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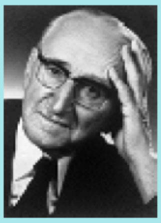



Atom S. Margaryan, Haroutyun T. Terzyan, Emil A. Grigoryan

Belt and Road Initiative as an Innovative Platform for Technology Transfer: Opportunities for Armenia

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Atom S. Margaryan

Haroutyun T. Terzyan

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Abstract

One of the pillars of the Belt and Road Initiative is the deepening of cooperation between member countries, especially in the field of science and innovation. But, is there any historical evidence of the concept of the Great Silk Road as a region of technology transfer, first? Secondly, what are the priorities and development directions of the initiative in the mentioned context? Third, what development guidelines should be set for the participating countries (Washington, Beijing, etc.). And finally, is there really a connection between infrastructure development and innovation activity? To answer the last question, a correlation and econometric analysis has been performed, the results of which indicate positive effects.

Keywords

The Great Silk Road, Belt and Road Initiative, Innovation, Patent Activity, Technology Transfer

Authors

Atom S. Margaryan is an associated professor at the Laboratory of Innovation and Institutional Research, Armenian State University of Economics

Haroutyun T. Terzyan is a senior researcher at the Laboratory of Innovation and Institutional Research, Armenian State University of Economics

Emil A. Grigoryan is a researcher at the Laboratory of Innovation and Institutional Research, Armenian State University of Economics

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1. Introduction

It is not difficult to define the goal of the Belt and Road Initiative. It is a major economic integration project involving dozens of countries in the Eurasian region (M. Chen et al., 2020, p. 1). "The BRI focuses on the creation and importance of international connections and infrastructure projects to stimulate investment, knowledge and trade flows between participating countries"(Brakman et al., 2019, p. 12). Almost from the very beginning of the initiative, steps have been taken to improve the innovative environment and to cooperate in the field of science (Office of the Leading Group for Promoting the Belt and Road Initiative [OLGPBRI], 2019).

Back in 2017, Xi Jinping stressed the need for the project to reach a new level of cooperation in the field of science and technology. It was preceded by the launch of a Digital Silk Road project, which brings together environmental specialists from dozens of countries (Normile, 2017), and Mariani (2021) noted. "Scientific cooperation has consequently become a pillar of the Belt and Road Initiative (BRI), China's connectivity project whose ostensible goal is to foster land and maritime trade routes between East Asia and Europe" (p. 3). In this context, it is simply imperative to study the links between the development of the project and the scientific and technological processes to which the following sections are devoted.

2. Literature Review

So far, various studies have been conducted to identify and present the above-mentioned interactions. One of the key characteristics of innovation is its spatial-temporal location (Feldman, 2016). According to Feldman (2016),"of all economic activity, innovation benefits most from location" (p. 626). Thus geography provides certain conditions for the effective implementation of innovation activity. Referring to Marshall ([1890] 1948, as cited in Feldman, 2016) the author emphasizes the phenomenon of centralization of economic activity due to infrastructure, labor and knowledge. Feldman (2016) wrote in particular: "Taken together these factors are referred to as industrial clusters, ecosystems or innovative milieus" (p. 626). On the basis of the above-mentioned circumstances, Feldman (2016) continued: "Patents are geographically concentrated, which reflects a concentration of research and development (R&D) activity" (p. 629). Minpeng Chen et al. (2020, p. 10), studying the transfer of climate technology through the New Silk Road, emphasize that one of its obstacles is the low level of communication and infrastructure development.

Patent activity is an appropriate tool for studying the interconnectedness of links and innovation, given the large database and availability of country data (Brem & Nylund, 2021, p. 298, Makkonen, 2014, p. 42). That priority has been set by Peter (2019, p. 300), who pointed to the weak ground of intellectual property protection in the Belt and Road Initiative. On the basis of historical and political factors, Brakman et al. (2019, pp. 11-12) have singled out 30 key countries of the New Silk Road (including the countries of the South Caucasus) and presented their weight and role in regional and global development. In particular, since 2000, the share of gross real income of China and core countries has significantly increased. Nonetheless, China's role was especially important in that process.

The issue of technological learning and technology transfer is rarely addressed in state infrastructure development programs. However, technological learning can be greatly facilitated by the development of air, sea and land transport infrastructure. With the relevant level of infrastructure development, it is possible to create a solid basis for technology transfer from the early phase of creation to diffusion (Ridley et al., 2006, p. 271). "Particularly in the era of globalization and knowledge-based economies, the quality and functionality of information and communications technology infrastructure – as well as logistical infrastructure – are essential for the development of academic and research institutions" (Ridley et al., 2006, p. 271).

The study of different sources and the combination of the theses reflected in them allow us to conclude that there is a need to consider BRI and patent activity in one dimension, as the first is in fact a major regional development project, which also includes cooperation in the field of science and formation of clusters, and the second describes the very innovation and technological activity.

3. Method

In the context of the issue defined in a paper the study has been based on data from the World Intellectual Property Organization (WIPO) (2020), the World Bank (2022), as well as the China

International Contractors Association (CHINCA) (2019, 2020). Belt and Road Infrastructure Development Index (BRIDI) published by the latter is calculated for 63 BRI countries and 8 Portuguese-speaking countries. The study includes data of countries BRIDI and total patent grants indicators for the period 2010-2020. It should be noted that data from only 33 countries out of 71 have been available. Based on the data of population of the countries, the number of patent grants per million people has been calculated. In addition to observing the general trends, a a panel-data based econometric model with fixed effects has been carried out.

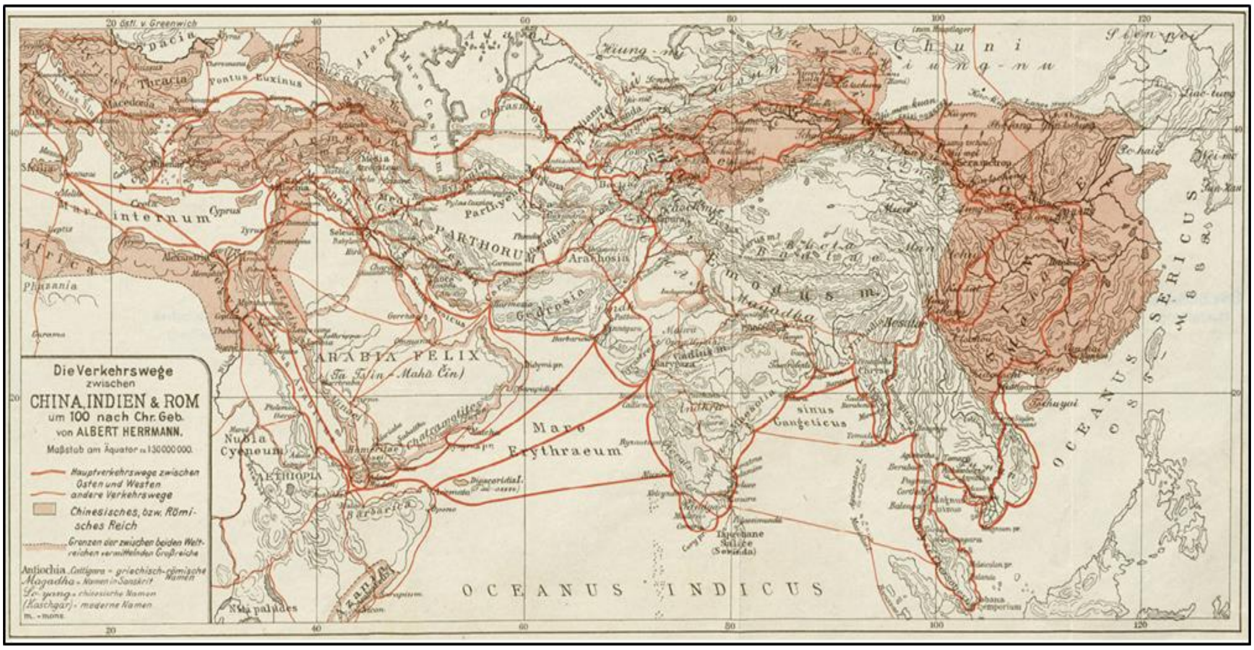
4. Results

4.1 China and Innovation: the Ancient Silk Road

It is not by chance that Xi Jinping presented the BRI as a reincarnation of the ancient Silk Road. The term "Silk Road" is also an innovation (the author is the German geographer Ferdinand von Richthofen (1833-1905)) which characterizes the network of roads connecting ancient China and the Roman Empire (Brakman et al., 2019, p. 6). Although, Waugh (2010) argued that "most today would agree that Richthofen’s original concept was too limited in that he was concerned first of all about the movement of silk overland from east to west between the "great civilizations" of Han China and Rome" (p. 9). More than 2,000 years ago, the Huns greatly contributed to the formation of the Silk Road (Waugh, 2010, p. 10). According to Galli (2017, p. 5), attempts were made to establish trade links between China and Rome. The Silk Road also included sea routes since ancient times which passed either through the trade nodes of the Indian Ocean and Red Sea shores, reaching Egypt or from the Persian Gulf to the Levant (Galli, 2017, pp. 6-7). Richthofen's arguments were also criticised from another point of view: Although Richthofen felt that the Silk Road trade ceased to be important with the decline of the Han Dynasty in the 2nd century CE, there is ample evidence of very important interactions across Eurasia in the subsequent period when—both in China and the West—the great sedentary empires fragmented. (Waugh, 2010 p. 12).

In essence, the term "Silk Road" characterizes the transmission of goods, ideas, technologies, innovations, languages, religions and even genes across the Eurasian-African regions (Brakman et al., 2019, p. 6; J. Chen et al., 2021, p. 1). From the 16th to the 17th century, during the period of hegemony of European countries on the international arena and the fall of the Silk Road, the source countries for technology transfer for the countries of the East changed (J. Chen et al., 2021, p. 1, Waugh, 2010). Armenia had a unique position along the ancient Silk Road as a crossroad of civilization and trade and a transit country. (Bakhchinyan, 2014, p. 23) (see Figure 1). Moreover, there is a lot of historical evidence confirming that during 16th and 17th centuries Armenian diasporas of Persia and India greatly contributed commercial activity along the Silk Road (Waugh, 2010, pp. 18-20).

Fig. 1: Map of ancient Silk Road



Note. The map delineating a network of silk routes from China to the West was created by German archeologist and geographer Albert Herrmann (1886-1945). From "Beyond frontiers: ancient Rome and the Eurasian trade networks" by M. Galli, 2017, *Journal of Eurasian studies*, 8(1), p. 4. Copyright 2017 by Asia-Pacific Research Center.

Fung et al. (2018) noted that "the confluence of technology and the Silk Road is not new" (p. 313). According to the authors, nowadays the majority of specialists from different areas are skeptical of the concept of China as a generator of innovation, while China was homeland or at least the co-inventor of the so-called "The Four Great Inventions" (papermaking, printing, gunpowder and magnetic compass), and the role of China in human history can not be underestimated. These inventions and technologies were later developed in the regions along the Silk Road (India, Arabia, Persia, Europe, etc.). According to another remarkable fact presented by Peters (2021), one of the earliest forms of merchant capitalism evolved along the ancient Silk Road, in parallel with the development of Middle Eastern and Greek trade hubs. The ancient Silk Road was, in a sense, one of the earliest forms of globalization, promoting "the introduction of financial norms and institutions, and, perhaps, most significantly, the spread of ideas, knowledge and technology transfer" (Peters, 2021, p. 956). Based on Peters' (2021) point of view, it can be concluded that China (along with the ancient Middle Eastern civilizations) became one of the cradles of merchant capitalism as the system of relations due to the development of the ancient Silk Road. It is the previous experience of knowledge and idea transfer that inspires hope that now, thanks to a solid infrastructure base, ideas will be generated, transfered and disseminated at much higher speeds (Peters, 2021).

Thus, the introduction of the New Silk Road as a technology transfer platform is not a novelty at all. It has a history of thousands of years, in which China acted as a source of innovations and discoveries, which were further developed along the Silk Road.

4.2 Alternatives to Technological Modernization of Post-Soviet States: "Washington" or "Beijing" Consensus?

The collapse of the Soviet Union raised great expectations among the population in terms of democracy, technological modernization and alternatives to economic development. The ruling elites of one and a half dozen countries that emerged as a result of the dissolution of the USSR chose the models and recommendations for economic and political reform offered by the International Monetary Fund (IMF) and the World Bank (WB). The set of neoliberal principles and approaches on the basis of which the institutional-economic-political reforms were carried out were developed in the 1960s and were known as the so-called "Washington Consensus". These 10 principles were most clearly formulated by Williamson (2004) in 1989.

The Washington principles are based on the principles of privatization, price liberalization, free trade, competitive markets, floating exchange rates, economic regulation and macroeconomic stability. More precisely, these principles have been applied more consistently in Asia, Latin America and especially in the Post-Soviet states, including the Republic of Armenia. The application of these principles, however, did not lead to the technological modernization of the once administratively centralized type of economies, to the increase of the level of productivity and competitiveness. The opposite happened. The main results of such liberal reforms were the deindustrialization of the economy, the growth of poverty, the level of corruption, the deterioration of the demographic situation and the "brain drain".

It is no coincidence that the application of the "Washington principles" has been harshly criticized from many points of view. In particular, according to Pettinger (2017), the use of free trade without elements of patronage can push the population of developing countries into a low-income trap, depriving them of workplaces. Meanwhile, the development of one's own economy the creation of competitive workplaces presupposes certain state subsidies and favorable election tariffs. Thus, the Post-Soviet states, including the Republic of Armenia, building their reform policy on the principles of the "Washington consensus", not only failed to solve the problems of technological modernization in the long run, but also did not develop a progressive economic structure that would break the defective framework of "middle income trap". This model of reforms, in fact, did not allow not only to solve the problem of creating effective and competitive basic technologies, but also to import high-quality technologies from foreign markets and restore the normal level of employment. By and large, the ideology of neoliberalism, in particular the "Washington Consensus", provides a theoretical opportunity for technological imitation and borrowing of technologies already established in developed countries, but, as life shows, even at that level the problems of economies with emerging markets remain unresolved.

In contrast to the "Washington Consensus", which guided the the Post-Soviet countires during their reforms, the principles of the so-called "Beijing Consensus" are more preferable for many countries in Southeast Asia. These principles are summarized as follows (Ramo, 2004):

- Striving for innovation in the economic, political and social spheres, but taking into account the Chinese peculiarities.
- The social sphere must develop in parallel with the development of the economy.
- Large-scale state support for projects in key sectors of the economy is needed.
- Political initiatives must have a clear economic content.

The above-mentioned principles presuppose maximum pragmatism, an innovative policy, in many cases opposed to extremely liberal or neoliberal approaches. At the forefront of the Beijing consensus is innovation activity with effective institutional support, which should receive priority state support.

This means that, in contrast to neoliberal approaches, the "Beijing Consensus" focuses on effective options for promoting opportunities for harmonious integration and institutional provision of innovative (technological), economic and social components. However, mechanical copying of Chinese development experience and technology transfer, such as borrowing from neoliberal models, may not be effective in most cases, as the specific historical and institutional conditions of a particular country may be extremely inconvenient and inadequate for congruent imitation and adoption of, albeit highly successful, Chinese development model. In this case, it is necessary to try to delineate the elements and components of the Chinese development experience, which will be more adaptable and appropriate to the specific conditions of the institutional environment of the country.

4.3 Technology Transfer along the New Silk Road

Against the background of the historical factor, the interest of BRI countries is growing, given the role of China in improving international trade and technology transfer (Silin et al., 2018, p.

314). The historical overview of the Great Silk Road allows us to fully understand the value of the "project of the century" by China. The latter, as Peters (2021) pointed out, is a clear manifestation of "Chinese infrastructuralism" (p. 955).

Recently, the interest of specialists in the innovation activity of BRI innovator and imitator countries has increased. In the context of the development of the New Silk Road and the deepening of regional cooperation, one of China's priorities is the promotion of innovative activities and technology transfer (J. Chen et al., 2021). Jin Chen et al. (2021, p. 2), referring to the work of various authors, emphasized that BRI countries can ensure the development of innovation activity if they have the appropriate infrastructure. Exploring the relationship between open innovation and China's international innovation impact, Brem and Nylund (2021) stated: "Due to the innate uncertainty and newness of innovation, partners beyond the common local and long-term networks must be included. Hence, to effectively create a New Silk Road of Innovation, innovation ecosystems may need to expand across national borders" (p. 293).

Fung et al. (2018) introduced the analogies and interactions of technology diffusion along the old Silk Road and Silicon Valley. There are two phases of technology and knowledge transfer along the New Silk Road, from Silicon Valley to China and from China to the BRI countries, and China is currently both the source and intermediary of technology and knowledge transfer along the Silk Road. Thus, according to the authors, in the case of the New or Digital Silk Road China is not the only source of innovation.

Minpeng Chen et al. (2020) noted: "China is sowing seeds of innovation in the BRI countries" (p. 11). The BRI aspires to become today's digital Silk Road by promoting innovation activity and expanding scientific and technological cooperation (OLGPBRI, 2019). China has already signed 46 agreements with the BRI member states, which are aimed at promoting the development of 5 regional platforms for technology and innovation transfer (OLGPBRI, 2019, pp. 43-44). It can be said that China has created an infrastructural basis for technology transfer. Signing agreements with countries and developing platforms are aimed at improving innovation in the long run. The introduction of an effective mechanism presupposes the existence of a flexible legal system for intellectual property protection (OLGPBRI, 2019, p. 60). The examples of similarity of knowledge and technology transfer along the ancient Silk Road and the New Silk Road, such as the concrete steps taken by China, are striking, but the fundamental differences are also noteworthy, particularly the fact that the technology sources and transfer methods have changed in the same geographical area.

4.4 Infrastructure Development and Patent Activity along the New Silk Road

The role of infrastructure is also important from the point of view of investment attractiveness (Ridley et al., 2006, p. 276). There is some evidence that investment in traditional infrastructure contributes to economic growth. The so-called new infrastructure investments (such as 5G, artificial intelligence and big data) are aimed at improving traditional infrastructure (Du et al., 2022). In 2013-21, China's BRI engagement amounted to more than USD 850 billion. The energy and transport sectors account for about 63% of the total engagement. China actively participates in the development of transport infrastructure (roads, railways, aviation, shipping). It should be noted that only a small part of engagement in transport is through investments (Nedopil, 2022, pp. 8, 12, 15). Taking into account the orientation of the BRI towards regional development-cooperation, as well as the methodology developed by CHINCA, it was appropriate to consider the level of infrastructure development by 7 regions (see Table 1).

Tab. 1: Regional Cluster-Countries' BRIDI in 2010 and 2020

Region	Country	BRIDI	
		2010	2020
Southeast Asia	Indonesia	135	126
	Brunei	107	106
South Asia	Pakistan	125	115
	Bhutan	110	102
Western Asia and North Africa	UAE	109	114
	Yemen	100	92
CIS-7 Countries and Mongolia	Russia	128	117
	Ukraine	104	94
Central Asia	Kazakhstan	119	112
	Kyrgyzstan	109	103
CEE	Hungary	101	107
	Cyprus	104	98
PSCs	Brazil	133	109
	Mozambique	105	99

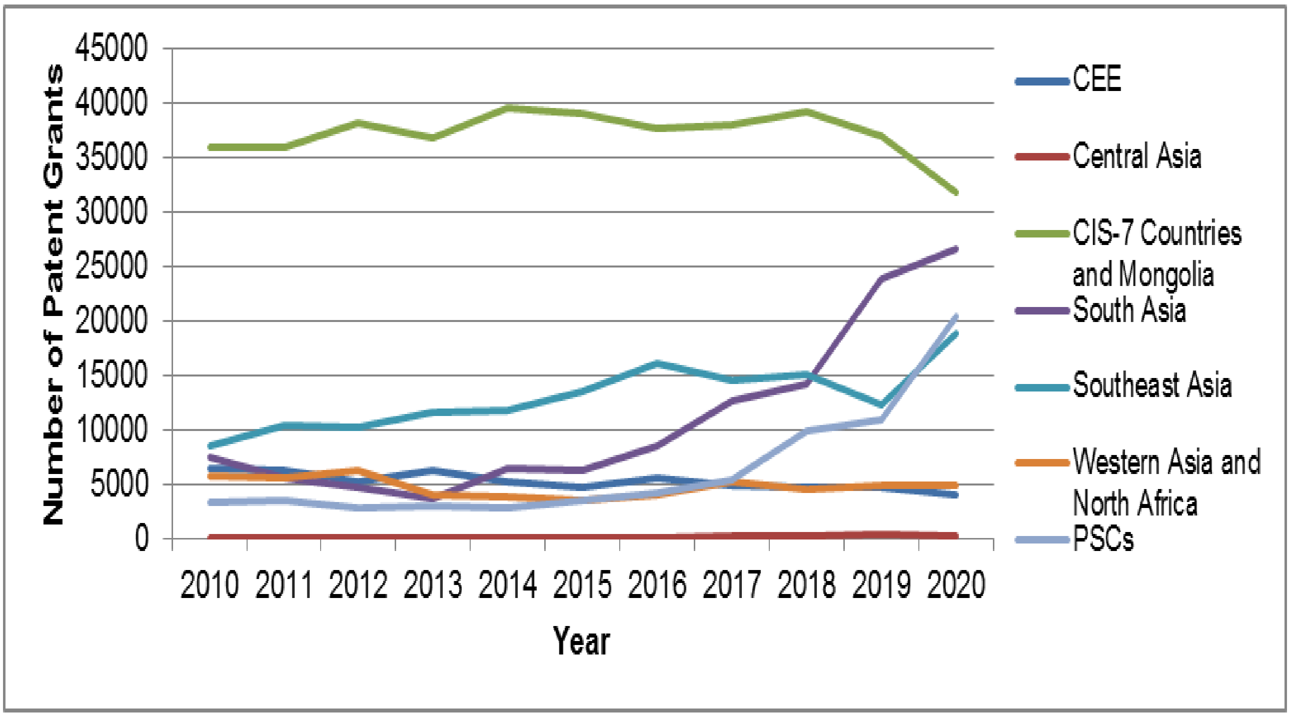
Note. A higher score of BRIDI characterizes the higher opportunity for further infrastructure development and investment attractiveness in a country. Adapted from *The Belt and Road Infrastructure Development Index Report 2020* (p. X), China International Contractors Association, 2020, s*ource:(http://events.chinca.org/public/uploadfile/2020/1202/1606863831216535.pdf).*

As shown in Table 1, in 2020, Indonesia is the leader among all 71 countries. The lowest level of infrastructure development among South Asian countries was recorded in Brunei. Hungary is the leader in terms of infrastructure development in the most distant land region, that is, in Central and Eastern Europe. Russia and Ukraine are in the first and last places in the region of CIS 7 countries and Mongolia. The infrastructure systems of Armenia and Georgia are more developed in the South Caucasus: BRIDI of Azerbaijan is 101.

Figure 2 illustrates the regional picture of patent activity of BRI countries. During the entire observed period, the region of CIS-7 Countries and Mongolia was the leader (31,792 patent grants in 2020), and since 2018 was followed by the region of South Asian (more than 26,000 patent grants in 2020). For the period 2010-18 the second region with the highest number of patent grants by 2018 was Southeast Asia (about 20,000 patents in 2020). It should be noted that if at the beginning of the period more than half of the patent grants of the BRI countries belonged to the region of CIS-7 Countries and Mongolia, then in 2020 the region's share decreased to about 30%.

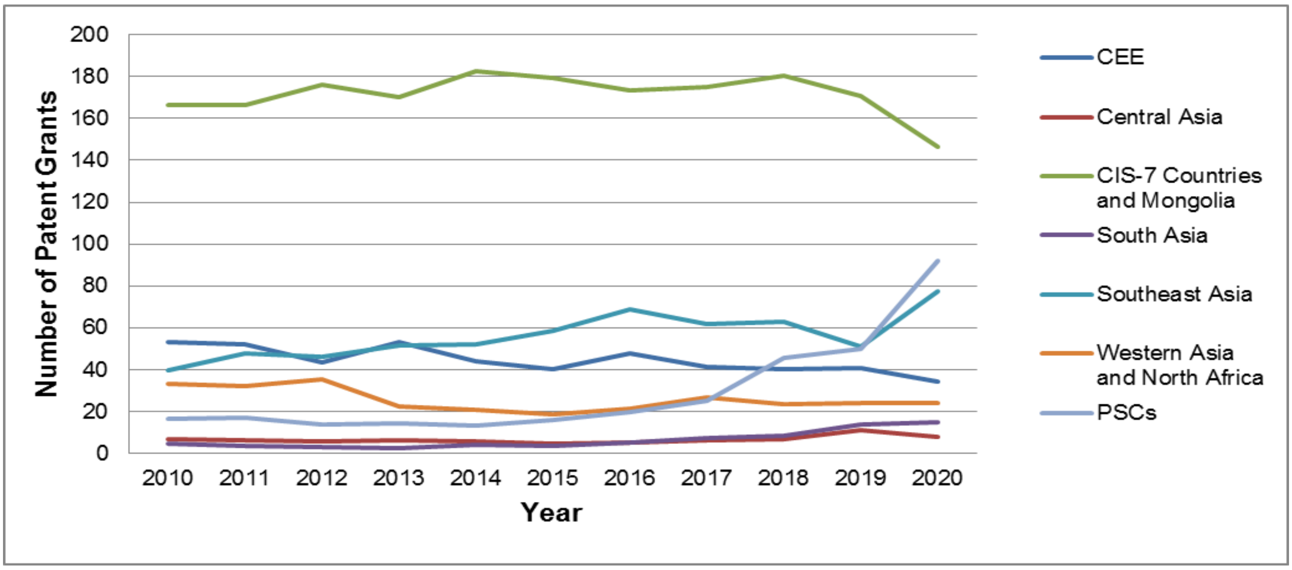
The picture is different when the number of patent grants is expressed per million population (see Figure 3). The region of Central Asia, which plays a key role in the BRI project, ranks last. Central Asia is followed by one of the previous leading regions, South Asia (15 patent grants in 2020). As in the previous case, the leader is the region of CIS-7 Countries and Mongolia (147 patent grants in 2020).

Fig. 2: **Number of Patent Grants by Regions**



Note. Adapted from WIPO IP Statistics Data Center. Copyright 2020 by World Intellectual Property Organization.

Fig. 3: Number of Patent Grants per Million Population by Regions



Note. The data for patent grants are adapted from WIPO IP Statistics Data Center. Copyright 2020 by World Intellectual Property Organization. The data for country population are adapted from World Development Indicators. Copyright 2022 by World Bank.

Russia plays a significant role in the region's leading position (about 200 patent grants in 2020), followed by Ukraine and Belarus (50 and 48 patent grants, respectively). The leader in the number of patent grants is Georgia (41 patent grants), followed by Armenia (25 patent grants). Azerbaijan ranks last in the number of patent grants per million population in the region of CIS-7 Countries and Mongolia (11 patent grants).

5. Model Evaluation

The main objectives of the study are:

- to determine whether there are links between BRIDI and the patent applications,
- to find out how a change in BRIDI in the presence of links affects the change in the number of patent applications, thereby contributing to the process of technology transfer.

In order to answer the first question, various kind of analysis-review of literature, graphic illustrations of the dynamics of BRIDI and the patent grant data, discussions of other researchers, experts and economists, were carried out. For a more detailed consideration of these relationships, a panel-data based econometric model with fixed effects (Verbeek**,** 2004**,** pp. 345-347) was presented with the following specification:

$$\mathrm{Y_{it}} = \sum_{j=1}^{32} \alpha_j \cdot \mathrm{d}_{ij} + \beta \cdot \mathrm{X_{it}} + \varepsilon_{\mathrm{it}}$$

where,

$\mathrm{Y_{it}}$ – is the logarithm of the number of patent grants in case of the New Silk Road i-th member country as of t-th year,

$\mathrm{X_{it}}$ –is the logarithm of BRIDI level as of t-th year in the case of the i-th member country of the New Silk Road,

$\mathrm{d_{ij}}$ –is a dummy variable, that takes the value 1 if $\mathrm{i} = \mathrm{j}$, otherwise it is 0. These dummy variables represent countries which are involved in the research,

$\alpha_1, \alpha_2, \cdots, \alpha_n$ and β – are unknown parameters of the model,

$\varepsilon_{\mathrm{it}}$ –is a random error of the model in the i-th representation at t-th year,

i –is the index of the country, where $\mathrm{i} = \overline{1{,}33}$.

t- is the index of time, where $\mathrm{t} = \overline{1{,}11}$ (2010-2021),

It should be noted that the final choice of the the econometric model was made as a result of several stages of analysis. The model was evaluated using the method of least squares (LSDV). Table 2 illustrates the results.

Tab. 2: Panel-data based econometric model estimation results

Dependent variable: log(Y)

Variable	Coefficient	Level of Significance
log(X)	1.53	***
Armenia	-2.60	***
Azerbaijan	-2.60	***
Bangladesh	-2.47	***
Belarus	-0.30	***
Brazil	1.12	***
Bulgaria	-2.54	***
Croatia	-3.27	***
Czech Republic	-0.69	***
Egypt	-1.01	***
Estonia	-3.60	***
Georgia	-1.90	***
Greece	-1.38	***
Hungary	-1.61	***
India	1.75	***
Iran	1.03	***
Jordan	-2.64	***
Latvia	-2.53	***
Lithaunia	-2.44	***
Malaysia	0.87	***
Pakistan	-1.88	***
Philippines	0.19	***
Poland	0.77	***
Portugal	-2.65	***
Moldova	-3.01	***
Romania	-1.24	***
Russia	3.01	***
Serbia	-2.51	***
Singapore	1.36	***
Slovakia	-2.32	***
Ukraine	0.98	***
UAE	-2.79	***
Uzbekistan	-1.86	***
R-squared	0.99	
Adjusted R-squared	0.98	

$^{***}p < .001$.

The evaluated model is of high quality. The estimated coefficients of the latter are strongly significant, and adjusted R-Squared is 0.98. With the help of the evaluated model we can answer the second question of the research. In particular, the results of the evaluation show that an increase of BRIDI 1%, ceteris paribus, leads to an increase in the number of total patent grants by an average of approximatly 2%.

The mentioned results indicate the presence of interactions revealed in various studies. The rapid development of high-tech industries would be impossible without the presence of an appropriate infrastructure base. In addition, the connection between entities of innovation systems is also improved through infrastructure (UN Millennium Project, 2005, p. 79). Ridley et al. (2006) emphasized interactions between infrastructure development and innovation acitvity are reciprocal. According to the authors, infrastructure development policy can be considered as a part of innovation policy. They noted: "Infrastructure is a fundamental element of a comprehensive and effective science, technology, and innovation policy" (Ridley et al., 2006, p. 272).

However, there are some limitations to the study. It is related to the database, which has objective reasons. First of all, the presented indicators cover an 11-year period. This is due to the fact that the New Silk Road project is still in the early stages of development and the available data is from 2010. The next limitation is related to the inclusion of a small number of countries. In this case, the problem is related to the incomplete series of statistics of patents grants.

6. Conclusion

Several conclusions can be drawn from the perspectives of the concept of the Silk Road as an innovative platform. First of all, the origins of this concept actually go back more than two millennia. The prevalent thought that China is historically more imitator than innovator is baseless. In addition to "The Four Great Inventions", the Great Silk Road was also one of the platforms for the development of globalization and merchant capitalism (Peters, 2021). Second, an acceptable way to apply the Beijing consensus is to filter out the elements and components of the Chinese development experience that are most adaptable to the specific conditions of the country's institutional environment. Third, various authors (Fung et al., 2018, Peters, 2021) presented the role of the ancient Silk Road and the New Silk Road in the process of technology transfer. In addition to the similarities, it can be noted that currently China often acts as an intermediary in this process. Moreover, a special place is given to innovation activity and scientific and technological cooperation in BRI policy, whereas technology transfer and diffusion along the ancient Silk Road was of a spontaneous nature.

The opportunities for Armenia's infrastructure development, as a BRI country, can be pointed out. The historical factor has a great influence on the readiness of the country to become an active participant of the BRI. The former Armenian trace along the ancient Silk Road is tangible. Armenia has been participating in BRI programs since 2015. However, the level of cooperation is quite modest compared to other countries in the region (Bergman, 2019). Armenia is not currently a BRI transit country, but "country may still benefit from the BRI and those benefits can be enhanced if the implementation of complementary policies accompanies infrastructure improvements" (World Bank, 2020, p. 1). One way of improvement is to connect the Persian Gulf to the Black Sea via the Iran-Armenia-Georgia transit route, attracting additional investment from China (Poghosyan, 2018, World Bank, 2020). In this regard, the discussions on the construction of new highways, railways and sea routes between Armenia, Iran, Georgia, Bulgaria and Greece in 2016 are noteworthy (Poghosyan, 2019). In this respect, there is a somewhat contradictory situation. On the one hand, being a BRI transit country for Armenia is an economic priority. On the other hand, the construction of a 550-kilometer North-South road corridor has not been completed for a decade. In this context, the results of the analysis and especially the econometric analysis show that BRI infrastructure development contribute technology transfer, in particular in terms of increasing total patent grants, which once again confirms the widespread aspect in professional circles that there are interactions between infrastructural development and innovation activity.

References

Bakhchinyan, A. (2014): The Activity of Armenian Merchants in International Trade. In S. Yamane & N. Naganawa (Eds.), *Regional Routes, Regional Roots? Cross-Border. Patterns of Human Mobility in Eurasia* (pp. 23-29). Slavic Research Center, Hokkaido University.

Bergmann, S. (2019, December 16): Armenia in the Belt and Road Initiative. *EVN Report*. https://evnreport.com/economy/armenia-in-the-belt-and-road-initiative/#

Brakman, S., Frankopan, P., Garretsen, H., & Van Marrewijk, C. (2019): The New Silk Roads: An introduction to China's belt and road initiative. *Cambridge Journal of Regions, Economy and Society*, *12*(1), 3-16. https://doi.org/10.1093/cjres/rsy037

Brem, A., & Nylund, P. A. (2021): Maneuvering the bumps in the New Silk Road: Open innovation, technological complexity, dominant design, and the international impact of Chinese innovation. *R&D Management*, *51*(3), 293-308. https://doi.org/10.1111/radm.12451

Chen, J., Di Minin, A., Minshall, T., Su, Y. S., Xue, L., & Zhou, Y. (2021): Introduction to the Special Issue on the New Silk Road of Innovation: R&D Networks, Knowledge Diffusions, and Open Innovation. *R&D Management*, *51*(3), 243-246. https://doi.org/10.1111/radm.12479

Chen, M., Zhang, L., Teng, F., Dai, J., Li, Z., Wang, Z., & Li, Y. (2020): Climate technology transfer in BRI era: needs, priorities, and barriers from receivers' perspective. *Ecosystem Health and Sustainability, 6*(1) , 1780948. https://doi.org/10.1080/20964129.2020.1780948

China International Contractors Association (2019): *The Belt and Road Infrastructure Development Index Report 2019*. https://www.ipim.gov.mo/wp-content/uploads/2019/05/PT_EN_The-Belt-and-Road-Infrastructure-Development-Index-Report-2019.pdf

China International Contractors Association (2020): *The Belt and Road Infrastructure Development Index Report 2020*. http://events.chinca.org/public/uploadfile/2020/1202/1606863831216535.pdf

Du, X., Zhang, H., & Han, Y. (2022): How Does New Infrastructure Investment Affect Economic Growth Quality? Empirical Evidence from China. *Sustainability*, *14*(6), 3511. https://doi.org/10.3390/su14063511

Feldman, M. P. (2016): Geography of Innovation. In M. Augier & D. J. Teece (Eds.), *The Palgrave Encyclopedia of Strategic Management* (pp. 625-630). Palgrave Macmillan.

Fung, K. C., Aminian, N., Fu, X., & Tung, C. Y. (2018): Digital silk road, Silicon Valley and connectivity. *Journal of Chinese Economic and Business Studies*, *16*(3), 313-336. https://doi.org/10.1080/14765284.2018.1491679

Galli, M. (2017). Beyond frontiers: ancient Rome and the Eurasian trade networks. Journal of Eurasian studies, 8(1), 3-9. https://doi.org/10.1016/j.euras.2016.12.001

Magnus, J., Katyshev, P., Peresetsky, A. (2004): *Jekonometrika. Nachal'nyj kurs* [Econometrics. Introductory Course]. Delo.

Makkonen, T. (2014): National innovation system dynamics in East Central Europe, the Baltic countries, and Russia. In A. Zhuplev & K. Liuhto (Eds.), *Geo-regional competitiveness in Central and Eastern Europe, the Baltic countries, and Russia* (pp. 32-56). IGI global.

Mariani, L. (2021, September): *The Belt and Road Initiative and the Internationalisation of China's Scientific Power: The Case of Italy.* (IAI Papers 21|40). https://www.iai.it/en/pubblicazioni/belt-and-road-initiative-and-internationalisation-chinas-scientific-power-case-italy

Nedopil, C. (2022): *China Belt and Road Initiative (BRI) Investment Report 2021*. Green Finance & Development Center, FISF Fudan University, Shanghai. https://greenfdc.org/wp-content/uploads/2022/02/Nedopil-2022_BRI-Investment-Report-2021.pdf

Normile, D. (2017, May 16): China's belt and road infrastructure plan also includes science. *Science*. https://www.science.org/content/article/china-s-belt-and-road-infrastructure-plan-also-includes-science

Office of the Leading Group for Promoting the Belt and Road Initiative (2019): *The Belt and Road Initiative: Progress, Contributions and Prospects*. https://www.mfa.gov.cn/ce/cegy/eng/xwfw/t1683480.htm

Peter, K. Y. (2019): Building Intellectual Property Infrastructure Along China's Belt and Road. *U. PA. ASIAN L. REV.*, 14, 275-325. https://scholarship.law.upenn.edu/alr/vol14/iss3/1/

Peters, M. A. (2021): The ancient Silk Road and the birth of merchant capitalism. *Educational Philosophy and Theory*, *53*(10), 955-961. https://doi.org/10.1080/00131857.2019.1691481

Pettinger, T. (2017, April 25): Washington consensus – definition and criticism. *Economicshelp*. https://www.economicshelp.org/blog/7387/economics/washington-consensus-definition-and-criticism/

Poghosyan, B. (2018): China's OBOR Initiative: Opportunities for the South Caucasus. *IndraStra Global*, 4(7). https://nbn-resolving.org/urn:nbn:de:0168-ssoar-57806-2

Poghosyan, B. (2019): The Seventh Corridor of the Belt and Road Initiative. *IndraStra Global*, 5(1). https://media.neliti.com/media/publications/279366-the-seventh-corridor-of-the-belt-and-roa-e6919e36.pdf

Ramo, J. C. (2004): *The Beijing consensus*. The Foreign Policy Centre.

Ridley, T., Yee-Cheong, L., & Juma, C. (2006): Infrastructure, innovation and development. *International Journal of Technology and Globalisation*, 2(3-4), 268-278. 10.1504/IJTG.2006.011915

Silin, Y., Kapustina, L., Trevisan, I., & Drevalev, A. (2018): The silk road economic belt: balance of interests. *Economic and Political Studies*, *6*(3), 293-318. https://doi.org/10.1080/20954816.2018.1499072

UN Millennium Project (2005): *Innovation: Applying Knowledge in Development* (Task Force on Science, Technology, and Innovation). Earthscan Publishing.

Verbeek, M. (2004): *A Guide to Modern Econometrics*. John Wiley & Sons.

Waugh, D. C. (2010): The Silk Roads in History. *Expedition Magazine*, 52(3), 9-22.

Williamson, J. (2004): *The Washington Consensus as Policy Prescription for Development* [Lecture notes]. https://www.piie.com/commentary/speeches-papers/washington-consensus-policy-prescription-development

World Bank (2020): *South Caucasus and Central Asia - The Belt and Road Initiative : Armenia Country Case Study.* https://openknowledge.worldbank.org/handle/10986/34120
World Bank, World Development Indicators (2022): *Population, total* [Data Set]. https://data.worldbank.org/indicator/SP.POP.TOTL

World Intellectual Property Organization, WIPO IP Statistics Data Center (2020): *Total patent grants (direct and PCT national phase entries)* [Data Set]. https://www3.wipo.int/ipstats/index.htm?tab=patent

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Herausgeber:

Prof. Dr. Stefan Kolev - Erfurt
PD Dr. habil. Bernhard Seliger – Seoul
Prof. Dr. Ralph M. Wrobel – Zwickau

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