Special Issue Article

OJED
OPEN JOURNALS IN EDUCATION

Volume 16, Issue 3 (2024), pp. 148-162
Journal of Comparative & International Higher Education
DOI: 10.32674/jcihe.v16i3.6207 | https://ojed.org/jcihe

STEM Students' International Mobility in Kazakhstan in the Context of the Russia-Ukraine War Conflict

Ainur Almukhambetova[a*], Jason Sparks[b], Manat Sergazina[c], Manat Sergazina[d], & Assylzhan Ospanbek[e]

Nazarbayev University, Kazakhstan [A, B, DC]

*Corresponding author (Ainur Almukhambetova): Email: ainur.almukhambetova@nu.edu.kz
Nazarbayev University, Kazakhstan

This article was not written with the assistance of any Artificial Intelligence (AI) technology, including ChatGPT or other support technologies

Abstract

Using the pull-and-push model as a main theoretical framework, this qualitative interview-based study explores the changes in STEM students' intentions to pursue international mobility in the context of the Russia-Ukraine war and the factors related to students' mobility decisions in the context of geopolitical tensions. The findings suggest that in situations with military conflict, STEM students are 'pulled' and 'pushed' to make decisions under the influence of the factors located both on the receiving and domestic sides, and the decisions of whether to pursue international mobility were primarily driven by safety, financial, and social tension concerns. The study's findings offer some theoretical and practical implications of the changes in student mobility in the context of war conflict for higher education institutions internationally.

Keywords: international mobility, STEM students, war conflict

Introduction

Within the global scholarly inquiry on the internationalization of higher education, studies focusing on international student mobility attracted greater attention during the last three decades. According to estimates from the Organization for Economic Cooperation and Development (OECD) and the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics (2022), the global number of international students has increased from 2.1 million students in 2000 to 6.1 million before the COVID-19 pandemic. Although the pandemic has disrupted this trend, more students are predicted to seek education abroad opportunities outside their home countries in the following years (de Wit & Altbach, 2021).

STEM students are one of the largest categories of international students worldwide (UNESCO, 2022). STEM talent mobility has a significant development impact on both host and sending countries. This is reflected in how many countries

Received 9/1/23; revised 11/16/23; revised 2/4/24; accepted 3/1/24

strive to increase the educated and skilled STEM workforce critical to economic growth (Beine et al., 2014). The industrialized countries with low STEM enrolment rates and nations with an aging population try to attract more STEM international students who would stay and work in the receiving country after graduation (Freeman et al., 2019; Galama & Hosek, 2009;). Countries with lesser industrial capacity try to send their STEM students abroad to get a quality STEM education so that they can contribute to developing their home country's STEM innovative capacity after completion of their studies (Beine et al., 2014).

While the increasing numbers of student mobility reflect the students' aspirations to pursue education outside their home countries, they are still unable to uncover all the multitude of factors that influence the students' mobility decisions (Choudaha & DeWit, 2014). According to Choudaha (2017), three significant events influenced international student mobility in the 21st century before the COVID-19 pandemic: (1) the 9/11 terrorist attacks in the United States; (2) the global financial recession in 2008/09; (3) a combination of three: the slowdown of the Chinese economy, 2016 UK referendum to leave the European Union, and Presidential elections in the US. Currently, the world is facing a new set of global, political, and social challenges, such as the recent COVID-19 crisis, military conflicts, and climate change, which might have a significant impact on international students' mobility trends. Given that many international students come to receiving countries to pursue STEM education, it is critical to understand the factors that influence STEM students' decisions in contexts affected by geopolitical challenges.

This paper takes up the question of international student mobility in the context of the Russia-Ukraine war, which started in February 2022, to understand whether and how this conflict has impacted STEM student mobility since the start of this conflict. The complex geopolitical situation caused by the Russia-Ukraine war and the changing geopolitical landscape seem to have profoundly changed the established models of international mobility in the region, but it is unclear to what extent. Given that many students from Kazakhstan used to choose Russian technical universities before the Russia-Ukraine war, it is important to understand what factors determine STEM students' decisions in current reality.

The study intends to answer the following research questions:

RQ1. How did the STEM students' intentions to pursue international mobility change due to the Russia-Ukraine war?

RQ2. Which factors determine the mobility decisions of STEM students in the context of current geopolitical realities?

Contextual Background

In the emerging field of International Student Mobility (ISM), limited research is specifically dedicated to mobile students from post-Soviet countries. These countries were part of the Union of Soviet Socialist Republics (USSR), which had limited outbound student mobility and primarily hosted students from other socialist nations (Chankseliani, 2015). The disintegration of the Soviet Union disrupted the period characterized by restrictions on travel. There was a subsequent increase in migration, with many students actively pursuing study-abroad opportunities (Chankseliani, 2017).

Except for Kyrgyzstan, which experiences a positive net flow of internationally mobile students (3,397 in 2017), the other four Central Asian countries primarily served as source nations, according to data from the UNESCO Institute of Statistics (Alimukhamedov, 2020). Russia successfully recruited international students from former Soviet states due to a complex mix of motivations: (1) to strengthen its 'soft power' (Grove, 2017), (2) to improve the country's economy (Barinova et al., 2022).; (3) attract talented students, particularly from STEM areas who will work in the country's strategic fields post-graduation (Belov, 2020). Between 2013 and 2019, international student enrollments in Russia increased by 40%. Before the Russia-Ukraine war, Russia occupied the sixth place among the most popular destinations for international students worldwide. It was estimated that by 2025, the income from foreign enrolments in the Russian economy will constitute around $6.5 billion (Akhmetzhenova, 2020).

Russia's attractiveness as a core country in the region stems from its size, economic prosperity, linguistic compatibility and similar cultural environment (Chankseliani, 2015). Furthermore, Russia stands out as a provider of top-

quality higher education within the post-Soviet region, as evidenced by its strong representation in international rankings. Russia also offers highly conducive circumstances for harnessing academic potential in STEM in the region. According to Tarasova et al. (2019), Russia has notably outperformed countries like Great Britain, Denmark, Switzerland, and the Netherlands in the number of students graduating from programs focused on natural sciences, engineering, and construction. Moreover, the country has successfully enhanced its innovative capacity by developing university-industry collaborations. Most regional technical universities, established in the 1960s-70s within the 'industrialization' initiative of the Soviet Union, followed the strategy of supplying highly qualified STEM specialists for the needs of the region, paying high attention to the demands of local industry (Ershov et al., 2020)

Kazakhstan presents an interesting case for exploring students' international mobility as it is a typical sending country (Almukhambetova, 2022), experiencing a significant brain drain, especially from the Northern Kazakhstan regions bordering Russia and mainly in STEM fields. According to the National Center for the Development of HE (ENIC), the number of Kazakhstani students participating in outbound academic mobility for the last 12 years demonstrates an almost tenfold increase in outbound student numbers. Moreover, Kazakhstan takes 8th place among the top 20 countries for outbound student mobility, according to the T.I.M.E Association report (2021).

A large share of Kazakhstani students who prefer to study in Russia are students from the Northern regions of Kazakhstan that border Russia. In 2017, the total number of Kazakhstani students studying abroad exceeded 89,000, and from them, approximately 70, 000 students chose to study in universities in Russia (Chankseliani, 2018). According to Akhmetzhanova & Kuzhabekova (2022), 94.6% of Kazakhstani students from Northern Kazakhstan regions chose to study in Russia, whereas only 5.4% chose Europe before the Russian-Ukraine military conflict.

Given that Kazakhstan is a typical sending country, a closer look at the change in international mobility intentions of STEM Kazakhstani students, as well as the adjustments they have made in their study plans due to geopolitical events, might offer some insights into research on international mobility and to research on STEM education as the paper also discusses the implications of the changes in student mobility on domestic higher education and on higher education in receiving countries.

Theoretical Framework

This study was guided by a 'push-pull' model for international student mobility (Altbach, 1998, based on Lee's theory of human migration,1966). The model proposes that two types of factors influence students' decisions to pursue international mobility. Traditionally, the push factors are associated with the domestic country, while the pull factors are associated with the destination country. The students are 'pushed' by unfavorable higher education conditions in their home countries and 'pulled' by the scholarship and other opportunities provided by receiving countries (Altbach, 1998). The pull factors are usually country-specific and include advanced research facilities, scholarships provided to international students, employment, and migration opportunities (Li & Bray, 2007). Push-pull model also suggests that domestic higher education might not only have the negative 'push' factors, but also implement some policies, acting as reverse push factors that might keep students at home countries. Similarly, receiving countries and institutions might not always attract international students but have some negative influences that serve as reverse pull factors (Li & Bray, 2007).

There are several important considerations behind choosing push-pull model as a guiding framework for the study. First, the push-pull framework of international student mobility had never been tested in post-Soviet context. Second, the situation with the war conflict in the region suggests that students might be 'pulled' and 'pushed' to make decisions under the influence of completely different factors and pre-war factors might have enhanced/weakened in the context of geopolitical tensions. Third, this paper is one of the few studies focusing on STEM students. This framework is widely used to explore the students' intentions to pursue an international education, but there is a lack of studies exploring STEM students' decisions to pursue international mobility.

Overview of Previous Research

Many studies on international student mobility have focused on understanding the factors that pull and push students to decide to study abroad (Mazzarol & Soutar, 2002). Previous research identified some macro-level factors attracting international students to pursue education outside their home countries. Scholars argue that such factors as favorable immigration policies, and job market opportunities pull students to pursue higher education outside their home countries (Altbach, 1998). At the same time, such factors working in domestic side as poor quality and lack of access to educational resources, economic instability, low living standards, and lack of employment opportunities, also push students to seek higher education abroad.

Although previous studies argue that most factors influencing students' decision to pursue international mobility are located at the country level (Kim, 2015), the research also points out several factors on an institutional level, such as policies at higher education institutions aimed at recruiting more international students, as well as the availability of scholarships for international students and tuition fees (Chadee & Naidoo, 2008). Prior research also mentions domestic higher education opportunities can influence students' intentions to stay in their home countries, serving as reverse push factors. In contrast, some negative factors working on the side of the destination country, such as political instability and unwelcoming attitudes, might negatively affect the students' intentions to pursue education overseas and push them away from choosing a particular country (Li & Bray, 2007). Scholars also agree that among the most influential factors in students' choice are geographic, cultural, historical, and language proximity (Kondakci, 2011), as students still prefer to choose a context with a more accommodating linguistic and cultural background.

Previous research suggests that the internationalization of higher education has become more complicated in the context of recent global, regional, and national developments, such as health crises, religious extremism, and war conflicts (Makinen, 2023). Several views have been expressed on how the conflict and crisis might affect international student mobility. According to De Wit & Altbach (2021), some receiving countries have become dependent financially on international students and will have to rethink their recruitment policies. Both domestic and host universities in the regions affected by conflict and crisis might experience changes in mobility patterns and will have to rethink their student recruitment policies, prioritize student safety and wellbeing issues and be also able to adjust to the changing mobility flows (De Wit & Altbach, 2021).

Methodology

The study employs an exploratory qualitative research design to achieve its aims (Lincoln & Guba, 1985). The study was conducted between May 2023 and August 2023.

Sampling

The participants were recruited for the study via convenience and purposeful maximal variation sampling procedures, which helped to obtain the variation in participants' responses. The participants varied in their gender, region, type of STEM school, and ethnicity (see Table 1 for more information about participants). To increase the chances of recruiting graduates of STEM schools, a research assistant hired for the project also placed an advertisement on social networking sites.

Overall, 29 students who graduated from schools in 2022 (before the war started) and who graduated in 2023 (after the war started) were interviewed, so the participants of the study are 11 current mobile students and 18 prospective mobile students. Both categories of participants were older than 18. The participants were purposefully selected from 6 regions bordering Russia as majority of the school graduates from these regions chose to study in Russian universities before the start of the war. Overall, there were 10 school graduates from Astana, 6 students from the Semey, 5 school

graduates from Kostanay, 5 school graduates from Pavlodar, and 1 school graduate from each region Oskemen, Petropavl and Karaganda, respectively.

Table 1.
Demographic Characteristics of the Participants

Code	Status	Gender	Region	STEM school	Ethnicity
A1	School graduate	Male	Astana	NIS	Tatar
S2	Student graduated pre conflict	Female	Semey	NIS	Russian
S3	Student graduated pre conflict	Female	Semey	Economic lyceum	Russian
S4	Student graduated pre conflict	Male	Semey	Economic lyceum	Russian
A5	Transfer student	Male	Astana	NIS	Kazakh
A6	Student graduated pre conflict	Male	Astana	NIS	Kazakh
O7	School graduate	Male	Oskemen	Physics and Maths school	Russian
A8	School graduate	Male	Astana (lived in Uralsk)	STEM school	Kazakh
A9	School graduate	Female	Astana	STEM school	Russian
A10	School graduate	Male	Astana	STEM school	Kazakh
A11	School graduate	Male	Astana	STEM school	Kazakh
S12	Student graduated pre conflict	Male	Semey	Economic Lyceum	Russian
K13	School graduate	Male	Kostanay	BIL	Kazakh
K14	School graduate	Male	Kostanay	BIL	Kazakh
K15	School graduate	Male	Kostanay	BIL	Kazakh
K16	School graduate	Male	Kostanay	BIL	Kazakh
A17	Student graduated pre conflict	Male	Astana	NIS	Kazakh
S18	School graduate	Male	Semey	STEM school	
S19	School graduate	Male	Semey	Economic Lyceum	Russian
P20	Student graduated pre conflict	Male	Pavlodar	Mainstream School	Russian Ukrainian
K21	School graduate	Male	Kostanay	BIL	Kazakh
P22	School graduate	Male	Pavlodar	NIS	Kazakh
PL23	School graduate	Male	Petropavl	NIS	Kazakh
A24	Student graduated pre conflict	Female	Astana	NIS	Korean
P25	School graduate	Female	Pavlodar	NIS	Kazakh
A26	School graduate	Female	Astana	NIS	Kazakh
P27	Student graduated pre conflict	Female	Pavlodar	NIS	Kazakh
KA28	Student graduated pre conflict	Male	Karaganda	BIL	Kazakh
P29	Student graduated pre conflict	Female	Pavlodar	NIS	Kazakh

Data Collection Instrument

Semi-structured interviews with STEM school graduates currently pursuing higher education in Russia or planning to pursue higher education abroad before the war started were chosen as the main data collection instrument. This type of interview was chosen as it allows the researchers to understand the participants' experiences in the words of the participants themselves (Smith, 1995). The semi-structured interview approach also allowed the organization of the interview process around themes identified in the international literature on student mobility, as well as allowed for flexibility to ask some unplanned questions to obtain clarifications. The interview protocol included questions collecting information about (1) the

demographic characteristics of the participants, (2) questions about students' intentions to pursue international mobility in the context of geopolitical events, (3) the factors related to their decision-making, and (4) challenges in decision making.

The invitation to participate in the interview contained information about the purposes and the format of the study, as well as the background of the researchers. The interviews were conducted in the language chosen by the participant (either Russian or Kazakh) and at a time convenient for the participants and were recorded upon obtaining written or oral consent.

The process of conducting the study was guided by ethical principles and regulations. The study was approved by the University Institutional Ethics Review Committee. Measures were taken to protect the rights of the participants at all stages: data collection, data analysis, and storage of data. Given the topic of the research, additional measures were implemented to protect the identity of participants. The research team ensured there were no sensitive questions, especially with regard to the attitudes to the Russia-Ukraine war. The participants were informed of their right to withdraw from the study at any moment during the interview and not to answer some questions if they felt uncomfortable.

Data Analysis Procedures

The recordings of the interviews were transcribed and thematically coded with the help of Nvivo12 research software. The coding process was guided by the themes emerging from the literature on international student mobility, and emerging themes were registered from the interviews with participants. The lead author and 2 research assistants who are proficient in both Kazakh and Russian conducted data analysis collaboratively to ensure intercoder reliability (Lombard et al., 2002). To demonstrate the trustworthiness of the collected data and transparency of data collection, evidence in the form of illustrative quotes is used extensively in subsequent chapters of the paper.

Findings

The findings below are presented as themes emerging from the broader categories of the 2 research questions guiding this inquiry: (1) changes in STEM students' intentions to pursue international mobility due to the Russia-Ukraine war, and (2) factors that determine the mobility decisions of students in the context of current geopolitical realities.

Changes in STEM Students' Intentions to Pursue International Mobility

As participants constitute both those who were applying to universities and those who were already pursuing international mobility when the war started, this section presents information on the change in students' plans and the decision-making process.

Almost half of the interviewed school graduates who graduated in 2023 had already decided where to study by the time the interviews were conducted. Fourteen participants have already decided on HE institution, received their admission offers, or have already started their education. Nine students planned to pursue higher education in Russia before the conflict but changed their university plans due to the war conflict. Seven participants decided to stay in Kazakhstan. Three students reported that they were still planning to pursue education in Russia. The participants mentioned migration as their intention in pursuing HE in Russia.

Out of 11 interviewed students who were already pursuing mobility in Russia when the war started, a male participant reported that they transferred to Kazakhstani University due to instability associated with the war conflict. When talking about his feelings, one participant reported being 'overwhelmed' and nervous about the situation. He also shared that his parents insisted on his return, although he had to reapply to university in Kazakhstan after his arrival. Another student also mentioned that he was very concerned with the situation as the prices for rent and food started to grow. Several students displayed their disappointment with the situation as they could not transfer to Kazakhstani universities due to the regulations in Kazakhstani universities. They considered it a waste of time and money as they had to reapply to university in Kazakhstan. A comment from the participant:

> The war started in February, and after that, I started to feel the change. The shops closed. I realized that the situation was getting worse. I was very uncertain whether I needed to return to Kazakhstan... The prices started to grow for food, for rent…It was very hard as I was in doubt, then made a decision… It was a waste of time and money… (A5)

Other interviewed participants also stated they had friends who studied in Russian universities when the war started. According to the participants, most of them decided to return to Kazakhstan:

> Yes, I heard from my friends…who entered Moscow universities. Almost all of them came back to Kazakhstan except for one girl. They either transferred to universities here or even dropped out of their studies. It was after the first news about mobilization (P29)

Three female students who entered Russian universities before the war started reported that they decided to continue their studies as they were confident that there were fewer risks to be involved in mobilization for women than for men. Another reason reported by these participants was that the universities where they studied were situated in regions that were not actively involved in the war conflict. Although they decided to stay, they felt anxious about the situation:

> I feel the situation is different now. There is pressure, it's a war! I am not afraid to call this "a war." The place where I live is relatively peaceful and quiet, but there are places where the situation is much worse and many young people prefer to leave and the girls also leave when it is still possible to leave (A24).

When asked about the reasons why they preferred to stay than to return to Kazakhstan, a female participant highlighted that she intended to apply for a narrower STEM specialization, such as Bioengineering and Biotechnology, but only Biology majors were available in Kazakhstani universities, mostly in those situated in the capital cities and not in the regional ones. Therefore, she had to apply to a technical university in St.Petersburg and decided to stay to finish her studies.

> In Kazakhstan, we do not have certain universities with certain narrow specializations. For example, a biotechnology major or, similarly, a uranium industry major is available only in 1-2 universities. These specialties are well developed in Russia ... certain specialties, I think, that are still more developed abroad. Those specialties that we need are still not developed much. For example, nuclear technologies in Russia have entire institutes, and in Kazakhstan, I could not find anything except KAZNU [Kazakh National University] (P25).

Overall, the interviewed students studying in Russia almost unanimously stated that there would be fewer students from Kazakhstan willing to pursue international mobility in Russia in the current and subsequent years. Several noted that they would have considered other destinations if they knew about the possibility of the war conflict. A quote from a female participant: After the situation changed, if I were a school graduate now, I would think a hundred times before going to Russia as this is a big risk to some extent… (P25)

Factors that Determine the Mobility Decisions of STEM Students in the Context of Current Geopolitical Realities

Pull Factors on the Receiving Side

Quality of STEM programs.

Almost a third of the participants (n=10) highlighted that they were attracted by the quality of STEM education in Russian universities and the universities' reputation. Several students highlighted STEM programs offered in Russian universities and highly qualified faculty at technical universities, especially in such big cities as Moscow and St. Petersburg. Three participants stated that if not for the war, they would still pursue education in Russia as they still considered that

technical universities offer a quality education in STEM subjects and are much more advanced in some STEM fields, such as IT and mathematics. As one participant commented:

> Before these geopolitical events, I thought that I would apply there [to a university in Russia], I know that Moscow State University is very good…in general, Russian universities- are quite advanced, especially in Maths, and there were many Russian mathematicians who were…the prominent scholars in their field, so yes, I was planning to apply there (PL23)

> Personally, I think that the quality of teaching is higher in Russia, as they have more experience in IT. In Kazakhstan, IT disciplines are being taught only in some universities. In Russia, they have been teaching IT disciplines for a while, so Russia is much more advanced in this field (A1)

STEM Infrastructure and Capacity.

In the participants' view, the university infrastructure is well-developed in Russia, and this was one of the factors attracting students from neighboring countries. Other advantages of technical universities in Russia are the well-equipped labs, the science parks situated on campus territory, and the funding provided for STEM research. According to the participants, Russia has inherited all technical universities and the technological and research infrastructure after the breakup of the Soviet Union and it is much more advanced than in Kazakhstan, which had to build its science infrastructure from scratch. As the participant commented:

> Infrastructure is more developed there [in Russia]…we might have only 3-4 universities in the city [Kazakhstan], whereas, in Russia, 10 to 20 different universities, and each of them will have much more funding, a big campus, and also companies situated on the university campus which collaborate with the university (A6)

> Russia was the core country of the Soviet Union, and it already had good universities. After the breakup of the Soviet Union, Kazakhstan, like many other post-Soviet countries, was in decline after gaining independence. Even now, there are very few good universities in Kazakhstan. Russia has a bigger number of universities. Therefore, students have more choices of where to study, and accordingly, there are more opportunities…

Recruitment Policies of Russian Universities.

It seems that the aggressive recruitment policies of Russian universities and their cooperation with some STEM-focused schools in Kazakhstan were also contributing factors in school graduates' decision-making process. Several students who chose to study in Russian universities before the war started shared that they participated in STEM Olympiads and examinations organized by Russian technical universities. As a result, the winners were invited to summer schools organized by Russian universities, became more familiar with the university, and then accepted the admission offer. As one participant commented:

> Yes, it turns out that the school associated with the university in Novosibirsk [Russia] has co-operated with our economic lyceum in Semipalatinsk for a long time… We passed the entrance exams. If you got a good score, you were approved, and for a week, we traveled to Novosibirsk. And there we studied in a physics school, there were all sorts of excursions, lectures, and team-building events that were very cool. (S12)

Moreover, in most cases, the high-performing students had been offered a full-ride scholarship from the university and made their decision to enter the university far ahead of the official round of applications to Kazakhstani universities. According to the participants, the whole application process to Russian universities is easy and can be done online. The participants also shared that, in their view, it was much more difficult to enter a university in Kazakhstan than in Russia as the entrance examinations to international standard universities in Kazakhstan are very competitive compared to Russian

universities, which only require a test on STEM subjects. According to the participants, the entrance test is much easier to pass than Unified National Testing in Kazakhstan. In addition, the whole package that is offered for talented STEM students from Kazakhstan is quite generous: full scholarship, accommodation, stipend, which is higher than in KZ universities, as well as the opportunity to have paid internships and live in a bigger city.

> …there are international standard universities in Kazakhstan, they are very few, and it is really difficult to enter these universities. It's much easier to enter a good university in Russia. Especially taking into account that Russia offers scholarships for students from Kazakhstan. Before the geopolitical events, this offer was much better than local universities could suggest, and another factor is that cities in Russia are much more developed than in Kazakhstan (S4)

Geographic and Language Proximity and Cultural Affinity.

The analysis of interview data also identified that Russian universities were also a priority for school graduates with limited English language and Kazakh language proficiency but still willing to pursue education outside Kazakhstan. It is important to note that some participants of Russian ethnicity reported their limited Kazakh language capacity and related it to the low quality of teaching of Kazakh at their schools. Participants highlighted that the fact that there was no language barrier was an important factor when choosing the destination country.

> The reason why I was going to apply to Russian University is that you just need to know the Russian language to apply. This was the main reason. And now, I am trying to learn English and Kazakh (P20).

> I had a priority [of choice]: only in Russian because, honestly speaking, English, well, at school, I did not like it much because of the teachers. I also had problems with Kazakh (P20).

> There will be no language barrier, like in any other foreign country because we speak fluent Russian here (A5).

Four students reported that they were inclined to study in Russia that it was easy for them to commute there from their home cities, situated very close to the Russian border.
As one of the participants from Uralsk commented:

> I lived in Uralsk [Kazakhstan], and we were very close to the border with Russia. It turned out that it was convenient for me, and it was one of the closest universities. Say, Astana is 2000 kilometers from Uralsk, and Kazan [Russia] is only 500 kilometers away. That is, it was easier for me to study and live in Kazan and come to Uralsk than to Astana (A8).

> …geographical location. My hometown, Semey [Kazakhstan], Novosibirsk [Russia]is almost at the same distance that Almaty [former capital of Kazakhstan]is from Semey, that is, in fact…about half a day's drive by car (S12).

When asked about other factors that have influenced their decision of where to study, one participant also stated that Russia was a priority destination for him due to his awareness of the destination country. The student noted that he would be comfortable studying in Russia due to the 'similar culture,' similar way of life, and, at the same, being outside their home country and having new experiences.

Employment and Immigration Opportunities.

Five interviewed participants, especially those currently studying in IT majors, have highlighted that they see more employment prospects in STEM and IT companies in Russia with higher salaries right after graduation and professional

development opportunities. Those students (all of Russian ethnicity) highlighted that it makes no sense for them to come back to Kazakhstan, and they are planning to stay in Russia after graduation. As one participant commented:

> …I do not see any reason for returning to Kazakhstan to work in my specialty. If you compare IT specialists' salaries in Russia and Kazakhstan, they differ as heaven and earth. Even now, my friends and my brother, his groupmates who have just finished their fourth year of studies…their salary is…more than a million tenge (S2)

This participant also commented that IT departments in the university where he studies, work in close partnership with Russian IT companies. The student highlighted that most students get job offers from these companies in their junior year and start working part-time, even being full-time students.

Overall, the interview data suggests that Kazakhstani students were attracted by a combination of geographical, linguistic, cultural, and education/employment-related pull factors, including the opportunity to live in bigger and more developed cities and advice from students who previously studied in Russia. An illustrative quote on the reasons why students from Kazakhstan chose Russian universities:

> I think because Russia is just a bigger country, it is close to us geographically, it cooperated with us in the past, it cooperates with us now. Well, at that time, it was more developed and maybe, you know, like word of mouth, maybe their older brothers went there, also their older friends also went there, and all this started a chain reaction, that is, they liked it, and they saw that there were more job opportunities there as well. I think big cities attracted them too. (S19).

Push Factors on the Domestic Side

Low Quality of STEM Programs and Rigorous Admission.

Many interviewed participants mentioned that one of the major factors that push the students to seek higher education outside Kazakhstan is the low quality of STEM programs. As participants commented: "Most students are not happy with the education in Kazakhstan. Not in all the universities, except the top ones like Nazarbayev University [western style university in the capital city], the quality of education is good" (S12).

The students also commented on Unified National testing (UNT), which serves as an entrance examination to universities, as very rigorous and requiring a long preparation. They highlighted that it would be better to concentrate on having STEM subject tests instead of UNT, which is very stressful for school graduates.

Lack of STEM Capacity.

The students mentioned poor STEM infrastructure and lack of research funding as factors that discourage them from applying to universities in Kazakhstan. Students highlighted that more funding should be spent on STEM equipment in particular. As one student commented: "More funding should be spent on equipment and other things for the students, as far as I know, the situation in Kazakhstani universities is really bad, both with equipment and funding" (PL23). A similar comment from another participant:

> I think that there is not much research, there is an absence of research in universities, so there should be more attention to research. The university should prioritize research and be asked to prioritize research (A26).

Reverse Pull and Push Factors Associated with War Conflict

The analysis of interview data also identified reverse pull and push factors, which have emerged in the context of war conflict both on the receiving and domestic sides and influenced the students' final decision to pursue international mobility. These factors are reported in the subsequent sections of the paper.

Perceived Devaluation of Diplomas and Economic Decline.

The concerns about the value of diplomas from Russian universities were named as the major counter-influence in making their mobility decisions in the context of the Russian-Ukraine war. Seven interviewed participants reported that they changed their decisions due to the perceived devaluation of Russian diplomas associated with the war and concerns that they would not be able to find a job internationally, having a diploma from a Russian university. A comment from a participant:

> I was considering Russia as one of the destinations, but I decided not to apply there due to the situation. I was in doubt if their diploma would be recognized internationally as they have a lot of restrictions, sanctions, and so on (A26).

Another important factor was the economic decline and the potential influence of economic sanctions on Russia. The students were concerned that there would be a slowdown in the Russian economy under the influence of economic sanctions. It has also become evident that the war would bring economic recession to Russia and devaluation of currency, and it would potentially influence the quality of life. As one student commented: "Honestly, I considered applying to Russia before the events that started last year in February. But when this happened, and many sanctions were applied, I decided not to apply there (A1)

For some students, the fact that many internationally recognized STEM and IT companies had left Russia was an additional factor as they realized this would have a strong negative effect. Most importantly, the students were anxious not only about their future employment and internships in these companies but also about fewer learning opportunities due to the absence of access to licensed IT software, and AI learning tools and the shortage of STEM equipment, which is exported to Russia and related challenges such as the termination of bank transfers to Russia and blocking social networking sites. Some participants commented: "People say that we cannot use the cards and some social networking sites are blocked" (K16).

> One student entered there, but he currently faces the problem that some services are not available in the territory of Russia, especially IT services, for example, ChatGPT does not work in Russia, and all the IT companies have terminated their contracts with Russia. So, what is the point of studying there (A1)

Increased Social and Economic tensions.

An important detail is that the students who were currently studying in Russian universities noted the changes in the mentality of the citizens and the frequent emergence of conflicts of opinion in the society after the start of military conflict. Some students even mentioned xenophobia associated with war conflict and highlighted that the growing social tension made them feel uncomfortable. Perspective mobile students mentioned potential discrimination associated with the fact that they are initially from a different country and the fact that they are international students, even being of Russian ethnicity. Some illustrative quotes:

> Maybe these are just rumors or facts, I do not know, but my relatives say that there are cases of racism against Asians (A10).

> …they started to feel the danger, although they were in Moscow…and they also mentioned the changes in people's mentality due to the latest events. And the conflict of opinions and interests is

> very common. It became a concern, they started to feel the discrimination, and they decided to leave Russia (P30).

The participants also mentioned the financial considerations of studying in big cities, the potential cut of scholarships, and the concerns about overall instability in the country:

> The percentage of students entering Russian universities may decrease. First, it is difficult psychologically. Economically also, the situation is not stable, and not everyone can afford a child's education in Moscow, where the situation is so unstable. There is a high likelihood of civil war and riots…again, it is difficult for parents to send their child to a country involved in military conflict and unstable situation (K28).

Parents' Influence on Students' Decisions.

Only 7 graduates reported being independent in their decisions to pursue mobility after the start of the war conflict. It seems that in the context of geopolitical realities, the influence of family on student's mobility decisions has significantly increased, especially for the students who were the only or late children in the family or of the female gender. It should be highlighted that several female students reported they were not allowed by their parents to go to study abroad due to geopolitical events. Some illustrative comments from participants:

> … I was not worried about it, I mean, once the situation started happening. I went home and talked to my parents. They said… It's fine for now…but if something serious happens and there is an emergency situation, of course, it is quite possible that I would have to go back to my country, to Kazakhstan. Of course, for the sake of my parents, so they are not worried about me (S18).

> I will tell you personally about my family, there are only three of us and I am a late child… my parents are retiring this year, and naturally, they are afraid, that is, they say there is a war going on, they did not want to let me go…(A26).

Domestic STEM opportunities.

Recent developments in Kazakhstani universities were also counter-influencing the students who were uncertain about their decisions in the context of war conflict. Four students mentioned that the government increased scholarships for STEM specialties and there appeared the opportunities to get an international degree in Kazakhstani universities, which established dual degree programs with some Western partners. One student mentioned that tuition fees for some STEM specialties have become lower. Another student mentioned that the universities started to pay more attention to establishing the partnership with employers in the IT sphere, which was one factor that influenced his decision to stay in Kazakhstan:

> It is cheaper and more stable in Kazakhstan now, and IT majors [at X university] are providing a connection with big companies. After graduation, it is possible to apply for a job or even to try to apply immediately (A1).

However, it was also identified that most interviewed school graduates were unaware of domestic higher education opportunities. It was also found that not all the universities have implemented measures to support Kazakhstani students willing to return and continue their studies in domestic universities in the context of war. Many students could not transfer to local universities due to the difference in the programs and strict student transfer regulations in Kazakhstani universities. The students who were on full-ride scholarships in Russia were able to transfer to Kazakhstani universities only on a fee-paid basis.

> A friend of mine… graduated last year and applied/entered MGU [a leading Russian university] and got a scholarship. However, because there are uncertainties in Russia, their economy is failing,

and because they are involved in the war, he transferred to X [domestic university] on a self-paid basis… (K16).

It has become obvious that most university graduates who have previously considered entering universities in Russia, stayed in Kazakhstan. However, we also noted that they were unsatisfied with their choice and considered applying to universities abroad the following year.

Discussion

Students' international mobility decisions are often viewed through the lens of push-and-pull factors (Mazzarol & Soutar, 2002). The study suggests that in a situation of military conflict, there is less clarity with respect to which side is predominantly pushing and pulling. It was identified that Russia is no longer the priority option for STEM students from Kazakhstan but is still seen as an attractive destination, especially for ethnic Russians, those who initially planned to migrate to Russia, and those students who were not able to find a certain STEM specialty in Kazakhstani universities. The strongest pulls are the perceived quality of STEM education in Russian technical universities, universities' reputation, STEM university infrastructure and scholarships provided by Russian universities for STEM-talented students. The students were also pulled by cultural and language affinity and geographic proximity but to a lesser extent.

On the domestic side, the study identified such push factors as low-quality STEM programs and a lack of STEM capacity. We found that the low quality of STEM programs in domestic universities and low STEM capacity remain a strong push factor even in the context of war conflict. School graduates were concerned about lower employment prospects and stayed in Kazakhstan only due to 'forced immobility' (Mulvey & Li, 2023).

Although the study identified pull and push factors on both sides, there is still little clarity on how the combination of these factors influences the students' decisions in a situation with military conflict. Although pull factors remain strong, in the context of war conflict, the students are counter-influenced by safety concerns, the risk of being involved in military obligations, social and economic tensions, and rising xenophobia. It seems that financial considerations are also one of the major counter influences, as the participants were anxious about the potential cut of scholarships for international students, devaluation and growing living expenses.

The study identified that such factors as parental influence on students' mobility decisions and adaptability of domestic higher education in the context of instability have become more prominent in the context of geopolitical tensions. It was also noted that female STEM students seem to be more affected by the family in the process of decision-making (Almukhambetova & Kuzhabekova, 2021). It seems that although the government puts some efforts change into changing the students' mobility dynamics, many domestic universities were not able to reconsider their recruitment strategies to attract school graduates and were not responsive to the needs of the students who wanted to transfer from Russian universities when the war started. As Tran et al. (2023) argue, the students "caught in geopolitics-international education crisis need to be embraced, welcomed and supported" (p. 438), and crisis management is especially important in such situations (Rumbley, 2020; Yang, 2022).

Conclusion

Using the pull- and push model as a main theoretical framework, this study explored the changes in STEM students' intentions to pursue international mobility in the context of the Russia-Ukraine war and the factors related to students' mobility decisions.

The study offers some theoretical and practical contributions. The traditional push-pull model (Altbach,1998) assumes that push factors are associated with the home country and pull factors with the host country only. It was identified that STEM students were 'pulled' and 'pushed' to make decisions under the influence of the factors located both on the receiving and domestic sides, and the students' mobility decisions have proven to be highly prone to geopolitical turbulence. The situation with the Russia-Ukraine military conflict seems to modify the typical pull-push model and the decisions of

whether to pursue international mobility were primarily driven by safety, financial, and social tension concerns. This has implications for other contexts affected by geopolitical turbulence as in the situation with conflict and crisis, there is less clarity on which side is predominantly pushing and pulling and the way this combination plays out in students' decisions has become much more complicated (Mok et al., 2021).

It is still unclear whether the changing mobility patterns in the region provided opportunities for Kazakhstan to retain talented STEM students who previously used to study in Russia and whether regional universities have made all efforts to adjust to students' growing demands. It is also unclear what the potential impact of the shifting mobility decisions on the local Kazakhstani higher education sector, in terms of challenges or opportunities to attract talented STEM (both international and Kazakhstani) students in the new context of war and future post-war in the region.

The study offers several practical implications for policymakers and university administrators internationally. Higher education institutions interested in understanding students' mobility decisions in times of conflict should develop more effective university recruitment and admission policies and adjust their regulations to address the needs of transfer students affected by geopolitical tensions. In the competition for retaining STEM talent, the universities should also apply more efforts to attract students from affected regions by providing more scholarships.

Even though the study provided some fresh insights into how the students' intentions to pursue mobility in the context of the Russia-Ukraine military conflict have changed, it is still limited in its scope, with 29 students being interviewed. More research is needed to understand how the students' mobility patterns in the region are changing amidst geopolitical turbulence and the mechanisms the universities have in place to respond to growing students' demands.

References

Akhmetzhanova, A. (2020). Outflow of Kazakhstani students to Russian universities: Where to Look for Reasons? In *SOROS.kz*.

Alimukhamedov, F. (2020). Central Asia: Crossing the threshold at different speeds. *International Higher Education,* (103), 12–14. https://ejournals.bc.edu/index.php/ihe/article/view/14639

Almukhambetova, A., & Kuzhabekova, A. (2022). COVID-19 and the Changes in STEM Students' Intentions to Pursue International Mobility. What Do the Students Say? *European Education*, *54*(1-2), 47-62.

Altbach, P. G. (1998). Comparative Higher Education: Knowledge, the University, and Development. Greenwich, CT: Ablex Publishing Corporation

Barinova, V., Rochhia, S., & Zemtsov, S. (2022). Attracting highly skilled migrants to the Russian regions. *Regional Science Policy & Practice*, *14*(1), 147-173.

Beine, M., Noël, R., & Ragot, L. (2014). Determinants of the international mobility of students. *Economics of Education Review*, *41*, 40–54. https://doi.org/10.1016/j.econedurev.2014.03.003

Belov, F. D. (2020). Educational migration: factors influencing the attraction of foreign young scientists and the return of Russian young scientists. *RUDN Journal of Economics*, *28*(1), 184–195.

Chadee, D., & Naidoo, V. (2008). Higher educational services exports: sources of growth of Asian students in US and UK. *Service Business*, *3*(2), 173–187. https://doi.org/10.1007/s11628-008-_0041-7

Chankseliani, M. (2015). Escaping homelands with limited employment and tertiary education opportunities: Outbound student mobility from Post-Soviet countries. *Population Space and Place*, *22*(3), 301–316. https://doi.org/10.1002/psp.1932

Chankseliani, M. (2017). Four rationales of HE internationalization: Perspectives of U.K. universities on attracting students from former Soviet countries. *Journal of Studies in International Education*, *22*(1), 53–70. https://doi.org/10.1177/1028315317725806

Chankseliani, M. (2018). The politics of student mobility: Links between outbound student flows and the democratic development of post-Soviet Eurasia. *International Journal of Educational Development*, *62*, 281–288. https://doi.org/10.1016/j.ijedudev.2018.07.006

Choudaha R. & De Wit H. (2014). Challenges and opportunities for global student mobility in the future: A comparative and critical analysis. In Streitweiser B. (Ed.), *Oxford Studies in Comparative Education Series: Internationalization of higher education and global mobility* (pp. 19-34). Symposium Books.

Choudaha, R. (2017). Three waves of international student mobility (1999–2020). *Studies in Higher Education*, *42*(5), 825–832. https://doi.org/10.1080/03075079.2017.1293872

De Wit, H., & Altbach, P. (2021). Internationalization in higher education. In *Higher Education in the Next Decade* (pp. 303–325). https://doi.org/10.1163/9789004462717_016

Ershov, B. A., Nebolsin, V. A., & Solovieva, S. R. (2020). Higher education in technical universities of Russia. In *7th International conference on education and social sciences. Abstracts & Proceedings* (pp. 55-58).

Freeman, B., Marginson, S., & Tytler, R. (2019). An international view of STEM education. In *STEM Education 2.0* (pp. 350-363). Brill.

Galama, T., & Hosek, J. (2009). Global competitiveness in science and technology and the role of mobility. In *Higher education on the move: New developments in global mobility* (pp. 95–111). The Institute of International Education.
Grove, J. V. (2017). The geopolitics of extinction: From the Anthropocene to the Eurocene. In *Technology and World Politics* (pp. 204-223). Routledge.
Kim, S. K. (2015). Redefining internationalization: Reverse student mobility in South Korea. *Redefining Asia Pacific higher education in contexts of globalization: Private markets and the public good*, 41-56.
Kondakci, Y. (2011). Student mobility reviewed: Attraction and satisfaction of international students in Turkey. *Higher Education*, *62*, 573-592.
Li, M., & Bray, M. (2007). Cross-border flows of students for higher education: pull pull push-pull factors and motivations of mainland Chinese students in Hong Kong and Macau. *Higher Education*, *53*, 791-818.
Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.
Lombard, M., Snyder-Duch, J., & Bracken, C. C. (2002). Content analysis in mass communication: Assessment and reporting of intercoder reliability. *Human communication research*, *28*(4), 587-604.
Mäkinen, S. (2023). Internationalization in challenging times: Practices and rationales of internal and external stakeholders. *European Journal of Higher Education*, *13*(2), 126-141. https://doi.org/10.1080/21568235.2023.2196434
Mazzarol, T., & Soutar, G. N. (2002). "Push-pull" factors influencing international student destination choice. *International Journal of Educational Management*, *16*(2), 82–90. https://doi.org/10.1108/09513540210418403
Mok, K. H., Xiong, W., Ke, G., & Cheung, J. O. W. (2021). Impact of COVID-19 pandemic on international higher education and student mobility: Student perspectives from mainland China and Hong Kong. *International journal of educational research*, *105*, 101718.
Mulvey, B., & Li, B. (2023). Social inequality in a 'hyper-mobile society: intra-national mobilities and formal education in China. *Journal of Ethnic and Migration Studies*, 1-19. https://doi.org/10.1080/1369183X.2023.2193673
Rumbley, L. (2020). COVID-19 and internationalization: Mobility, agility, and care. *International Higher Education*, (102), 14-16.
Smith, J. A. (1995). Semi-structured interviewing and qualitative analysis. Birkbeck, University of London.
Tarasova, A., Korneeva, E., Krayneva, R., & Gudkova, S. (2019). Pitfalls and drawbacks in engineering education in Russia. *Journal of Applied Engineering Science*, *17*(1), 43–51. https://doi.org/10.5937/jaes17-19097
Tran, L. T., Nguyen, D. T. B., Blackmore, J., He, B., & Vu, H. Q. (2023). COVID-19, geopolitics and risk management: Towards framing a reciprocal, coordinated, responsive and empathetic international education sector. *Policy Futures in Education*, # 14782103231163480.
UNESCO (2022). Moving minds: Opportunities and challenges for virtual student mobility (VSM) in a post-pandemic world. Retrieved from https://www.iesalc.unesco.org/wp-content/uploads/2022/ 03/IESALC_220315_RE_VSM_EN.pdf
Yang, P. (2022). Rethinking international student mobility through the lens of "crisis" at a juncture of pandemic and global uncertainties. *Asia Pacific Journal of Education*, *42*(sup1), 20-33. https://doi.org/10.1080/02188791.2022.2031872

Ainur Almukhambetova Ainur holds a PhD in Education from Nazarbayev University. Ainur's primary research interests are students' experiences in higher education and critical transitions, equity and access in STEM education, and international student mobility.

Jason Sparks is an Associate Professor and Vice Dean for Academic Affairs at the Graduate School of Education, Nazarbayev University (Kazakhstan). He holds a PhD in Education Policy Studies from the University of Illinois at Urbana Champaign. His main research interests are the internationalization of higher education, students' mobility and university-industry partnerships.

Assylzhan Ospanbek is a research assistant at the Central Asian Research Center for Educational Innovation and Transformation (CARCEIT), Nazarbayev University.

Manat Sergazina is a research assistant at the Central Asian Research Center for Educational Innovation and Transformation (CARCEIT), Nazarbayev University.