FROM BRAIN DRAIN TO BRAIN CIRCULATION

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Abstract

In knowledge-oriented economy, economic growth is primarily determined by factors such as human capital, research, innovation and international cooperation. Due to this reason, migration of highly qualified working forces appears as one of the most important elements that contribute to GDP growth. Intensity of migration flows related to highly qualified migrants has significantly increased since millennium started. Therefore, governments of individual countries implement programs focused not only on attraction of their own scientists working abroad, but also at foreign researchers and students. Many experts who deal with this issue warn to the fact that concept of brains leakage becomes outdated and needs to be replaced by circulation of brains concept. The aim of this paper is to define main features of brains circulation concept, to identify steps of India, China and Korea for its stimulation and to make description of some EU member countries policies focused on foreign students who are predecessors of highly qualified workers.

Keywords: *brain drain, brain circulation, migration of highly skilled workers, migration policy.*

1. INTRODUCTION

Brain circulation is becoming a relatively new phenomena in the management of international labor migration. It leads to greater internationalization of the labor market. Governments are aware of the importance of human capital accumulation and its contribution to economic growth. Therefore, they are implementing various programs that help attract highly skilled workers.

Although there is no single definition of brain circulation, most researchers who study the phenomenon agree that it is the repeated mobility of highly qualified individuals between their home country and abroad. This stimulates the creation, dissemination, and adaptation of new knowledge.

Recent evidence suggests that return migrants (i.e. migrants who return to their country of origin after a period of residence abroad) may account for as much as 25% of international migration flows globally [Azose & Rafterz, 2019].

The aim of this paper is to define main features of brains circulation concept, to identify steps of India, China and Korea for its stimulation and to make description of some EU member countries policies focused on foreign students who are predecessors of highly qualified workers.

2. MAIN FEATURES OF THE CONCEPT OF BRAIN CIRCULATION

The term “brain drain” originates in the 1950s and refers to the immigration of scientists from countries such as the United Kingdom, Canada or the former Soviet Union to the United States. In the 1970s, there was a clear view on the brain drain. The migration of highly skilled people was detrimental to the countries of origin. Many scientists argued that the brain drain was essentially a negative externality imposed on those left behind in the developing countries. Furthermore, it represented a zero-sum game in which the rich countries become richer and poor countries become poorer. They also argued that the international community should implement a policy whereby the countries of origin should be compensated for the losses they suffer from the brain drain, for example a “tax on brain drain” [Rapoport, 2004].

The basic neoclassical economic model explains emigration decisions as the outcome of cost-benefit calculations by rational actors. A person decides to emigrate if the financial returns in the destination country net of expected costs of migration are greater than returns to staying in the home country.

Because migration is interpreted as an individual investment in human capital, individuals take into account that such gains may take some time to materialise and therefore calculate not only immediate but also expected future returns [Todaro, 1969].

From the perspective of the neoclassical model, remigration decisions are a consequence of failed migration, which results either from erroneous calculations of costs and benefits from the beginning or from unexpected circumstances that cause migration to fail [Borjas and Bratsberg, 1996].

Later, however, the negative view of brain drain had changed. Many developing countries have experienced a social gain from the brain drain [Rapoport, 2004]. Scientific research describes new trends in the migration of highly qualified persons who are working in a foreign country and later return to their country of origin, the so-called brain circulation. Several recent theoretical studies have shown compensatory effect, that the brain drain can also be beneficial for the migrant's country of origin [Lohest & Marfouk, 2007]. Tung [2008] argues that in the past there has been a tendency to talk about "brain gain" – whereby a country receives a healthy injection of human talent through immigration – and its controverse situation of "brain drain". The author highlights that now it appears more appropriate to view such immigration and emigration patterns in the context of brain circulation.

Recent studies have shown that most migrants move on a temporary basis only. They want to acquire new skills – for example, language or intercultural skills as well as all sorts of tacit knowledge - or use their stay abroad as a signalling device for employers in order to gain a competitive edge on the labor market in the country of origin [Baláž et al., 2019]. From this perspective, return migration is the result of an optimal human capital investment plan over the individual's life cycle. As a result, the better educated are also more likely to return because, on average, they are expected to benefit more from their newly acquired skills on the labor market of the country of origin [Stark, 2019].

It is important to comprehend what factors had a significant impact for the emergence, manifestation and consolidation of the brain circulation phenomenon. As Tung [2008], who devoted much attention to the analysis of the brain circulation phenomenon, points out, brain circulation has become possible because of several important factors (Fig. 1).

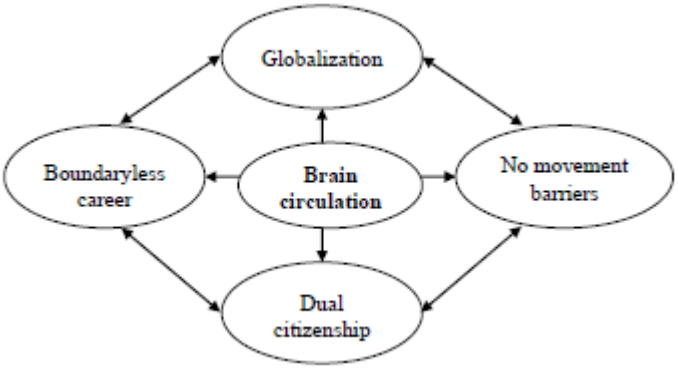

Fig. 1. The model of factors which stimulate brain circulation

Source: Tung [2008]

● Globalization: the growing economic interdependence has meant that countries around the world are more interconnected than at any other previous time in history;

● The reduction of immigration and emigration barriers to the movement of people had made it easier for people to relocate across countries within countries;

● A growing number of countries, including the US, Canada, and many European Union countries permit dual citizenship, thus facilitating this mobility across nations;

● The emergence of the concept of boundaryless careers where highly qualified people are increasingly willing to change jobs across international boundaries in search of more satisfying career [Tung, 2008].

3. BRAIN CIRCULATION POLICIES

The ability to attract talent to work to any country depends on many factors [Zweig, Fung, Han, 2008, Suntharasaj and Kocaoglu, 2008]. The country must be attractive for highly skilled workers and give them comparatively better conditions to work than he/she has now. But there is no universal recipe which could ensure the success of a brain circulation policy.

It should be emphasized that the brain circulation and brain gain policies applied by countries are closely connected, because they seek the same goal – to retrieve the talents or/and try to collaborate with their scientists living and working abroad.

Some Asian countries (for example China, India, Korea) are implementing quite successful policies of brain circulation and brain acquisition. These countries can be described as examples of good practice. EU countries can also be inspired (to some extent).

3.1. China's brain circulation policy

In the 1990s, the country's brightest professionals started migrating to European countries and the US. But within a decade, reverse migration helped China improve the research standards of its institutes.

Many migration experts believe that reverse migration results in a net loss to developed countries who invested in Chinese researchers. However, a section of researchers differ. They argue that returnees are boosting transboundary research, helping both host institutions and Chinese researchers. The returning Chinese researchers are publishing high-quality research papers in collaboration with their host institutions.

Naturally, the role of the state in stimulating reverse migration is irreplaceable. In order to strengthen the return flow of human talent and strengthen national capacity in science and technology, states must invest heavily in research and development, as well as transform the institutional research culture, such as the scientific environment, laws and regulations that create disincentives for return migration.

Since the mid-1990s, the Chinese government, universities, and scientific organizations have established a series of programs targeted at attracting high end talent from the mainland, who are working and studying overseas, to return to China. In addition, the Ministry of Education launched the “985 Program” and the “Changjiang Scholars Program” (CJSP), both targeted at establishing world-class universities. Funds initially went to nine top universities, and the program required that 20 percent of the funds be used to improve the quality of the faculty by importing overseas talents. The CJSP offers competitive salary for overseas returnees and an annual subsidy of $25,000 over their salary. The first version of the plan required that scholars to return permanently, but when the number of full-time participants did not meet expectations, the returnees were divided into full-time and part-time returnees.

In their article, Zweig, Siqin & Huiyao [2020] compare the quality of returnees in three nationally funded programs and examine the differences between those who participate in these programs full-time – i.e., they give up their overseas positions entirely – and those who keep a foot overseas in some foreign institution and return only on a part-time basis. To compare these cohorts, the authors use each researcher’s h-Index as well as the average annual impact factor (AAIF) of the journals in which these individuals published. Based on this empirical analysis, they draw the following conclusions: full-time returnees were simply not as strong researchers as those who chose to maintain overseas post and work in China only part-time. Second, the authors show that returnees to China’s major research institute, the Chinese Academy of Sciences, under the institute’s program to promote reverse migration, were weaker in terms of the quality of their publications than returnees under national programs at universities. The authors argue that the main problem was the continuing resistance to reforms within the Chinese Academy of Sciences. Finally, the authors compare the flow of China´s best overseas talent into top universities and show that universities whose presidents were more amenable to reforming the institutional culture and actually implemented such reforms, introduced more overseas talent to work in

their universities. The authors' findings therefore show unambiguously that resistance to institutional change in developing societies such as China can undermine the state's efforts to enhance state power through the promotion of research and development.

3.2. From brain drain to brain circulation in India

India witnessed the phase of brain drain from the 1960s to the 1980s, brain gain during the 1990s and has been witnessing the phase of brain circulation since the beginning of the millennium.

In the 1980s, about 37 percent of undergraduates and 31 percent of postgraduates went abroad after their engineering studies, and only a small percentage, 3 to 7 percent, returned to India [Sukhatme and Mahadevan, 1987]. Of the many findings presented in the study done by Sukhatme and Mahadevan [1987], two main findings behind the large-scale migration are: First, a significant number of alumni out of those who did not go abroad were willing to go if financial aid had been available. The second, and perhaps more important, finding is that the main positive feature of Western society which encourages Indians to settle there is the "comfortable standard of living."

These two positive features, combined with the most dominating negative feature of Indian society as perceived by the alumni, via, the all-pervading presence of a suffocating, unresponsive bureaucracy, are the main causes of the severe brain drain of graduates from Indian universities.

In the late 1980s, the Indian government took serious note of the loss of human capital in the form of brain drain and started devising policies, methods, procedures to curb the exodus. The country witnessed significant economic development of scientific and technological infrastructure coupled with the emergence of science community and intellectual climate in the 1990s. These developments reversed the process of brain drain. India's national expenditure on research and development in relation to gross domestic product, with minor fluctuations, increased every year since the mid-1990s. Foreign direct investment, setting up of R&D centers by multinational corporations and the growing importance of the ICT software sector gave rise to a new industrial and economic climate since the mid-1990s. This is also the era when Indian GDP growth rates one of the highest in the world after China. This enabled the country to invest more money in the science and technology sector.

In addition, the Department of Science and Technology (DST) instituted two major brain drain schemes in the form of "Ramanujan Fellowships" and "Innovation in Science Pursuit for Inspired Research (INSPIRE)" to attract researchers and scientists working abroad:

- The Ramanujan Fellowships aim to attract brilliant scientists and engineers from all over the world to take up scientific research positions in India. The Ramanujan Fellows can work in any of the scientific institutions and universities in the country and they are eligible for receiving regular research grants. The duration of the Ramanujan Fellowship is five years.

- The INSPIRE scheme provides an opportunity to the scientists within 32 years of age and who have completed their PhD research from any recognized university/academic institution in the world. Each "INSPIRE Faculty Awardee" receives a consolidated amount equivalent to the scale of the Assistant Professor as a Fellowship amount per annum as a research grant for 5 years.

Anna Lee Saxenian [2008], in her work on "The New Argonauts," reports that by the end 1990s, Chinese and Indian immigrants (with the former outnumbering the latter) accounted for 29 percent of all IT start-ups companies in Silicon Valley. Saxenian further tracked the journey of these high-tech immigrants who, after successfully establishing their IT operations in California, have decided to ply between the US and their countries of origin to manage their businesses in dispare regions of the world to capitalise on the opportunities in both the US and their motherland.

Anna Lee Saxenian has explored the extent of brain circulation in India with reference to IT professionals. She traces the history from the 1980s and presents a case that how policy level change during the era of Raj Gandhi lead to the development of IT in India and ultimately making India as IT superpower by late 1990s. The Computer Policy of 1984 recognised software as an "industry", thereby giving entitlement to the industry for investment and incentives. The import tariffs on software and PCs

was reduced from 100 per cent to 60 per cent. In 1986, the Computer Software Development and Education Policy liberalised access to technology by opening this field to foreign investment.

The study by Sarma and Krishna [2010] draws attention to the role played by a range of public policies in the 1980s and 1990s, which have given a big boost to the software sector. These policies infused considerable dynamism, which in turn attracted thousands of software professionals back into the country to establish micro, small and medium enterprises to take advantage of liberal government policies. Among these policies, the following are worth mentioning:

- The Export-Import Policy of 1983 permitted duty-free import of computers;

- Another important initiative was the setting up of the Software Technology Parks (STPs);

- The STP norms and software related policies in 1995 gave these firms a 10-year tax holiday, which were kept extended and was valid till 2010.

All these efforts started yielding results in the 1990s and particularly after 2000, when US-educated Indian engineers began to return home and the "brain circulation" between the United States and India accelerated.

3.3. The success of Korea's brain circulation policy

Korea has achieved remarkable economic growth during the last half century. This is arguably due to the massive increase in human resources [Kwon, 2015]. Highly qualified Korean scientists trained overseas and their return home have played an important role in this process [Albuquerque, 2001]. The US-trained scientists played a leading role in the development of the Korean higher education system in Korean universities [Lee, 2004]. The point is that the quality of working conditions (e.g., three times higher salary than for domestic scientists) attracted a large number of highly qualified scientists and engineers trained in industrialized countries throughout the 1970s, 1980s, and 1990s in a process known as the "reverse brain drain" or "brain gain" [Moon, 2004].

However, since the early of the 21st century, a sharp increase in the number of domestically-trained doctoral students in science and engineering can be observed (see Fig. 2).

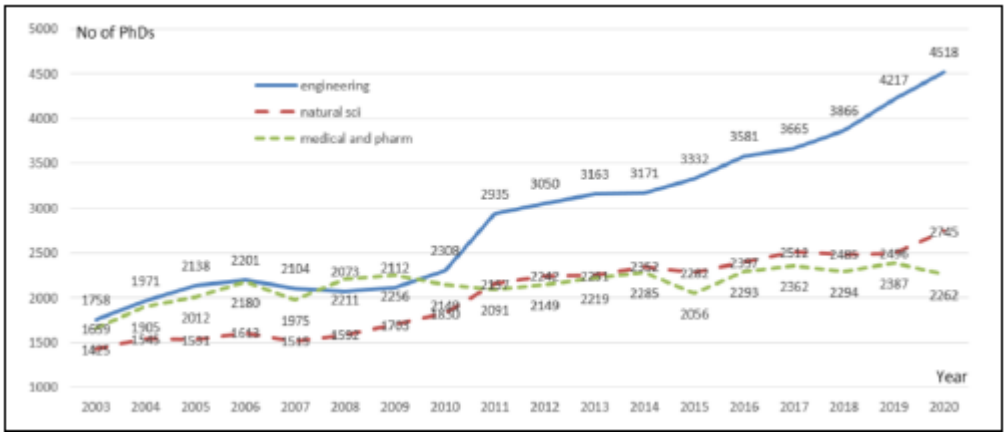

Fig. 2. The number of Domestic PhDs

Source: Korean Educational Statistics Service

Government support for domestic postgraduate programs has encouraged students to stay in domestic institutions rather than go abroad.

In this context, interesting findings are provided by the analysis of Kwon, Park, and Kim [2023], who analyzed statistical data on the performance of 48,499 Korean academics in science and engineering.

The authors formulated the following research question: Have domestically trained researchers perform show better performance than overseas returnees?

To examine the relationship between scientific productivity and overseas education, the authors used a statistical model. They chose abroad training as the independent variable and research output, measured by the number of publications, as the dependent variable.

In terms of dependent variables, they established two types of performance indicators: KCI and SCI-level research outcomes as measured by the number of publications. SCI papers are publications in journals listed in Clarivate Plc's Science Citation Index, whereas KCI papers are from the National Research Foundation of Korea´s KCI journals. Papers published in SCI journals are usually of higher quality than those published in KCI journals.

Based on regression analysis, the authors found that obtaining a degree overseas has a negative and significant impact on the production of KCI papers while obtaining a domestic degree has a positive and significant impact on the production of KCI papers. This suggests that academics who received their training overseas are more likely to publish in SCI journals than in KCI journals.

In Model 2, Kwon, Park, and Kim explores the cohort of newly appointed in higher education institutions from 2015 to 2017 (junior academics). The most noteworthy discovery is that unlike Model 1, the attainment of education abroad is not a significant predictor for academic performance. In other words, young academics trained domestically are academically competent enough to compete with their peers trained abroad.

Domestic academics have thus become the main driving force behind the development of the Korean academic system over the past decade. Consequently, the job market for overseas-trained academics has become more competitive due to the emergence of qualified domestic degree holders.

3.4. Measures against students on international mobility in EU countries

Policies for international students are also an important part of immigration policy, as students are the precursors of future highly skilled workers.

EU countries are currently reforming their policies towards international students. Many are now trying to limit international student flows as their numbers significantly exceed pre-COVID-19 levels.

For example, the Netherlands intends to increase tuition fees for students from outside the EU as part of effort to limit the number of foreign students.

Denmark has significantly reduced the number of places in English-taught master's programmes to reduce the number of international students in 2021 but has now reversed its approach. In June 2023, the government announced its intention to increase the number of international students. This change in approach is motivated by labour market demands, and the additional English-taught places will mainly be attributed to academic fields in line with the Danish labour market.

Despite a trend towards stricter control over international student enrolment in several EU countries, governments continue to recognise the significant contributions of international students to the local economy and workforce. Policies aimed at increasing student retention and improving labour market integration, such as expanded post-study work opportunities.

Several countries have modified the right of international students to work during their studies. Being able to work during their studies allows them to gain professional experience and helps to better retain students after they have obtained their diploma. For example, Germany has extended the period during which students can work from 120 to 140 days per year.

Sweden is implementing specific measures to attract third-cycle students, including facilitating the transition from studies to the labor market.

Lithuania has increased the number of years following graduation during which international students can apply for temporary residence permits from two to ten years.

4. CONCLUSIONS

Highly skilled migration plays a central role in today's knowledge economy. Countries increasingly compete to attract and retain human capital.

The discussion over the migration of skilled workforce is stemming as far back since 1960 and has undergone various phases in last six decades with important implications for both, host and receiving countries. Research on the migration of skilled workforce deals with the phenomena mainly, as three different but overlapping concepts: “brain drain”, “brain gain” and, most recently, “brain circulation”.

Brain circulation is a significant phenomenon in globalized, knowledge-based world. Highly qualified persons are moving among different countries and institutions, thus acquiring, sharing and spreding their knowledge. Brain circulation is one of the most important factors influencing countries economic growth and its competitiveness.

This article presented examples of good practices from Korea, China, and India in brain circulation policies.

Chinese talent programs emphasize material incentives such as salary and research funding, “hard environment”, as well as social benefits such as housing, children’s education, employment for spouses, and academic rank which the returnee is awarded.. However, their weakness is that they underestimate the “softer” research environment. [Shi and Rao, 2010].

The process of brain drain that has taken place in India during the 1960s to 1980s begun to turn into the process of brain gain during the 1990s. As the country progressed into the new twenty-first century, evidence of brain circulation has come into sharp focus. This process of brain circulation has become a powerful economic factor for the development of previously marginal regions.

In the case of Korea, overseas-trained academics tend to produce more papers, especially those published in SCI journals, on average, compared to domestically-trained academics. The conduction of high-quality academic research necessitate the presence of overseas returnees. Therefore, policymakers ought to prioritize the implementation of policy measures that promote research collaboration and facilitate brain circulation.

International student mobility is currently a subject of increased interest in EU countries, given the continuous growth in student numbers. Many countries are experiencing, student numbers far above pre-COVID-19 levels in 2023. Consequently, major student destination countries are implementing more selective and restrictive measures to limit international student enrolment.

On the other hand, the retention of international students and their labour market integration continues to be an important policy objective of many EU countries, as students are the precursors of future skilled workers.

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REFERENCES

1. Albuquerque, E. M. (2001). Scientific Infrastructure and Catching-Up Precess: Notes about a Relationship Illustrated by Science and Technology Statistics, Revista Brasileira de Economia, 5 (4), 545-566.
2. Azose, J. J., & Raftery, A. E. (2019). Estimation of emigration, return migration, and transit migration between all pairs of countries. *Proceedings of the National Academy of Sciences, 116,* 116-122.

3. Baláž, V., Williams, A. M., & Kollár, D. (2004). Temporary versus Permanent Youth Brain Drain: Economic Implications. *Journal of International Migration* (4).
4. Chacko, E. (2007). From brain drain to brain gain: reverse migration to Bangalatore and Hyderabad, India´s globalizing high tech cities. *Geo Journal,* 131 – 140.
5. Daugeliene, R. (2007). The position of knowledge workers in knowledge-based economy: migration aspect. *European Integration Studies* (1), 103 – 112.
6. Docquier, F., Lohest, O., and Marfouk, A. (2007). Brain Drain in Developing Countries. *The World Bank Economie Review,* Vol. 21, No. 2, 193 – 218.
7. Docquier, F., Lowll, L. & Marfouk, A. (2009). A Gendered Assessment of Highly Skilled Emigration. *Population and Development Review,* Vol. 35, No. 2, 297 – 321.
8. Docquier, F., Rapoport, H. 2012. Globalization, Brain Drain, and Development. *Journal of Economic Literature,* Vol 50, No 3, 681 – 730.
9. Fragomen (2024). *Worldwide immigration Trends Mid-year report.*
10. Kwon, K. S. (2015) Evolution of Universities and Government Policy: the case of South Korea, Asian Journal of innovation and Policy, 4 (1), 103 – 128.
11. Kwon, K. S. Kim, S. H., Park, T. S., Kim, E. K., and Jang, D. (2015). The impact of graduate students on research productivity in Korea, Journal of Open Innovation: Technology, Market, and Complexity, 1, 21.
12. Kwon, K. S., Park, J., Kim, S. (2023). Mobility and productivity: brain circulation and sustainability of the Korean academic system. *Asian Journal of Innovation and Policy,* Vol. 12, 27 – 51.
13. Mahroum, S. (2000). Scientific mobility: and agent of scientific expansion and institutional empo.erment , Science Communication, 21, 367 – 378.
14. Mahroum, S. (2000). Highly skilled globetrotters: mapping the international migration of human capital. *R & D Management,* Vol. 30, 1, 23 – 31.
15. Mahroum, S. (2005). The international policies of brain gain: a review. *Journal of Technology Analysis & Strategic Management* (2), 219 – 230.
16. Moon, M (2004). Reappraisal of the Establishment of KIST: U.S. and Korea´s Role, The Korean Journal of History of Science, 26 (1), 57-86.
17. Newland, K. (2009). Circulation migration and human development. Human development Research Paper 2009/42, UNDP.
18. OECD (2023). Perspectives des migrations internationals 2023, Éditions OECD, Paris.
19. Rapoport, H. (2004). Who is Afraid of the Brain Drain? Human Capital Flight and Growth in Developing Countries. *Brussels Economic Review,* Vol. 47, No. 1, 89 – 101.
20. Sarma, M., & Krisha, V. V. (2010). State and the software: Public policies in the shaping of the Indian software sector. *The Service Industries Journal, 30* (1). 25 – 42.
21. Saxenian, A. (2005). From Brain Drain to Brain Circulation: Transnational Communities and Regional Upgrading in India and China. *Studies in Comparative international Development, Summer 2005,* 35 – 61.
22. Shin, J. C., and Kehm, B. M. (2013). The world-class university across higher education systems: Similarities differences, and challenges. In J. C. Sin & B. M Kehm (Eds.), Institutionalization of world-class university in global competition. Berlin: Springer.
23. Sukhatme, S. P. & Mahadevan, I. (1987). *Pilot study on magnitude and nature of the brain-drain of graduates of the Indian Institute of Technology, Bombay.* Bombay: Indian Institute of Technology.

24. Suntharasaj, P. & Kocaoglu, D. F. (2008). Enhancing A Country´s Competitiveness through "National Talent Management Framework". *Management of Engineering & Technology,* 314 – 327.
25. Tung, R. L. (2008). Brain Circulation, Diaspora and international competitiveness. *European Management Journal,* 298 – 304.
26. Varma, R. & Kapur, D. (2013). Comparative Analysis of Brain Drain, Brain Circulation and Brain Retain: A Case Study of Indian Institutes of Technology, *Journal of Comparative Policy Analysis: Research and Practice,* 15, 315 – 330.
27. Yigong Shi and Yi Rao (2010). China´s Research Culture. *Science 329,* p. 1128.
28. Zweig, D., Changgui, C. and Rosen, S. (2004). Globalization and Transnational Human Capital: Overseas and Returnee Scholars to China. *The China Quarterly,* No. 179, 735 – 757.
29. Zweig, D., Fung C. S., & Han D. (2008). Redefining the Brain Drain: China´s Diaspora Option. *Science, Technology & Society,* 1 – 33.
30. Zweig, D., Siqin, K., Huiyao, W. (2020). The Best are yet to Come: State Programs, Domestic Resistance and Reverse Migration of High-level Talent to China. *Journal of Contemporary China,* p. 1 – 16.