science and technology

Turning to Asian countries, we found that the number of research articles and specific secondary data on the influence of migration on the development of science and technology is extremely limited. However, there are also a few research results from reputable organizations that have shown that attracting high-quality human resources to Asian countries, especially in China, Korea, and Japan will promote the development of science and technology. According to IOM[16], the creation of transnational scientific networks between members of the diaspora contributes to the diffusion of technology across countries. The Chinese diaspora is also a prime example of how knowledge is transferred across countries of origin and destination thanks to the presence of countries abroad, and how this makes manufacturing activities more productive, leading to the enhancement of science and technology. These are strengthened by S. Gelb and A. Krishnan [52], migration impacts innovation, technology production, and technology distribution in destination countries, especially highly-skilled individuals who have significant impacts on innovation and research and development (R&D) activity.

The impact of innovation on the development of some countries in Asia

Historically, economists have struggled for centuries to understand the relationship between technological progress, industrial structural change, and economic growth [53–57].

In this section, our inquiry will be about the interconnection between innovation and economic development. Although existing theoretical frameworks generally affirm a positive correlation, previous literature shows that R&D investment is insufficient for predicting economic performance. What is equally important is social, economic and institutional conditions [58].

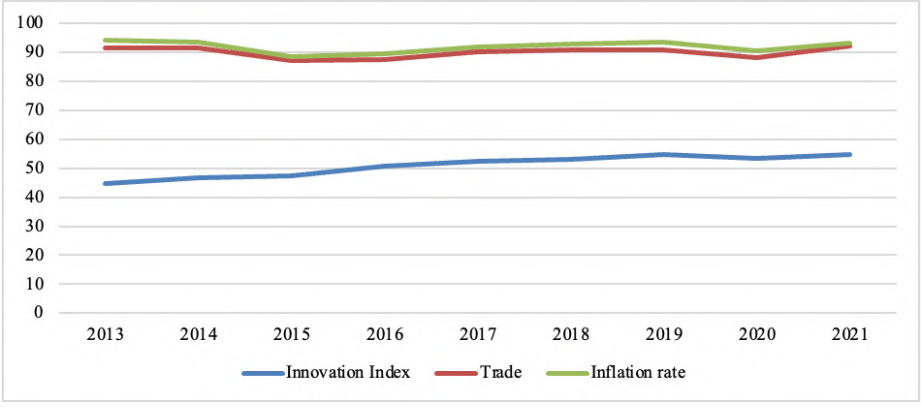

Fig 8. **Innovative index, trade, and inflation rate of China (2013–2021)**
Source: Mendeley Data[17]

[16] A World on the Move: The Benefits of Migration // International Organization for Migration : [site]. 25.09.2014. URL: https://www.iom.int/speeches-and-talks/world-move-benefits-migration (accessed on 10.03.2024).

[17] Foreign direct investment and Innovation – developing countries // Mendeley Data : [site]. URL: https://doi.org/10.17632/8ymh93nbsc (accessed on 10.03.2024).

In terms of China, the years from 2013 to 2021 have seen notable shifts in the innovation index, ascending from 44.7 to 54.7. In contrast, the trade market index experienced a downturn, reaching 34.7 in 2020 before recovering in 2021. Concurrently, the inflation rate displayed fluctuations over the years, reaching its lowest in 2021. The pivotal observation is that, in 2021, an augmentation in the innovation index coincided with positive changes in trade rates and the inflation rate.

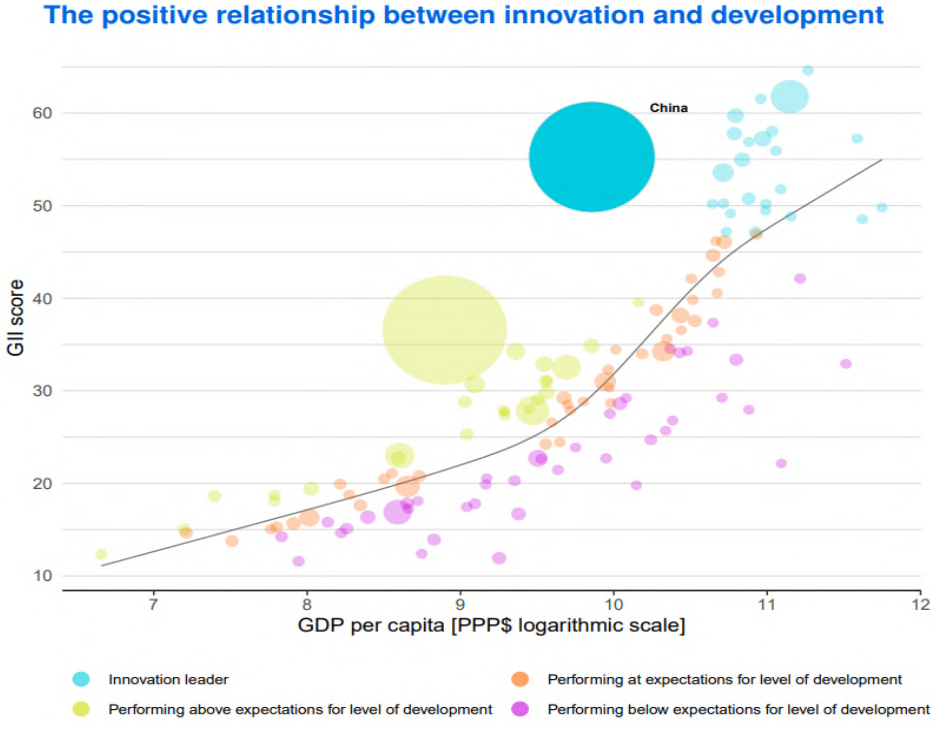

Fig 9. The positive relationship between innovation and development of China (2022)
Source: Global Innovation Index 2022[18]

A significant challenge confronting the Chinese innovation system is its pronounced dependence on the government sector. According to the data presented in the China Statistics Year Book 2020[19], government subsidies for R&D accounted for 16.8% of total R&D expenditures, with enterprise-funded R&D constituting 86.6%. Although the direct government-funded R&D proportion in China does not markedly exceed that of Western countries, State-owned enterprises (SOEs) play a substantial role in enterprise-supported R&D funding, contributing 55%. Notably, research by C. H. Yang et al. [58] using panel data in China revealed that a higher ratio of State-owned enterprise (SOEs) R&D adversely impacts local innovation ability due to inefficiencies inherent in SOEs. Therefore, policies that benefit SOEs may have crowded out support for non-SOEs in China.

The Global Innovation Index 2022 report provides a Bubble Chart depicting the relationship between income level (GDP per capita) and innovation performance (GII

[18] Global Innovation Index 2022 // World Intellectual Property Organization : [site]. URL: https://www.wipo.int/global_innovation_index/en/2022/ (accessed on 10.03.2024).

[19] China Statistical Yearbook 2022 // National Bureau of Statistics of China : [site]. URL: https://www.stats.gov.cn/sj/ndsj/2022/indexeh.htm (accessed on 10.03.2024).

score). The trend line illustrated anticipated innovation performance based on income levels. Economies situated above the trend line outperform expectations, while those below fall short. Remarkably, China's performance surpasses expectations relative to its level of development, 1% increase in R&D expenditures corresponds to a 0.92% increase in GDP level in China.

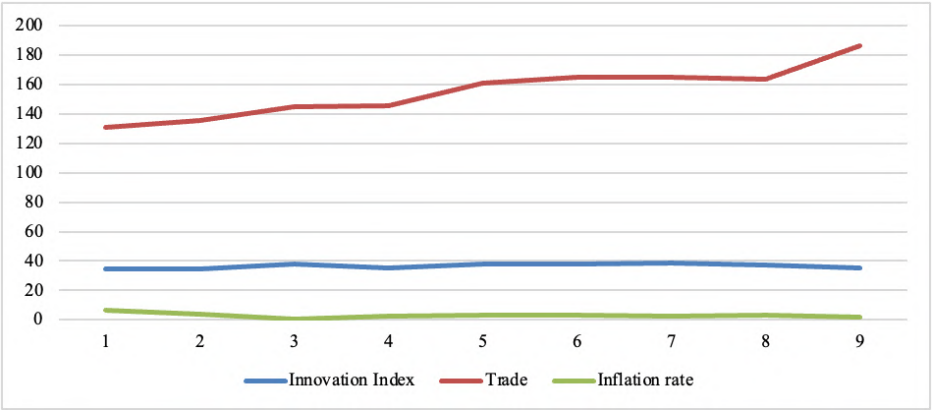

Fig. 10. Innovative index, trade, and inflation rate of Vietnam (2013–2021)
Source: Mendeley Data[20]

In a broader context, Vietnam's innovation index has kept stability, consistently hovering around the 40 mark. Without experiencing significant development or garnering substantial attention, this lack of emphasis on innovation is reflected in the stagnant nature of the innovation index over the past eight years. Concurrently, the trade market in Vietnam has undergone a significant increase, and there has been a gradual reduction in the inflation rate. Consequently, the current stance in Vietnam appears to lack a definitive perspective on innovation, with a discernible absence of motivation for new developmental endeavours. Presently, the perpetuation of state subsidies and the prevailing dominance of state-owned enterprises contribute to a dearth of strong incentives for businesses to invest in innovation. Moreover, the absence of a comprehensive set of state policies designed to effectively support innovation activities presents a formidable impediment to the growth of innovative businesses. This, in turn, exacerbates the challenges faced by Vietnamese businesses in competing with their foreign counterparts.

The presented bubble chart illustrates the correlation between income level (measured by GDP per capita) and innovation performance (quantified by the Global Innovation Index or GII score). The accompanying trend line illustrates the anticipated innovation performance based on different income levels. Economies situated above this trend line surpass expectations, while those below fall short. A trend emerges from the chart, indicating that the higher the concentration of innovative leaders within a group corresponds, the higher the Gross Domestic Product (GDP). Specifically, the data reveals that a population of 1.4 billion individuals with a GII score of 55 exhibits an average GDP per capita of 20 thousand USD. This observation underscores the positive association between innovation leadership and economic prosperity, as reflected in the higher GDP levels achieved by entities with superior GII scores.

[20] Foreign direct investment and Innovation – developing countries // Mendeley Data : [site]. URL: https://doi.org/10.17632/8ymh93nbsc (accessed on 10.03.2024).

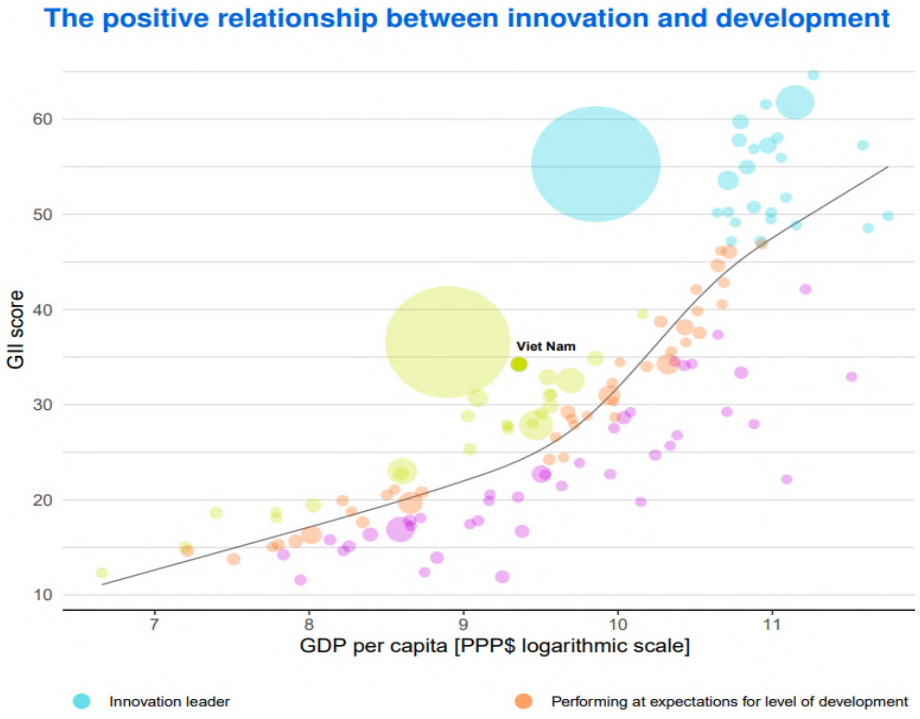

Fig. 11. **The positive relationship between innovation and development of Vietnam 2022**
Source: Global Innovation Index 2022[21]

Science and Technology human resources attraction policies in Asia

Policies to attract high-quality S&T human resources from abroad for work are among the most important policies of nations. According to Sami Mahroum (2007) [59], S&T human resources in countries are provided in two ways: domestic human resources from primary and university education, research and training centres, and businesses, while international human resources are trained in other countries and attracted to work by domestic organizations. Therefore, the policies to attract human resources in various countries have been implemented from an early stage, starting with the attraction of international students to countries with science and engineering programs [60].

However, alongside efforts to obtain a rich source of brain power from abroad in the field of S&T, nations must also contend with the potential loss of their brain power. This demonstrates the critical role of high-quality S&T human resources, creating a fiercely competitive market among countries in the battle for human resources [61]. Therefore, governments play a significant role in guiding development, promoting domestic science and technology capacity, and setting appropriate priorities for development.

S&T human resources attraction policies of South Korea

Since joining the OECD in 1996, South Korea has emerged as a global hub for science and technology, one of the most advanced digital economies in the world, and a leader in several industries such as electronics, automobiles, steel, and shipbuilding. To mitigate the negative impacts of S&T human resources mobility, the South Korean government has entered into several bilateral agreements with countries like Russia, Japan, and China

[21] Global Innovation Index 2022 // World Intellectual Property Organization : [site]. URL: https://www.wipo.int/global_innovation_index/en/2022/ (accessed on 10.03.2024).

to exchange experts and human resources. Another significant policy in South Korea is the "Internationalization of Science and Technology Initiative," launched in 2001, aimed at promoting international cooperation and enhancing the global presence of South Korean science and technology. Through this initiative, the South Korean government seeks to promote research exchange, joint projects, and partnerships with international organizations, with a focus on enhancing South Korea's scientific and technological capacity by engaging with the global scientific community. The two main objectives of the policy demonstrate the brain exchange through the movement of S&T human resources in two directions: first, sending researchers and research students to foreign universities and research institutions for research; second, inviting foreign researchers to work in South Korea and directly participate in research projects and activities. This initiative plays a vital role in shaping South Korea's research landscape and establishing connections with researchers worldwide.

S&T human resources attraction policies of China

Currently, in China, there is an imbalance in the distribution of science and technology human resources across different regions of the country. Some regions, such as Beijing, Shanghai, Tianjin, and Sichuan, have higher research and development (R&D) intensity compared to other areas. As a result, the Chinese government has introduced various policies to promote the rational redistribution of human resources. These policies aim to reduce domestic scientific and technological resources and regional imbalances while encouraging scientific and technological professionals to engage in commercial activities. The "Guidelines for Implementing the 11th Five-Year National Economic and Social Development Plan" (issued in 2006) emphasizes the importance of enhancing the development of science and technology human resources and cultivating outstanding talents in this field. The central and eastern regions encourage overseas Chinese students to work for their homeland, urging overseas Chinese scientists to serve their homeland and promote the flow of scientific and technological talents. This, in turn, helps develop China's S&T human resources. Two key initiatives of the national government in the 2006 Long- and Medium-Term Talent Development Plan are the "Thousand Talents Program" and the "Ten Thousand Talents Program," which were launched in 2008 and 2012, respectively[22]. Individuals who meet the educational and professional requirements of these programs receive generous financial support for research, entrepreneurship, living expenses, and other forms of assistance. Additionally, the Chinese Academy of Sciences initiated the "Hundred Talents Program," providing substantial research funding and other support to encourage top Chinese scientists abroad to return to China [62]. As globalization increasingly impacts China's economy, the Chinese government has realized that, besides accessing Chinese experts overseas, attracting skilled international migrants to China is crucial. Therefore, they are considering and comparing international human resource policies and practices as valuable resources to promote economic growth and innovation, as well as enhance China's relations with the rest of the world. In the early 2000s, the Chinese government began introducing a series of policies aimed at attracting highly educated and skilled foreign talents to China, including experimenting with "Green Card" policies in Beijing and Shanghai in recent years.

[22] K. Drinhausen, H. Legarda. "Comprehensive National Security" unleashed: How Xi's approach shapes China's policies at home and abroad // MERICS : [site]. 15.09.2022. URL: https://merics.org/en/report/comprehensive-national-security-unleashed-how-xis-approach-shapes-chinas-policies-home-and (accessed on 10.03.2024).

S&T human resources attraction policies of Japan

Intending to develop human resources in S&T, the Japanese government has implemented various policy measures to attract talented human resources from around the world. For instance, Japan established the "Advisory Board on Science and Technology Diplomacy" under the guidance of Minister Kishida in 2014 to discuss measures to promote diplomatic activities in the field of science and technology. Regarding bilateral cooperation, in 2014, Japan joined a joint commission with six countries, including the United States, India, the United Kingdom, Switzerland, based on the Agreement on Science and Technology Cooperation.

To meet the growing global demand for female researchers in science, technology, engineering, and mathematics (STEM) fields, the Tokyo Institute of Technology is making efforts to ensure an academic and research environment where all women can freely pursue their interests, thereby enhancing the female scientific workforce (expanding employment opportunities for female researchers). Furthermore, Japan has various policies to attract foreign researchers and students to work in Japan. For example, postdoctoral fellowships for foreign researchers are offered by the Japan Society for the Promotion of Science (JSPS) to foreign researchers. These fellowships provide financial support for conducting research in Japan and include maintenance allowances, research support allowances, travel allowances, and overseas travel insurance while in Japan. The Japanese government also promotes economic support policies for undergraduate and master's degree students in universities, allowing students to focus entirely on research activities [63].

The status of attracting talents in the field of Science and Technology and policy development in Vietnam: Expert opinions

Experts give the opinion that Vietnam was soon aware and had policies to attract talent in the field of science and technology, such as "National strategy to attract and utilize talents until 2030, vision to 2050". However, those policies have not been implemented effectively. Talent recruitment policies for the science and technology field are still very formal, heavy on theory, and do not really pay attention to candidates' working abilities and skills. Remuneration policies for talented people in the public sector, mainly through salaries, are still low compared to the private sector. After recruitment, the allocation of science and technology human resources is sometimes not reasonable, leading to ineffectiveness.

Experts suggest that Vietnam's policies to attract talent in the field of science and technology need to continue to improve, focusing on two aspects: reasonable use of talent and the working environment of talent; there also needs a suitable remuneration policy that is competitive with the private and international sectors.

The S&T talents attraction policies in developed Asian nations like South Korea, China, and Japan have specific pros and cons. However, these policies are viewed as references designed for developed nations, potentially unsuitable or competitive for Vietnam, currently undergoing development with diverse socio-economic constraints. In crafting its S&T talent strategy, Vietnam integrates experiences from regional counterparts. Hence, Vietnam needs tailored talent attraction and utilization policies, addressing its unique conditions, including cultural, historical, and situational factors.

According to experts, the success of these policies in Vietnam hinges on the implementation mechanisms and management practices, drawing lessons from other nations to refine their application in reality. Furthermore, policies should demonstrate greater generosity in attracting talents, particularly high-quality individuals, with

an accurate assessment of labor demand aligned with market dynamics and genuine appreciation for scientists. Some experts also recommend studying Singapore's experience as a noteworthy model in Asia, renowned for having the most comprehensive policies for attracting foreign talents globally.

Conclusion

In summary, migration and innovation significantly contribute to the Science and Technology (S&T) and economic development of Asian countries. High-quality human resources, particularly in the S&T sector, have become a top priority in foreign labor attraction policies across nations. Countries analyzed in this study, such as South Korea, Japan, and China, have implemented various policies to attract highly skilled foreign workers. Vietnam, an emerging Asian nation with unique geographical and economic characteristics, has also adopted appropriate policies, continuously attracting many talents to live, study, and work.

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МИГРАЦИЯ В КОНТЕКСТЕ ИННОВАЦИЙ: ИССЛЕДОВАНИЕ ПОЛИТИКИ ПРИВЛЕЧЕНИЯ НАУЧНО-ТЕХНИЧЕСКИХ КАДРОВ В АЗИАТСКИХ СТРАНАХ И ОПЫТА ВЬЕТНАМА В ЭТОЙ ОБЛАСТИ

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Аннотация. *В условиях глобализации миграция все чаще оказывается в центре международных дискурсов. В рамках настоящей работы авторы провели исследование влияния миграции в контексте инноваций, сосредоточив свое внимание на привлечении высококвалифицированных человеческих ресурсов в Азиатско-Тихоокеанском регионе, особенно в области науки и технологий. Данная статья кратко излагает ключевые теории касательно трудовой миграции в контексте инноваций, предоставляя обзор обмена между странами высококвалифицированными человеческими ресурсами через привлечение научных и технологических кадров. Кроме того, статья отражает влияние миграции на развитие науки и технологий, а также ее экономические последствия. Для проведения исследования авторы использовали два основных метода: качественное исследование (интервью с экспертами) и количественное исследование (анализ композитных индексов активности организаций, специализирующихся на миграции и инновациях). Статья акцентирует внимание на трех азиатских странах: Южной Корее, Китае и Японии, которые преуспели в развитии и улучшении своего уровня научных и технологических навыков, а также стратегий привлечения квалифицированного персонала. Политика, направленная на привлечение и использование высококачественных кадров, определена как решающий фактор для их прогресса. В тесном сотрудничестве с экспертами авторы предлагают рекомендации по привлечению качественных человеческих ресурсов в области науки и технологий во Вьетнам для правительства страны, бизнеса, образовательных учреждений и общества.*

Ключевые слова: *инновации, миграция, наука и технологии, человеческие ресурсы, таланты*

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