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The notion of diaspora knowledge network revisited: Highly skilled migrants forming a new invisible college

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This paper comes from a doctoral research project “Russian computer scientists in the UK: migration, career and diaspora knowledge networks”, devoted to diaspora knowledge networks formed by Russian-speaking computer scientists as migrants from countries of former Soviet Union, who moved after 1991 and live(d) in the United Kingdom holding academic positions of teaching and research. The study benefitted from continuous support by the CGES and travel grants for collecting empirical material in 2015 and 2018, provided by the CGES to the author as a winner of two Russian-European research papers competitions organized by the Centre.

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Introduction

Research on diaspora knowledge networks (DKNs) was initially a part of highly skilled migration studies, brain drain and scientific and technological diasporas scholarship. DKNs were first identified in early 1990s and are defined as transnational associations of migrant professionals and scholars from the same home country, demonstrating the willingness "to contribute to the development of their origin countries" (Meyer, 2011: 159) as well as to engage in "mutual aid and information sharing" (Barre et al., 2003: 1). They were also called digital diaspora networks or ICT-enabled diasporic networks, as Internet was the main medium for facilitating linkages between network members in different destination countries (Grossman, 2010). Because of their organisation and potential for "concerted action" among highly skilled migrants, DKNs were distinguished from traditional diaspora, which are the "totality of individuals living abroad" (Kuznetsov & Sabel, 2008: 1). Viewed as a new form of transnational cooperation and connectivity among much valued "brains" abroad, DKNs were treated as a promising means of stimulating brain circulation for the benefit of developing countries losing their talents to their powerful competitors. This vision inspired a wealth of DKN studies throughout the 2000s. However, being concerned with harnessing the capacities of a DKN for contribution to the development of the homelands of their members, these studies were predominantly policy-oriented and lacked substantial theoretical background. Their understanding of DKNs had an applied character and remained rather narrow, incorporating such basic features as the link between the highly skilled migrants' associations and their home countries, networking as their internal logic and uniting principle, knowledge flows among migrant professionals and their counterparts at home and the reliance on ICT (Brown 2002, Kuznetsov 2006, Meyer 2007, Grossman 2010). This limited understanding based on the vision of a DKN as a "brain gain" strategy and a variation of diaspora does not allow to fully explore the set of exciting questions such as the interplay between transnational and diasporic practices of highly skilled migrants and the interaction between their professional and cultural identities. This paper suggests redefining the notion of a DKN and placing it on a new conceptual ground, aiming to provide a tool for investigating the previously downplayed aspects of diasporic networking.

I highlight the activation and mobilization of the sense of national belonging in professional networking, called "re-identification through professional motives" (Meyer, 2007: 10) as a distinctive feature and a driver of DKN formation and development. There is growing evidence that this revitalization of national identity, characterizing professional relations between highly skilled migrants of the same country of origin, is not confined to formal and ICT-enabled associations, but takes place across a variety of organizational settings, formally and informally, in academia and industry, locally and transnationally, in the host and in the home country. However, these relations are neither incorporated into the current notion of a DKN nor can be explained by the existing conceptual perspectives on a DKN. As a result, diasporic networking in professional sphere becomes largely invisible, not sufficiently recognized or conceptualized. It is particularly disappointing given that knowledge work and, especially, scientific work is intensively internationalized throughout European Union, with a growing

number of foreign-born specialists and scientists entering the European countries. There is a lack of understanding of how highly skilled migrants arrange their lives and careers in a different national contexts, why they sustain professional connections with their compatriots and what consequences it brings. I argue that despite the seeming differences, the process of diasporic networking and the social structures it produces have common origins and logic and therefore, deserve to have a common notion to designate them and to separate them from other links and networks they create. This paper aims at explaining what these common origins are and how the initial understanding of DKNs should be reconfigured to reflect this phenomenon and its essential features.

I accomplish this task by making a problem-oriented literature review, developing and enriching ideas from the existing DKN studies through the lenses of various streams of social science research, combining and linking them in a novel way. In particular, I suggest applying migration network theory developed in low-skilled migration to make sense of the experience of mobile academics and other knowledge workers. I propose to integrate this theory with social studies of science, innovation and knowledge networks research. Ideas presented in this text were developed as part of my doctoral research project devoted to the DKN of Russian computer scientists working in the UK. Therefore, the argument is largely based on the literature about academia, higher education, scientific collaboration and focuses mainly on mobile academics. Still, this argument is relevant for other categories of highly skilled migrants and knowledge workers as the pattern of DKN formation follows similar logic. Only the institutional and normative context of the relevant professional area and policy regulations of the destination country should be taken into account as they shape the structure and effects of DKNs.

The paper is organized as follows: firstly, I examine higher education studies and migration scholarship to demonstrate that the predominant discourse on academic mobility concentrates on its positive effects, while its “darker side” is underplayed (Richardson & Zikic, 2007). In contrast, I argue that foreign-born scholars find themselves in a migrant position and experience various disadvantages associated with migrant status in the host country academia. Secondly, I discuss the migration network theory and ethnic networks research, showing that foreign-born professionals rely on diasporic contacts as a resource in overcoming difficulties of their migrant position. Thirdly, I refer to innovation and scientific collaboration studies to demonstrate the importance of diasporic identity and common origin for knowledge exchange and generation activities. Finally, I draw on social studies of science, the concept of invisible college and sociological theory to shed light on how a network of highly skilled migrants becomes a knowledge production unit. As a result, I compose a new extended notion of a DKN and build a new conceptual framework, which can be used for empirical studies of DKNs.

When scientists are migrants or invisible immigrant minority in the academia

Mobility and migration have been on the rise among scientists in the last few decades, characterized as “systematic, dense, multiple and transnational” (Kim, 2010: 579). This phenomenon is associated with “neoliberal globalization” of science and higher education (Dervin, 2011: 4) and is accompanied by increasing competition between institutions and countries for research excellence and talent supply. Shaped by “regional and international political and economic relations of power” (Kim, 2009: 387), academic mobility and migration maintain their unevenness and hierarchical character, with the “global North” still acting as a powerful magnet for highly qualified professionals and researchers from the “global South”. It is especially visible in the increased recruitment of international students (Tremblay, 2005), one of the priority concerns in the developed countries, which is incorporated “into their strategies to attract and retain highly skilled migrant workers” (She & Wotherspoon, 2013: 1). The uneven character of the academic mobility is also pronounced in the phenomenon of a more massive, multiple and short-term migration of PhD students and junior researchers, being linked to the spread of project-based and contractual labour, the shrinking number of permanent positions along with the increase in temporary ones (Kim, 2009: 399-400).

Being a component and an effect of neoliberal reorganization of science and higher education, scientific mobility sometimes acquires a “forced” character (Karaulova, 2016: 235), becoming a pressing necessity rather than a matter of choice (Morano-Foadi, 2005). Still, many studies concentrate on various positive effects and consequences of spatial mobility for academics, including increased productivity and visibility of their research, larger and more diverse collaboration networks (Stephan & Levin, 2001; Scellato et al., 2012). This higher productivity of migrant scholars compared to native faculty is presented as a “mover’s advantage” (Franzoni et al., 2014), stemming from the “position of arbitrage, where they can exploit rich or unique knowledge sets” (Franzoni et al., 2014: 2) and benefit from their central role in the formation of global collaboration networks (Larner, 2015). Therefore, mobile researchers are recognized as a valuable asset making a substantial contribution into scientific research and technological innovation of the host country (Levin & Stephan, 1999; Lin, 2004; Corney & Sabharwal, 2011; Kim, 2011). As a result, transnational scientific migration is represented as an important factor of scholarly productivity and an achievement on an individual and national level. However, such representation constitutes migration as an overwhelmingly unproblematic process, what might disguise costs, risks and tensions experienced by migrant scientists from the pre-migration period to the post-migration adaptation.

Alternatively, a possible explanation behind the “more mobility-higher productivity” trend might be connected with “a discriminating environment in the host country”, when “migrants feel pressure to perform better than domestic scientists” (Franzoni et al., 2014: 9). Indeed, some studies find that foreign-born faculty spend more time on research than instruction (Weber, 2012) and prioritize publications over grants and collaboration compared to their native colleagues

(Lee, 2004). Furthermore, foreign-born faculty are "producing more, but getting less" in salaries, job satisfaction and promotion to permanent positions in comparison to native staff (Corley & Sabharwal, 2007: 909). Postdoctoral researchers are particularly affected: despite making a significant contribution to the host institution's and country's research output, they are characterized as "low-cost, high-yield scientific workers" in "exploitative" conditions with inadequate remuneration, a lack of professional autonomy and few opportunities "to move into tenure-tracked faculty jobs" (Cantwell, 2009: 10, 212)[1].

Disparities in remuneration, fewer chances for promotion and higher competition are not the only difficulties encountered by foreign-born scientists in the host country academia. These also include legal and visa issues, a lack of language skills, local connections, knowledge of taken-for-granted rules and norms of interaction both in everyday life as well as in professional context, resulting in cultural adaptation and integration problems, social isolation, stress and so on. Nevertheless, even when such issues are discussed, they are often approached from the perspective of the host country. For example, a lack of language skills and specific accents of foreign-born faculty attract attention as a factor undermining the quality of teaching in host country universities (Marvasti, 2005; Alberts, 2008). Difficulties in cultural adaptation of international faculty and visa issues are treated as a threat to the retention of valuable human capital and therefore potentially undermining the host university's or country's research strength (Sabharwal, 2011). Foreign-born scientists are also seen as unwelcome competitors of native-born population for highly skilled positions and as partially a cause of underrepresentation of "domestic" minorities in the national education system (Tapia, 2007).

Another stream of studies focuses on "international academics' lived experiences" (Kim & Locke, 2010: 32) and highlights the perceptions and views of foreign-born faculty in some of the most internationalized countries (US, UK, Australia). International academics in the UK encountered the "problems of cultural disconnectedness" such as dissatisfaction with the individualistic working culture prevalent in British universities and a lack of knowledge of "cultural nuances of the language" leading to embarrassment and inadequacy in interaction, especially in a professional setting (Pherali, 2012: 330, 323). In addition, the relations with students were undermined by the reduced awareness of their "prior curricular knowledge" acquired in a British school (Pherali, 2012: 325). The difficulties were found to be more pressing for the non-EU faculty and particularly acute upon arrival when settling in a new environment was coupled

[1] These findings are consistent with some statistical data for the US, indicating that higher numbers of migrant scholars is concentrated on temporary positions. Thus, foreign-born postdocs on temporary visas comprised 58,8% of the postdoctoral research staff in 2002 (Bonetta, 2007), compared with 20 per cent of foreign-born faculty in science and engineering overall (National Science Board, 2000). Higher rates are observed for engineering (38.0% of faculty members), medicine (35%), and mathematics (29.2%) (Lowell et al., 2010), though these numbers are still much lower than the share of doctoral degrees earned by foreign students (up to 60% in computer science) and the proportion of international postdocs, especially in STEM areas (Gahungu, 2011).

with a substantial professional workload. The study of foreign-born faculty in Australian universities revealed similar tensions of "cultural dislocation", especially for scholars with non-English-speaking background (Saltmarsh & Swirski, 2010: 295). Dealing with everyday life necessities, understanding particular jargon and informal language, finding their place in a new higher education system, arranging satisfactory interaction with students were are challenging for foreign-born scientists even despite their considerable work experience and expertise in their field.

Migrant scholars in the US were found to face the same problems (Price et al., 2005; Bonetta, 2007; Collins, 2008; Foote et al., 2008; Gahungu, 2011). In addition, they expressed concerns "incivility" and "obnoxious behaviour" from native students and colleagues (Gahungu, 2011: 12) and subjection to stereotypical and discriminative treatment (Foote et al., 2008, Ngwainmbi, 2006). For example, this treatment manifests itself in the assignment of courses: foreign-born staff are supposed to be more suitable instructors in disciplines with some "international and global perspective", like geography. But other subjects like the English culture or the American history and even general education courses are not typically viewed as proper ones for foreign-born academics (Foote et al., 2008: 171; Gahungu, 2011: 15), who risk being "rightfully perceived as unqualified impostors stealing positions from rightful native-born counter-parts" (Ibid). Moreover, even teaching a "suitable" course, foreign-born faculty "can easily be marginalized" because of their unconventional and "remotely critical" views on the US way of life, economic and political affairs (Foote et al., 2008: 171). Probably, the discriminative treatment contributes to the concentration of migrant scientists in particular disciplinary areas in the host country higher education and research system, such as natural sciences (Lin et al., 2009) and STEM areas.

Foreign-born scientists also experience disadvantages in the high-tech industry of a destination country. Thus, a study of biotechnology firms in Massachusetts and New England (US) discovered that immigrant scientists faced stereotypical treatment and had to "struggle for credibility on a daily basis", despite making "a disproportionate contribution to biotech entrepreneurship" in the region (McQuaid et al., 2010: 1055, 1053)[2]. Foreign-born entrepreneurs in Silicon Valley reported experiencing glass-ceiling and being in an outsider position as factors pushing them to start their own business, where again their immigrant status often acted as a barrier to securing funding (Saxenian, 1999). Foreign-born scientists and engineers working in Silicon Valley as employees were found to be disadvantaged in financial compensation, having lower salaries in comparison to their native counterparts despite higher levels of education and high presence in the area (Alarcon, 2000).

[2] Immigrant scientists were identified as founders of 42% of the region biotechnological enterprises, the majority of them being of "science-intensive" and having more impact – therapeutics and treatment of human deceases (McQuaid et al.: 1055)

In summary, these studies demonstrate that migrant and foreign-born scholars constitute a distinctive group in an increasingly internationalized academia and high-tech industry, transcending traditional racial and ethnic divisions. Being a foreign-born scientist implies many difficulties in everyday life and specific disadvantages in professional activities, starting before migration, strongly felt upon arrival and possibly never fully dissipating, even after successful adaptation in the new environment[3]. Therefore, "the notion that an academic's journey will be seamless when moving to a new academic post and location" should be abandoned as well as the vision of internationalization of science as a deterritorialization process (Saltmarsh & Swirski, 2010: 297). On the contrary, attention should be paid to migration regimes and visa regulations tied to certain territories and locations, the way they stratify migrant flows into different migrant categories and constituting a hierarchy of migrant statuses, and how these statuses are perceived, lived through and dealt with by foreign-born scientists. Another aspect of the foreign-born position in the destination country is the experience of cultural disconnectedness or cultural dislocation, which depends on the cultural distance between the home and the host country (Black & Mendenhall, 1992, cited in Libaers & Wang, 2012: 256)[4]. Thus, due to favourable legal regulations and comparative cultural proximity, scholars from the EU and English-speaking countries find themselves in a much less foreign position in leading research nations. Their migrant status is less constraining, as a result, they have a considerably different and often more positive migrant experience compared to their colleagues from the rest of the world. The problem of successful adaptation and integration into the host country's community and professional milieu is intensified by the "culture of silence" combined with "hyperindividualism" and "survival-of-the-fittest" neoliberal ideology (Thomas & Malau-Aduli, 2013: 35). Viewing migration as an exclusively private and personal affair, migrant academics prefer not to raise their concerns or ask for support, while host institutions provide only formal and brief induction, assuming that newcomers will manage the whole adjustment process independently. As a result, foreign-born scholars are left to cope with the process by themselves, while institutional and collegial assistance often has unsystematic and informal character.

[3] Though it should be noted that it is often a mutual adaptation process, when some components and features of the host country environment are also transformed under the influence of migrant academics flows (For instance, Borjas & Doran (2012) examine the impact of Soviet emigre mathematicians on American maths community).

[4] The concept of cultural distance elaborated by Hofstede (1980) and based on quantitative measurements presupposes that such countries as China, India, Korea, Japan, Iran, Turkey are the most culturally distant to US and other English-speaking countries like Canada, UK and Australia (Hofstede, 1980). Though severely criticized for certain conceptual and methodological assumptions (Shenkar, 2011), the concept might still be helpful as a metaphor enabling to speak about cultural similarities/dissimilarities on a national scale.

Diaspora knowledge networks are migration networks

Previous section demonstrated that foreign-born scientists experience various difficulties and disadvantages because of their migrant position. Moreover, the tensions of their migrant status are accentuated in a highly competitive, culturally diverse and neoliberalized academia of developed countries, that act as major magnets for mobile scholars. The question is how do they cope with these difficulties? What resources and contacts do they rely on during the migration process and afterwards? What strategies do they develop to ensure professional integration and career advancement in the host country? What is the role of ethnic ties and networks based on common origin? These questions can be answered with the help of migration network studies, enabling to disclose commonly downplayed aspects of foreign-born scientists' experience such as reliance on social connections in migration and manifestation of ethnic and cultural solidarity in a professional setting. A social network is the central concept in this respect as it is used in both migration network studies and scientific collaboration research, allowing to connect migration with STS scholarship and to extend the logic of ethnic affinity and cultural homophily into the domain of scientific knowledge production.

Migrant networks are famously defined as "sets of interpersonal ties that connect migrants, former migrants, and non-migrants in origin and destination areas through the ties of kinship, friendship, and shared community origin" (Massey et al., 1993: 448). Social ties constitute a vital source of support and necessary resources in the process of transnational migration (Gurak & Cases, 1992). Access to information about labor market and prospective employment, assistance with housing and legal issues, financial help and advice – these kinds of support substantially reduce the costs and risks of migration and influence its outcomes as well as allow to significantly improve the migrants' experience. During the adaptation period migrants often maintain ties with their compatriots and might even become more deeply incorporated in ethnic networks. The documented consequences of immigrants' interaction within ethnic networks include formation of ethnic communities and neighborhoods, ethnic businesses and trade, ethnic occupational niches, ethnic enclaves and even entire ethnic economies. Ethnic-based clustering and segregation of migrants, in terms of space, occupation, sector of the economy were found to be more pronounced when migrants encounter difficulties in integration, experience social isolation, alienation and are subject to discrimination in the host society. Thus, migrant ethnic networks have ambiguous effects and consequences: acting as a vital source of support during the initial moving and the settling-in stage, they may become a trap preventing a fuller cultural integration into the host society and impeding professional advancement.

The experience of foreign-born scientists and professionals in the host country discussed above suggests that engagement in migration networks is relevant for highly skilled migrants as well. In general, highly skilled migrants were found to heavily rely on social ties when moving to a foreign country, although their social networks are assumed to be of "a different nature" and lead to "different migratory outcomes" in comparison to migrants with lower qualification (Vertovec, 2002: 5).

Namely, qualified professionals are supposed to rely on the "networks of colleagues and organizations" (professional or organizational contacts) in contrast to kinship and family ties (interpersonal contacts), which are more utilized by low-skilled migrants (Vertovec, 2002). Another peculiarity is that the professional contacts mobilized in highly skilled migration are seldom classified into ethnic and non-ethnic or this division is not specifically addressed or problematized. The category of ethnic/ diasporic may be hardly used at all (Johnston et al., 2006: 1231); professional networks are assumed to be non-ethnic by default, in contrast to interpersonal ethnic networks associated with chain migration (Poros, 2011); or non-diasporic and diasporic ties are found to be "intertwined and sometimes difficult to distinguish" (Karaulova, 2016: 143).

More is known about ethnic networks during adaptation and integration of highly skilled migrants in the destination country. In a well-known study of immigrant entrepreneurs (Saxenian, 1999) it was found that Chinese, Indian and Taiwanese ethnic associations in Silicon Valley were formed by the highly skilled as a response to common problems and concerns arising from difficulties and barriers in their professional and business activities. Bound together by common ethnicity and language coupled with a similar education background and professional identity of its members, these local ethnic networks proved to be a viable source of support for foreign-born professionals facilitating "immigrant job search, information exchange, access to capital and managerial know-how" (Saxenian, 1999: ix). Offering consultations and training, investment and mentoring along with wide opportunities for networking, they compensated for the lack of resources immigrants experienced and became a crucial factor of their professional advancement and successful entrepreneurship. They also helped increase credibility and enhance the "visibility and success of Chinese- and Indian-run businesses" on a regional level, which facilitated immigrants' integration into the "mainstream technology economy" (Saxenian, 1999: 50, ix). However, there is always a "danger of insularity", when ethnic associations become too closed for outsiders and distance themselves from the wider professional milieu (Saxenian, 1999: 40). Therefore, ethnic networks are beneficial, when they are positioned in the middle between the foreign-born and wider professional community. Additional benefits may be gained from the extension of local ethnic ties in international direction, when a "rich fabric of professional and business relationships" with the home country and its specific regions is created (Saxenian, 1999: 56).

Another important product of ethnic networking is a tight, interactive and mutually enhancing connection between professional and ethnic identities, the incorporation of national/ cultural belonging into professional activities, interests and aspirations. Thus, organizations of immigrant specialists were found to "combine the elements of traditional immigrant culture with the distinctly high-technology practices: they simultaneously create ethnic identities within the region and facilitate the professional networking and information exchange" (Saxenian, 1999: 31). For instance, networking in an Indian professional association facilitated the formation of a broader Indian identity and a sense of belonging to a wider Indian community, though Indian are "deeply divided and typically segregate themselves by regional and linguistic differences" in the

country of origin (Saxenian, 1999: 49). Moreover, professional ties based on common origins might have a particular meaning for immigrants and are often experienced as relations of a different character in comparison to other professional connections. Professionals speak about “greater comfort” in working with their compatriots and feeling more familiarity and trust “because the language and cultural approach are so similar” (Saxenian, 1999: 43, 48). Consequently, ethnic/ national belonging and common education, professional background and career ambitions reinforce and strengthen each other. On the one hand, their combination transforms the meaning and quality of ethnic ties and national identification; on the other hand, it multiplies professional connections and boosts professional development, changes the experience of professional interaction, saturating it with more trust.

Ethnic networks are also found to play a significant role in student and scholarly migration (Tanyildiz, 2008, 2013, 2015). Analysis of social networks in doctoral students’ migration from Turkey to the US and the student population in American HEI showed that they extensively rely on contacts with “students, alumni, faculty and local community of the same nationality” (Ibid: xii), which impacts their migration decision and institution choice. While fellow students provided general information about education programs, alumni acted as mediators connecting students to senior faculty; foreign-born professors as lab directors played the role of “active nodes of ethnic networks, mobilising foreign students from their country of origin” (Tanyildiz, 2013: 60). Thus, ethnic professional contacts were found to both stimulate transnational migration as well as direct it towards certain locations and institutions. As a result, an increased concentration of foreign-born students of certain nationality was observed in particular US universities.

The study also detected ethnic clustering in research labs, with labs directed by foreign-born scholars being “more likely to be populated by students from the same country of origin” than labs directed by non-migrant faculty (Tanyildiz, 2008: 60-61). Thus, the composition of the research collectives was found to be affected by ethnic/ national affinity. The phenomenon proved to be unevenly distributed, being more pronounced in lower-ranked departments, for Korean and Turkish students and for some engineering areas. The author suggests that this pattern of ethnic-based student-professor cooperation brings a number of professional advantages to all the participants involved. Foreign-born professors can better evaluate the qualification of candidates from the same country of origin and ensure their labs are staffed with researchers with the appropriate skills. For students, the interaction with compatriots already established in the academia becomes “additional support to help absorb both tacit and codified knowledge” and facilitate their incorporation into the host country scientific community (Tanyildiz, 2008: 61). Finally, the “presence of compatriots” in the lab positively influences knowledge generation activities, creating a “comfortable environment” and encouraging an “easy flow of information as a result of their shared culture” (Tanyildiz, 2008: xii, 50).

Similarly to the findings of Tanyildiz, a case study of Russian-speaking computer scientists working in British universities revealed a “pervasive significance of ties based on common origins, ethnicity, and nationality” for the scientists’ migration

and careers in the host country academia, with a strong pattern of diasporic supervisor-student relation (Antoshchuk, 2019). Seeking qualified personnel for their research projects, the senior faculty played a crucial role in initiating the recruitment of doctoral students from the FSU area. For students the reliance on ties with Russian-speaking professors substantially reduced the costs, risks and stress of their movement and greatly influenced the course of their subsequent integration in the British academia. The majority of young scientists remained in the UK to pursue a career in academia or industry, with many young researchers continuing to work under the guidance of the Russian-speaking professors after their PhD defence. On a larger scale, it resulted in the formation of a diasporic knowledge network and a dramatic increase in the number of papers produced in a diasporic collaboration.

The phenomenon of strong ethnic concentration in research laboratories is called “ghetto labs” or “mono-cultural research teams” because they are “composed of scientists of similar origins” (Wagner, 2014: 145). Ghetto labs are a distinctive type of research organizations, markedly different from multicultural labs, They emerged as a response to the rising competition and challenging professional requirements in the internationalized academia. The principal investigator of migrant background plays the main role in creating and sustaining ghetto labs, as they are responsible for choosing and hiring research staff. Interestingly, in accordance with the cultural distance hypothesis, scholars from Western Europe typically integrate into multicultural teams, while scientists from Asia (China, Korea) and Eastern Europe (Russia, Poland) usually find themselves incorporated into ghetto labs.

Thus, ethnic or diasporic clusters of migrant scientists acquire different forms, varying in terms of density and homogeneity: from ethnic communities to diasporic networks, from ethnic concentrations in particular organizations to monocultural research labs. Examples of these forms can be seen when looking at the Russian-speaking scientists abroad. For instance, the laboratory of Andrei Gudkov (US), a prominent cancer researcher, with 15 employees out of 20 coming from Russia, might be considered a “ghetto lab” (Allahverdjan & Agamova, 2012: 48). Another example is Severinov laboratory at Rutgers University (US), which earned a title “the Russian lab” as it is comprised only of Russian-speaking staff, who were deliberately recruited by the Russian professor (Artiushina, 2014: 135, 138). Less homogeneous Russian mathematics communities were detected in some British universities (Bronnikova, 2010: 146). These communities started to form after the first mathematicians from FSU countries or pioneer migrants settled in the UK and gradually brought their former colleagues to the same institution (Ibid). Dense collaboration networks of Russian-speaking computer scientists incorporated in broader professional networks were found in highly ranked UK universities (Antoschyuk, 2015). Russian-speaking nanoscientists also engage in transnational and local “science diaspora networks” (Karaulova, 2016), which proved to serve as a “mechanism of scientific migration” and a “strategy of reconciliation” for mobile scientists who experience an “adaptation challenge” caused by the “tension between the academic identity and the local academic culture” (Karaulova, 2016: 209, 232). Being mostly driven by professional motives and needs, the involvement in

diasporic networks is determined by pragmatic rationality – intensifying when there is a professional necessity (for instance, a lack of a qualified staff) or decreasing when there is a risk of a disadvantage (for instance, "reputational hazards") (Karaulova, 2016: 232).

Based on this evidence, I conclude that highly skilled professionals and academics substantially rely on professional ties to their co-ethnics and compatriots both on the pre-migration and post-migration stage. As a result, migrant networks are formed, that function as a mechanism of migration, reducing the costs and risks of cross-border movement, and adaptation/coping strategy, helping to overcome the disadvantages of a migrant position upon arrival. These networks are tied together and maintained by pragmatic career considerations, as well as by a common language and shared cultural belonging, similar educational background and professional experience.

Diaspora knowledge networks are knowledge creation networks

Previous section indicated that scientists, as highly skilled professionals, build and maintain migrant networks supporting their cross-border movement and facilitating integration in the destination country. The knowledge-intensive character of scholarly and other highly skilled occupations leads to the assumption that ethnic networks of foreign-born professionals are involved in knowledge exchange and generation activities. In this section, I discuss the scientific collaboration and innovation research, demonstrating that diasporic professional ties gain more significance in scientific research and technological development, acting as facilitators of knowledge diffusion and channels of knowledge transfer. Drawing on social studies of science and the sociological theory of interaction ritual, I suggest explanations why and how ethnic connections of highly skilled migrants become more prone to systematic knowledge generation and are eventually transformed into knowledge creation networks.

The analysis of scientific publications of the last decades demonstrates that scientific research is becoming increasingly collective. The proportion of single-authored papers is continuously falling, while the share of co-authored papers as well as the number of co-authors per paper is rising (Glänzel & Schubert, 2005). Moreover, scientific cooperation is also becoming more internationalized, although it remains highly concentrated in the research-intensive nations of Europe and the US (Wagner, 2008, Leydesdorff et al., 2013). These countries function as academic mobility hubs and accommodate a substantial number of foreign-born scientists (Franzoni et al., 2012)[5], who demonstrate distinctive

[5] For instance, foreign-born scholars constitute 23,2% of all faculty in Germany, 27,7% - in Netherlands, 32,9% - in the UK, 38,4% - in the US. Switzerland was found to have the highest share of migrant scientists in the world - 56,7% (Ibid: 6).

collaboration patterns compared to non-migrant faculty. Namely, they tend to maintain professional ties with their compatriots both in the country of origin and other regions (Scellato et al., 2015).

A growing body of evidence shows that such diasporic collaboration gains more significance in science and other knowledge-intensive activities and leads to the formation and spread of DKNs. Thus, it was found that Chinese migrant scholars prefer cooperating with other Chinese researchers both in their home country and overseas (Jin et al., 2007, Jonkers, 2010). Foreign-born scholars in Italy and Portugal also engage in collaboration with their compatriots in the home country, which has a positive impact on their scientific productivity (Baruffaldi, Landoni 2012). Russian-speaking scientists who migrated abroad after 1990s were also found to cooperate with their compatriots both transnationally and in the host country (Bronnikova, 2010, Antoschyuk, 2015, Karaulova, 2016). A wider analysis covering 2,5 million publications of the US-based co-authors of diverse origins confirmed that cooperation “with people like me” or ethnic homophily is a “substantive phenomenon” in scientific research (Freeman & Huang, 2015: 289, 313).

Diasporic/ethnic ties are also an important factor for driving innovation. Thus, ethnic networks were found to function as a “transfer mechanism” ensuring a transnational exchange of codified and tacit knowledge, especially in the high-tech industries and among Chinese professionals (Kerr, 2008: 518). Access to ethnic knowledge and collaboration with the co-ethnics proved to increase the innovative performance of Indian inventors in the US (Almeida et al., 2014). Agrawal et al (2008) demonstrated that co-ethnicity acts as a predictor and mediator of knowledge flows interacting with the factor of co-location: it serves as a substitute of geographical proximity and helps reduce the effect of distance for inventors located far from each other. Similar findings confirming the role of co-ethnicity “reducing social distances” between inventors and therefore functioning as a resource in building social connections were obtained in the study of foreign-born inventors residing in the US and Europe (Breschi & Lissoni, 2013: 31).

However, to understand the phenomenon of ethnic or diasporic collaboration giving rise to DKNs and to explain its effects, we need to account for its propensity to generate new knowledge and stimulate innovation. Firstly, I apply to the notion of the “invisible college” introduced and established by D.Price (1963) and D.Crane (1972) that provides a framework for comprehending DKNs as a form of networked knowledge production. Secondly, I use the concept of tacit knowledge (Collins, 1974) and the theory of interaction ritual (Collins, 2014) to hypothesize why diasporic ties composing DKNs might be more conducive to knowledge creation.

Initially, the invisible college was defined as “the informal collectives of closely interacting scientists” (Price, 1963: 74) representing an “unofficial organization” of the scientific community, consisting of a “set of interacting leaders” and functioning on the basis of regular contacts, both distant and face-to-face (Price, 1963: 83-84). According to Price, the invisible college as a self-organized communication network becomes particularly important in the era of “big science”, characterized by a large number of scientists and a rapidly growing

number of publications, because the invisible college serves as a key social mechanism enabling information exchange within the discipline, facilitating coordination and development of scientific ideas. It was confirmed in Crane's study, who demonstrated the crucial role of a small group of leading scholars in ensuring the circulation of information throughout the knowledge field (Crane, 1972). But her main interest was to reveal "the social aspects of scientific change" (Crane 1989: 18) by looking at scientific collaboration networks or the invisible colleges which can be identified by co-authorship and citation connections. She found that these connections compose a complex social network with particular structure which can facilitate or impede the growth of scientific knowledge.

But Crane's work was criticized for undermining "the central role of communication behaviour and interpersonal ties" by focusing on formal means and results of interaction (publications, citations, co-authorship), which "reinforces the primacy of structure over process" and presupposes that informal communication can only grow from formal network structures (Lievrouw, 1989: 620). In contrast, other works prioritize informal interactions between scientists (Lievrouw, 1989, Cronin, 1982). Cronin views them as "the lifeblood of scientific progress" (Cronin, 1982: 225) and thinks they are "likely to remain a pivotal feature of the scientific communication system for the foreseeable future" (Cronin, 1982: 232). Lievrouw also underlines informality as the main constituting principle of an invisible college and defines it as "a set of informal communication relations among scholars or researchers who share a specific common interest or goal" (1989: 622). Zuccala proposes a more balanced and comprehensive understanding of an invisible college, including formal and informal interaction, emphasizing discipline as an "intellectual basis" for information exchange and "material contributions" of the invisible college participants or publications (2006: 5-6)[6].

Thus, an invisible college is a self-organized communication network of scientists of the same research area, which is formed in interactions, formal and informal, distant and face-to-face, on the basis of common research interests and results in publications. Invisible colleges ensure knowledge circulation in academic community and is associated with the growth of knowledge and scientific disciplines, showing the crucial role of collaboration structures in knowledge production. A DKN is also a communication network between scientists having common professional goals and scientific interests and producing publications together. Therefore, I argue that DKNs represent a new type of an invisible college emerging as a response to the intensifying internationalization and the neoliberalization of science and higher education. It becomes a mechanism of ensuring information exchange and connectivity in scientific communities, incorporating an increasing number of foreign-born researchers and being

[6] Full definition runs as follows: "a set of interacting scholars or scientists who share similar research interests concerning a subject speciality, who often produce publications relevant to this subject and who communicate both formally and informally with one another to work towards important goals in the subject, even though they may belong to geographically distant research affiliates" (Ibid).

internally divided by ethnic diversity and cultural heterogeneity. In these new conditions, a DKN is formed as a communication network between scholars of common ethnicity, national identity and/ or cultural background, because opportunities for establishing cooperation with non-migrant scientists are limited or difficult to access, at least during initial adjustment, This way, a DKN as an invisible college helps maintain high level of scientific output and contributes to further growth of scientific disciplines. Following Zuccala's definition and taking into account criticism discussed above, I consider DKN a network of formal and informal contacts between foreign-born/ migrant scientists or professionals, united by common research interests and country of origin, collaborating with one another and producing publications in their field.

However, why are common ethnicity, nationality or cultural origin powerful factors of knowledge production facilitating the formation of DKNs as knowledge creation networks? This question cannot be comprehensively answered in this paper, nevertheless, based on the existing research I make several suggestions. Firstly, a common ethnicity or nationality in a DKN typically imply similarities in cultural belonging and common language, which facilitate informal interaction constituting the principal component of invisible college. Thus, a number of studies report that foreign-born scientists and professionals feel more comfort and trust when working with their compatriots (Tanyildiz, 2008, Saxenian, 1999). Secondly, common ethnicity/ nationality point to common aspects of nationally specific professional socialization, playing an important role in the interaction, as migrant scientists share many aspects of codified and especially tacit knowledge in their discipline. This "intangible and unspeakable" part of scientific knowledge is deeply contextual, as it is incorporated in organizational and institutional settings and tied to specific academic cultures (Collins, 1974). Therefore, migrant scientists, being trained in a particular national context and having internalized norms and values of a particular academic culture, may find it much easier to understand each other and work together. For instance, Russian-speaking nano-scientists working abroad practiced recruitment of their compatriots when seeking to reconstruct some parts of the Soviet research culture in a different institutional context of the host country (Karaulova, 2016: 184). Thirdly, both common cultural and shared specific professional background encourage cooperation between scientists because they help establish a productive knowledge creation ritual and maintain a chain of such rituals (Basov, 2012: 188). According to the interaction ritual theory, new knowledge is produced in group communication with a particular social dynamic, when participants successfully establish a mutual focus and achieve entrainment of their bodily rhythms and emotional mood (Collins, 2014). A common background among migrant scientists seems to facilitate these processes and drive the cycle of group interaction, which saturates the communication between scientists with positive emotions, enhances their diasporic solidarity as well as leads to the creation of new group symbols in the form of scientific ideas, concepts and theories.

Conclusion

The paper focuses on DKNs as a widely spread and increasingly important phenomenon for highly skilled and academic migration as well as for the international market of knowledge work. Based on the previously elaborated understanding of DKN, I suggest a broader notion based on a theoretical framework integrating migration and science studies scholarship.

Contrary to the dominant discourse depicting highly skilled migrants as “global trotters” and cosmopolitan individuals, easily integrating into professional milieu in the destination country and devoid of nostalgic feelings towards their homeland, the existing research suggests there is a persistent significance of ethnic and diasporic ties and a feeling of diasporic belonging for mobile scientists and professionals. Encountering a variety of difficulties and tensions in their migration and adaptation in the host country because of their migrant status and foreign background, highly skilled migrants mobilize ties with their co-ethnics or former compatriots. It leads to the emergence and development of migration networks, which help reduce the costs and risks of cross-border movement, facilitate professional adjustment and advancement in the host country. However, the effects of these diaspora networks go far beyond their consequences for migration, and result in collaborations, joint projects and publications, innovative solutions and inventions. This way, the migration network simultaneously functions as a knowledge creation network and is involved in the knowledge exchange and generation activities. In this respect, diaspora knowledge networks feature a mechanism ensuring information exchange and connectivity in national and transnational scientific communities in the context of internationalization, with an increased level of academic mobility and internal divisions brought by ethnic diversity and cultural heterogeneity. Like an invisible college, DKNs help maintain a high level of scientific output and contribute to the further growth of scientific disciplines.

To sum up, a DKN represents a newly emergent and underexplored social structure, which unites the logic of an ethnic support network with the logic of knowledge production. This type of structures become a new site of interaction, intersection and co-construction of diasporic and professional identities, which has a wide range of consequences at individual, collective and organizational levels.

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