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Student Global Mobility: An Analysis of International STEM Student Brain Drain

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STUDENT GLOBAL MOBILITY: AN ANALYSIS OF INTERNATIONAL
STEM STUDENT BRAIN DRAIN

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ABSTRACT

STUDENT GLOBAL MOBILITY: AN ANALYSIS OF INTERNATIONAL STEM STUDENT BRAIN DRAIN

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This study seeks to understand global mobility patterns of international, graduate STEM students studying in the United States. Using data from the NSF Graduate Students in Science Survey (GSSS), this study investigates the political, economic, and social factors affecting students' intent to stay or go, identifying differences based on students' country of origin within World Bank defined categories of gross national income (GNI) per capita. Descriptive statistics identified factors affecting students' intent to stay or go. Chi-square analysis, and analysis of variance (ANOVA) identified differences between factors based on students' intent to stay or go, and identified differences based on students' home country GNI categories.

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CHAPTER ONE

INTRODUCTION

Mobility of highly skilled workers has become an essential component of globalization with a particularly strong impact on innovation in business and technology (OECD, 2008, 2016). Because of the expansion of higher education, recent migrants are more educated than earlier immigrants with business and academia seeking to create or integrate international knowledge networks by targeting specific knowledge and abilities in candidates from abroad (OECD, 2016). These networks are a part of global brain circulation, where knowledge is transferred from receiving to sending countries (OECD, 2008) when highly skilled immigrants create social and economic links between countries (Johnson & Regets, 1998; Saxenian, 2002). To illustrate the importance of this phenomena, in February 2017, over 100 United States (U.S.) technology companies joined together to file an amicus brief in support of a Washington state judge's ruling halting a presidential order that banned immigrants from seven countries (Drange, 2017). The brief voiced concerns about the industry's ability to attract talent to the U.S., highlighting the importance of international talent in the workforce.

The proposed ban had implications for all immigrants and affected thousands of international students (Barry-Jester, 2017) who play a distinct role in international migration, especially at the graduate level (Szelenyi, 2006). While researchers have looked at how international students make the decision to study outside their home country (Altbach, 1991; Cantwell, Luca, & Lee, 2009; Lee, 2008; Lee & Kim, 2010; Li & Bray, 2007; Mazzarol & Soutar, 2002; Wei, 2012), research is limited regarding international students' experiences after completion of studies (Choudaha, 2015; Szelenyi, 2006; Wu & Wilkes, 2017). One particular

area lacking information is international students' intent to stay in their host country versus return to their home country for work. These students' decisions have implications for global economic and workforce development that is exemplified by the technology industry's reaction to the immigration ban.

Study Goals and Objectives

This study investigates international graduate students pursuing Science, Technology, Engineering, and Math (STEM) degrees in the U.S., and the political, economic, and social factors affecting their intent to stay in the U.S. or go back to their home or another country. The study will identify differences based on students' country of origin within World Bank defined categories of gross national income (GNI) per capita¹. Understanding these differences can impact countries that stand to lose from brain drain, while encouraging the development of brain circulation where high skilled immigrants create social and economic links between countries, opening foreign markets, strengthening infrastructure, and providing new opportunities for growing regions in the world economy (Johnson & Regets, 1998; Saxenian, 2002). See Table 1.1 for operational definitions of brain drain and other terms used in the study.

The purpose of this quantitative study is to show how students' intent to stay or go is related to push-pull factors (Altbach, 2004; Carr, Inkson, & Thorn, 2005; Choudaha & DeWit, 2014; Lee & Kim, 2010; Li & Bray, 2007; Mazzarol & Soutar, 2002) that differ in magnitude based on World Bank GNI categories (World Bank, 2017). The decision to study and work abroad is found to be influenced by a number of push-pull factors (Altbach, 2004; Carr et al.,

¹ For the 2017 fiscal year, low-income economies are defined as those with a gross national income (GNI) per capita of \$1,025 or less in 2015; lower middle-income economies are those with a GNI per capita between \$1,026 and \$4,035; upper middle-income economies are those with a GNI per capita between \$4,036 and \$12,475; high-income economies are those with a GNI per capita of \$12,476 or more (World Bank, 2017).

2005; Lee & Kim, 2010; Li & Bray, 2007; Mazzarol & Soutar, 2002). Political, economic, and social conditions are frequently cited as factors pushing students to leave their home country (Altbach, 2004; Carr et al., 2005; Han & Appelbaum, 2016; Lee & Kim, 2010; Mazzarol & Soutar, 2002). These conditions can include lack of access to education and jobs, as well as concerns about political repression and academic freedom (Altbach, 2004).

In most developing countries, access to higher education is still restricted compared to high income countries, leading to reinforcement of existing social stratification (Dassin, Enders, & Kottmann, 2014). Because of this, students who do study outside their home country engage in a form of vertical mobility where they move from countries with too little or poor higher education to countries with quantitatively and qualitatively better higher education (Wachter, 2014).

Table 1.1

Operational Definitions

Term	Definition	Example
Brain Drain	Educated, skilled people leave their home country to immigrate to a more economically developed one (Baruch, Budhwar, & Khatri, 2007).	Students from developing countries come to the U.S. to study, and stay in the U.S. to work after graduation.
Brain Gain	Gain of the developed country, when talented individuals stay and work in their country (Myers, 1972).	Students who have earned a degree in the U.S., and remain to work in the U.S. tech industry.
Brain Circulation	Highly skilled immigrants create social and economic links between countries	Students who have studied in the U.S., who return to their home countries while

	(Johnson & Regets, 1998; Saxenian 2002).	maintaining connections to both home and host country.
International Students	Students studying at a higher education institution in the U.S. on a temporary student visa (F or J visa) (IIE, 2016).	International students studying at a U.S. university on an F-1 student visa.
Push-Pull	Factors that push students to leave their home country to study abroad. Factors of the host country that pull students to study there (Altbach, 2004).	Lack of jobs push students from their home country, while academic reputation and lifestyle pull students to a host country.
Reverse Push-Pull	Factors that pull a student back to their home country or push them to leave their host country (Li & Bray, 2007).	Family connections pull a student to return home, while visa issues push them to leave the host country.

Despite the large number of studies on globalization itself, there is a need for micro-level studies on globally mobile individuals, particularly international students who are the personification of globalization (Favell, Feldblum, & Smith, 2007). While there have been calls for more research into the impact of student mobility on social and economic systems (Streitwieser, 2012), Dassin et al (2014) have argued that instead the impact of social and economic systems on global student mobility requires greater understanding.

Scholars have studied students' reasons for studying abroad, however there is limited research about international students' paths after completion of studies. Gaining a better understanding through this study of the push and pull felt by graduate students can better align workforce supply and demand.

Justification and Study Benefits

Brain drain and brain gain as they were originally defined may be evolving, with brain circulation taking a bigger part in how international students interact on both a social and

professional level. By looking at home country GNI categories to identify the factors affecting international students' intent to stay in the U.S. or leave for their home or another country, we can better identify patterns of mobility related to economic development levels.

In spite of visa challenges, the number of international students coming to the U.S. for higher education continues to grow, with a record high 1,043,839 studying in the U.S. in 2015/2016 (IIE, 2016). As immigration reform is being considered, it is important that research is conducted to understand international students' goals and motivations. Little research exists that looks beyond international students' experiences as students, therefore there is a need to learn more about the paths they take after completion of their studies. A greater understanding of international students' global mobility post-graduation will have implications for workforce development in the U.S. and abroad.

Theoretical Framework

The theoretical framework is similar to that of Han et al. (2015)², and is built around the push-pull theory (Altbach, 2004) of influences that affect international student career decision making leading to brain drain (Baruch et al., 2007), or brain circulation (Saxenian, 2005). Looking at push-pull factors through the lens of brain drain and circulation allows for exploration of reverse push-pull (Li & Bray, 2007), or the factors that may push a student from a host country after completion of studies, including immigration policies and perceptions of neo racism, and factors that pull students home such as family ties, and home country programs encouraging return (Choudaha & DeWit, 2014; Han & Appelbaum, 2016). These reverse push-

² Han et al.'s (2015) study of STEM graduate students at UC Santa Barbara sought to explain how STEM graduate students' educational choices, and experiences in U.S. higher education predicted their career path and geographic location post graduation.

pull factors can also contribute to brain gain and brain circulation for both home and host countries.

Study Methodology

Student responses in this study are grouped using four World Bank categories based on gross national income (GNI) per capita (World Bank, 2017; Appendix A.). GNI per capita is used because it is closely correlated with other measures of quality of life including life expectancy at birth, mortality rates of children, and enrollment in schools (World Bank, 2017). Chapter 3 details the study's research method and activities.

Research Questions

The research study is guided by the following research questions:

RQ1 What are the political, economic, and social mobility factors that influence international students' intent to stay, go, or not be sure?

RQ2 Is there a significant difference in the political, economic, and social factors between international students who indicate that they will stay, go, or who are not sure?

RQ3 Are the political, economic, and social factors that influence international students' intent to stay, go, or not be sure different for students from countries in different GNI categories?

This study will show how students' intent to stay or go is related to political, economic, and social push-pull factors that differ based on World Bank categories of country of origin. Data examined will include data from a National Science Foundation (NSF) student survey (Han & Appelbaum, 2016). The Graduate Students in Science Survey (GSSS) of international students from ten U.S. higher education institutions (Han & Appelbaum, 2016) provided quantitative data about the factors affecting the intent to stay or go. The GSSS consisted of four categories of questions: 1) basic background information (age, gender, major, year of study); 2) reasons for

studying in the U.S.; 3) perceptions of graduate education in the U.S.; and 4) plans after graduation (Han, Stocking, Gebbie, & Appelbaum, 2015). Descriptive statistics, chi-square analysis, and analysis of variance (ANOVA) will be used to identify differences between how political, economic, and social factors predict students' intent to stay or go for people from different GNI levels. A copy of the survey can be found in Appendix C.

Respondents to the survey were 752 international graduate students representing 74 nationalities (Han & Appelbaum, 2016). Student respondents by GNI per capita included: 1) low-income $n = 11$; 2) lower middle-income $n = 251$; 3) upper middle-income $n = 333$; and 4) high-income $n = 156$. Low-income and lower middle-income categories were combined for analysis into the lower middle-income category (lower middle-income $n = 262$). Survey data includes 49% of respondents intending to stay in the U.S., 12% intending to go, and 39% not sure. The study includes 261 female and 480 male students, with 258 studying at the master's level and 494 studying at the doctoral level. All students were studying in STEM disciplines, with international students defined as temporary visa holders.

Survey data was made publicly available on the PLOS One website <https://doi.org/10.1371/journal.pone.0118183>. The 2016 NSF study (Han & Appelbaum, 2016) was a replication of a study completed on STEM students at the University of California Santa Barbara where 166 international graduate students, representing 32 countries responded (Han et al., 2015).

Summary

This chapter described the importance of examining international students' intent to stay or go upon completion of their studies. The goals and objectives, justification and benefits, methodology, and research questions were presented. Finally, operational definitions and

delimitations were presented. Chapter two presents the most current review of the literature covering global mobility; brain drain, gain, and circulation; and push-pull factors. It explores the relevance of GNI categories and includes U.S. visa implications as well as global workforce development implications.

In spite of visa challenges, the number of international students coming to the U.S. for higher education continues to grow. Connecting this research to migration research and immigration policy reform will help to maintain those numbers, while developing a greater understanding of international students' paths post-graduation. This adds to the research on high skilled mobility with implications for global economic and workforce development.

CHAPTER TWO

LITERATURE REVIEW

This chapter provides an in-depth review of literature related to brain drain (Baruch et al., 2007), brain gain (Myers, 1972), and brain circulation (Saxenian, 2005) as a result of student mobility. It includes exploration of the conceptual framework components of push-pull factors (Altbach, 2004; Mazzarol & Soutar, 2002) that influence student career decision making and how this relates to global mobility. Included in this chapter is a broad overview of the literature related to brain drain resulting from study abroad and the factors affecting the intent to study and work abroad. It explores the relevance of examining home country gross national income (GNI) levels. It includes immigration and visa policy implications and reviews workforce development implications for the United States (U.S.) and students' home countries.

The number of international students studying in U.S. colleges and universities is rapidly growing from 565,039 in 2004/2005 to 1,043,839 in 2015/2016 (IIE, 2016). Across OECD countries, a large percentage (24%) of international students are enrolled in doctoral programs, compared with 9% across all levels of tertiary education (OECD, 2015). Two-thirds of international students in the U.S. pursue a bachelors degree or higher in STEM or business, management and marketing, versus 48% of students from the U.S. (Ruiz, 2014).

Many students leave developing nations to pursue graduate education in more developed countries, some with the intent of staying in their host country permanently. Students who remain in their host country post-graduation can cause brain drain for their home country, however students who stay or return, but maintain connections to both home and host country, contribute to brain circulation.

Global Mobility

The global mobility of highly skilled individuals has become an important aspect of innovation and globalization and is acknowledged to contribute to the creation and diffusion of knowledge through direct interactions (OECD, 2008, 2016). The global economy has seen an increase in the global mobility of highly skilled individuals including students, scientists, and engineers with economic, technological, and cultural factors making mobility more affordable and less irreversible than in the past (OECD, 2016). Favell et al., (2007) proposed a research agenda for global mobility, highlighting the lack of "human level" research on skilled, educated, or professional categories of migrants whose mobility is linked to career and educational opportunities.

Students in particular play a distinct role in international migration, especially at the graduate level (Szelenyi, 2006). Nearly 4.5 million tertiary students enrolled outside their country of citizenship in 2013, a number that more than doubled between 2000 and 2011 with China, India, and Korea among the top sending countries (OECD, 2013). Research on the migratory intent and behaviors of students studying outside their home country is limited, however the migratory patterns of students follow those of other migrants from their country of origin, making them an important part of the migration system (Szelenyi, 2006).

Because of policy implications, brain drain, gain, and circulation have become a research focus, with concerns that the highest skilled are freer to move, taking their knowledge and skills with them (Favell et al., 2007). The zero-sum assumption of brain gain and brain drain ignores the transnational movement of skilled migrants' ideas, knowledge, and information. Instead, in the global economy these skilled migrants can stay at home using emerging technologies in

developing countries or, when they move, using transnational networks to contribute to the economic development of their countries of origin (Favell et al., 2007).

Brain Drain, Brain Gain, and Brain Circulation

Brain drain, the flow of skilled workers, gained attention in the 1960s when highly educated people from developing countries moved to more developed countries creating a potential economic loss for the sending country (Myers, 1972). At the time, it was believed that brain drain added to international inequality as wealthy economies grew at the expense of poor economies (Saxenian, 2005). Baruch et al. (2007) define brain drain as occurring when highly skilled people leave their countries to immigrate to more economically developed countries. This is seen as a one-way process, with the permanent loss of talent from the sending country and permanent gain for the receiving country. This brain gain for the receiving country is often thought of as the opposite of brain drain, where the host country gains the talents and skills of the international students who stay upon completion of their studies (Baruch et al., 2007; Myers, 1972).

Although brain drain is traditionally thought of as talent moving from developing to developed countries, there is concern that the U.S. education of international STEM students is leading to brain drain for the U.S. as immigration policy makes it difficult for these students to remain (Han et al., 2015). Some argue that America is losing the global race for talent, contending that the cumbersome visa process, including the implementation of the SEVIS computer-based tracking system³ and additional fees charged to international students are barriers to studying in the U.S. (Altbach, 2004).

³ The SEVIS computer-based tracking system was developed by the Department of Homeland Security (DHS) after 9/11.

This concern was amplified with President Trump's January 2017 signing of an executive order temporarily preventing citizens from seven predominantly Muslim countries from entering the U.S. In response, seventeen universities filed a brief supporting a court challenge to the executive order (Arriaga, 2017), while an amicus brief was filed by members of the U.S. technology industry, stating that the immigrant ban made it more difficult for companies to recruit, hire, and retain talent (State of Washington, et al., v. Donald J. Trump, et al., 2017).

In 2000, over one-third of Silicon Valley's highly skilled scientists and engineers were primarily from Asia, and were transferring technical and institutional knowledge between distant markets and the U.S. (Saxenian, 2005). These workers aided in the economic and political development of their home country by bringing their knowledge home and influencing policy. Brain drain does not account for the transfer of knowledge, the benefits of remittances, and the sharing of innovative technologies between home and host countries (Han et al., 2015), however brain circulation, or the phenomena of high skilled immigrants creating social and economic links between countries (Johnson & Regets, 1998; Saxenian 2002) considers the return of students to their home country in a different way.

Lee and Kim (2010) considered a "diaspora option" (p. 632) to explain how South Korea's national strategy extends the brain gain of students returning home after their education abroad to brain circulation where relationships with other countries maintain and strengthen ties with South Korea. The Brain Gain Initiative states that brain drain/brain gain is not a zero sum game, where the loss of one country offsets the gain of another. Instead, it is an improvement in human capital, transferring skills and experience and the creation of networks of expertise (UNESCO, 2013). This transfer can benefit both the home and host countries as information is shared across borders, leading to international students' contribution to their home country's

development. Brain gain and brain circulation can foster democratic and economic development that is necessary for world security; by learning about the host country and coming to appreciate its values, international students can become ambassadors abroad, enhancing national security (Dassin, 2005).

Carr, Inkson, & Thorn (2005), introduced a similar concept called talent flow, where economically valuable individuals migrate between countries. This flow can be seen in multiple ways as globalization continues to change how business is done. In some cases, western educated students may work in their host country for some time after graduation, and then migrate back to their home country bringing new knowledge and capital. Technology allows them to flow, or circulate to and from their home and host country in person and electronically. New forms of communication and transportation, the rise of multinational enterprises (MNEs), and other characteristics of globalization have diminished the effects of brain drain (Dassin, 2005) and have created more brain circulation.

Today, MNEs like IBM and Proctor & Gamble are bringing their businesses to developing nations, providing economic development and work opportunities, leading to the recruitment of local talent educated in the west. The growth of more globalized ways of doing business allows talent to circulate, resulting in intensified development of emerging markets.

Push-Pull Factors

The decision to study and work abroad is found to be influenced by a number of push-pull factors (Altbach, 2004; Carr et al., 2005; Choudaha & DeWit, 2014; Lee & Kim, 2010; Li & Bray, 2007; Mazzarol & Soutar, 2002). Push factors are characteristics of the home country that initiate the student's intent to study abroad, while pull factors operate in the host country, and are seen as benefits, attracting students to study there (Han et al., 2015; Mazzarol & Soutar, 2002).

Social, political, and economic conditions are frequently cited as factors pushing students to leave their home country (Altbach, 2004; Carr et al., 2005; Han & Appelbaum, 2016; Lee & Kim, 2010; Mazzarol & Soutar, 2002). These conditions can include lack of access to education and jobs, as well as concerns about political repression and academic freedom (Altbach, 2004). While three of the most frequently cited pull factors for host countries are academic reputation, prestige, and overall environment (Altbach, 2004; Han & Appelbaum, 2016; Han et al., 2015; Mazzarol & Soutar, 2002), additional social factors that may pull a student to a host country include: opportunity to work with specific faculty (Han & Appelbaum, 2016), the prospect of multi-national classmates (Li & Bray, 2007), geographic proximity to the home country, and social links in the host country (Han et al., 2015; Mazzarol & Soutar, 2002). Another pull factor identified by Mazzarol & Soutar (2002) was students' desire to migrate after graduation. This can tie into the economic factors that lead students to leave their home country, in the hopes of finding better, permanent opportunities in the host country upon graduation (Han & Appelbaum, 2016).

Reverse Push-Pull

Reverse push-pull factors are those that may pull a student back to their home country or push them to leave their host country (Li & Bray, 2007). There can be an interplay of the push-pull factors at home and in the host country, that can be influenced by students' personal characteristics and perceptions (Li & Bray, 2007). Pull factors at home can include non-economic forces such as desire to return to family (Han & Appelbaum, 2016; Han et al., 2015; Lee & Kim, 2010; Li & Bray, 2007), cultural background, social networks (Han et al., 2015; Lee & Kim, 2010; Li & Bray, 2007) and programs encouraging return from study abroad (Han & Appelbaum, 2016). Push factors from the host country can be economic and political, including

increasing fees and costs, tightening of visa and immigration policies (Han & Appelbaum, 2016; Han et al., 2015), lack of integration and support (Choudaha & DeWit, 2014) and discrimination against students from particular countries (Choudaha & DeWit, 2014; Li & Bray, 2007). Table 2.1 includes a comparison of factors for studying and factors for staying abroad.

These push-pull, and reverse push-pull factors highlight the complexity of the students' decision to study abroad and how the intent to stay or go is further influenced by the students' experience in the host country. This provides a framework for exploring the concept of brain circulation and the mobility of international graduate students.

Table 2.1

Factors for Study Abroad and Stay Abroad

Factor type	Brain drain study	Brain drain stay
Political	Ethnic differences Political repression Political environment Immigration policies Restrictive international student policies Discrimination-political or religious Travel ban	Freedom Immigration & visa policy Disrespect from U.S. officials
Political/Economic	Visa fees	Better regulatory environment Business conditions Taxes Political interference in business
Economic	Career Institution reputation Work/assistantships Financial assistance Academic enhancement	Labor markets-home and host National economic development Payment of student loans U.S. work experience/marketable Better market conditions

	Income Employment competitiveness Labor markets Home country economic involvement in world economy High salaries Investment in career Advanced research facilities Lack of education availability in home country	
Economic/Social	Educational quality Education programs Prestige "World class" reputation Training in specialized fields Congenial socio-economic environment	Educational quality Work with specific faculty Practice professions w/ high regard Improve family's life Education for children Employment for spouse
Social	Adjustment to host country Family home country Family host country Language Friends Lifestyle Studious environment	Adjustment to host country Family home country Family host country Support systems at university
Social/Political	Studying abroad Living abroad Cultural Multi-national classmates Geographic proximity to home country	Ethnic differences Living abroad Living U.S. Cultural gap Balance home/host culture

Brain Drain Resulting from Studying Abroad

The literature identifies factors that act as pushes from students' home country and pulls to their host country (Altbach, 2004). Economic, educational, political, cultural, family, and career factors have all been found to affect students' intent to study abroad (Baruch et al., 2007; Carr et al., 2005; Han & Appelbaum, 2016; Han et al., 2015; Lee, 2008; Lee & Kim, 2010; Li & Bray, 2007; Mazzarol & Soutar, 2002; Wei, 2012).

Mazzarol and Soutar (2002) examined studies from Indonesia, Taiwan, China, and India and found that economic and social factors within the home country pushed students to study abroad. Wei (2012) analyzed the data from the UN, UNESCO UIS, OECD, IIE, and the ILO⁴ studying the economic and educational determinants of how countries attract international students and found that students from developing countries look at economic factors when considering developed countries, but look at economic and educational factors when looking at peer developing countries. Along these same lines, Lee (2008) surveyed and interviewed international students in a case U.S. institution and found varying reasons for choosing an institution that included the reputation of the institution, offers of work/assistantship and financial assistance, and the college's types of education programs.

In a study of students from Mainland China, Li and Bray (2007) found that students studying in Hong Kong were motivated by academic enhancement to choose the host country, while students studying in Macau prioritized economic income and employment competitiveness. These results may have been affected by the demographics of the students in

⁴ United Nations (UN), UNESCO Institute for Statistics (UIS), the Organization for Economic Cooperation and Development (OECD), Institute of International Education (IIE), and the International Labor Organization (ILO)

the study where 70.6% of the students in Hong Kong were doctorate level and 89.7% of the students in Macau were bachelor level.

Lee and Kim (2010) interviewed 12 faculty members who studied in the U.S. and returned to their home country of South Korea upon completion of their studies. They found that the major reasons for studying in the U.S. were prestige, training in highly specialized fields, and the experience of studying and living abroad. While the reasons for returning to South Korea were related to family, culture, and career (Lee & Kim, 2010).

Baruch et al. (2007) examined the reasons that 949 management students who came to study in the U.S. and U.K. were inclined to stay in their host country, and found that students' perceptions of ethnic differences and labor markets, adjustment to the host country, and family ties in the host and home country all affected intent to stay. Carr et al. (2005) explored the idea of the boundaryless global career with a case study and preliminary data from a large sample of New Zealand expatriates and found that factors concerned with economic, career, family, and cultural forces all affected the decision to pursue career opportunities abroad.

Han et al. (2015) examined national education data, along with data from the GSSS survey administered at one U.S. research university, and in-depth interview data to explain how students' educational decisions along with their experience in school predicted their career path and geographic location. They found that a student's intent to stay or leave the U.S. upon graduation was dependent on the interaction of professional, personal, and social/cultural factors (Han et al., 2015). In a 2016 study for the Kauffman Foundation, Han and Appelbaum expanded these findings, connecting international doctoral students' intent to stay or go with the individual's reason for pursuing education in the U.S. in the first place.

Economic Factors

The push model suggests that the outflow of students is dependent in part on the level of economic wealth, and the degree of involvement of the home country in the world economy (Mazzarol & Soutar, 2002). Many students study abroad with the goal of staying in their host country to work and build a career; making the U.S. with its large and diverse economy, and high salaries attractive (Altbach, 2004). Research findings have shown that students believe that U.S. education will provide them with a strong advantage in their career (Han et al., 2015; Lee & Kim, 2010). Han et al.'s (2015) initial research using the GSSS found that career factors were more important than social and personal reasons when deciding to study abroad, with higher quality education and future career opportunities the top two reasons for studying in the U.S. Participants in a study of U.S. doctoral students from South Korea believed that a U.S. doctorate served as an investment that would pay off in the job market (Lee & Kim, 2010). These findings highlight the economic outcome expected by students who intend to pursue their studies abroad.

Altbach (2004) stated that students seek education abroad because their home country's higher education systems lack space and a "world-class" (p. 21) reputation. This ties in with a perception that overseas education is better than local education (Li & Bray, 2007). Students are pushed from their home country by the lack of availability of education opportunities (Mazzarol & Soutar, 2002), and are pulled to the U.S. because of the reputation and prestige of a degree from an American university (Altbach, 1991, 2004). Students may seek advanced research facilities (Li & Bray, 2007), and specializations including science and technology-based programs (Mazzarol & Soutar, 2002) that may not be available in the limited offerings of their home country.

These factors may change as countries continue to build their higher education offerings, increasing accessibility, and increasing internationalization of home institutions. This coupled with a desire to stay with one's family, may lead some students to stay and study in their home country (Li & Bray, 2007).

Political Factors

Students from some countries study abroad to escape political repression at home or to gain academic freedom (Altbach, 2004). They are looking for a congenial socio-economic and political environment (Li & Bray, 2007). However political factors may repel students from host countries where restrictive policies on international students, tightening of immigration policies, and discrimination against students from particular countries for political and religious reasons are a concern (Li & Bray, 2007). In the U.S., university administrators report that a significant number of students are delayed and/or denied visas and are unable to study in the U.S. (Altbach, 2004). This becomes an economic issue with additional fees being charged to students from abroad by the Department of Homeland Security (Altbach, 2004). Donald Trump's 2017 immigration ban on seven countries raised additional concerns that prospective students will be deterred from study in the U.S. wondering if their home country will be on the list next (Barry-Jester, 2017)

Social Factors

Carr et al. (2005) found that migrants often prefer to migrate to culturally similar countries. For example, students from countries where English is commonly spoken, often choose English speaking countries for their studies. The geographic proximity of the home and host countries, can also be a factor (Mazzarol & Soutar, 2002).

Han and Appelbaum (2016) found that international, doctoral STEM students wanted to experience studying abroad, with some specifically stating that they wanted to live in the U.S. Student decision making is influenced by social links in the form of friends and family who have studied in or currently live in the host country (Mazzarol & Soutar, 2002). Lifestyle is a factor as well, with students looking for multi-national classmates (Li & Bray, 2007) and a studious environment (Mazzarol & Soutar, 2002).

Brain Drain Resulting from Staying Abroad

Baruch et al.'s (2007) research of international students studying management in the U.S. and U.K. found that 30.5% of the students intended to return to their home countries after completion of their studies, and that very few students would admit that they intended to stay in their host country permanently, however 40% indicated that they planned to stay for a considerable time. They attributed this to a combination of factors that included students' perception of ethnic differences and labor markets, their adjustment process to the host country, and their family connections in both host and home countries. These factors can tie into the economic, political, and social factors found in much of the research on students' decisions to study abroad (Baruch et al., 2007; Carr et al., 2005; Han et al., 2015; Lee, 2008; Lee & Kim, 2010; Li & Bray, 2007; Mazzarol & Soutar, 2002; Wei, 2012).

The results of Han et al.'s 2016 study showed that most international, doctoral students (48%) wished to stay in the U.S. after graduation, while 12% wanted to leave, and 40.5% were undecided, with the most important factor determining their intent being the same as the reason they chose to pursue graduate study in the U.S. in the first place. These factors included higher quality of education, future career opportunities, experience living abroad, work with specific faculty and wanting to live in the U.S.

Economic Factors

Baruch et al. (2007) found a relationship between national economic development and inclination to stay or return. Students' perception of their home country's labor market can significantly affect their intent to stay in the host country after their studies (Baruch et al., 2007). They found that students from China and Taiwan, countries where the economies have done well in recent years and where there is a larger cultural gap between countries like the U.S. and the U.K., have shown greater intent to return home. While students from India were more inclined to stay and work abroad, at least for a short time, in order to pay back student loans and gain experience that makes them more marketable when they return to their home country. Carr et al. (2005) added that professionals look for opportunities to practice their profession in countries where their profession is highly regarded and better resourced, and where market conditions or the regulatory environment appear to be better.

Political Factors

Political and economic factors may interact. Political decisions can be framed by policy in host countries concerning issues of freedom, immigration, business conditions, and taxes (Carr et al. 2005). These factors make politics both a push and a pull to and from the student's home country.

Careers can be restricted by political interference in how organizations run, however political reasons for emigrating often go beyond just careers (Carr et al. 2005). Events like Tiananmen Square, 9/11, and the Arab Spring can factor into the decision to stay or leave a country as well. Uncertainty about visa policy, including the Trump administration's executive order banning U.S. entry of citizens from six nations in the Middle East and Africa, have

prospective students questioning the U.S. as a nation for study, and have raised uncertainty about the future of studying abroad in the U.S. (Morgan & Blume, 2017).

Political factors vary based on students' country of origin. In a survey of expatriate professional New Zealanders, Carr et al. (2005) found that politics did not emerge as a clear factor in why subjects chose to work abroad. This could be because there is high political security in New Zealand and in the countries to which New Zealanders travel: Australia, United Kingdom, Western Europe, and North America.

Social Factors

The adjustment process for students can be a predictor of students' intent to stay in the host country (Baruch et al., 2007). During the adjustment process, students must choose how to balance their home culture with the host culture (Carr et al., 2005). This can be affected by support systems at the university and ties to family members in the host country, however strong ties with family members in the home country may pull students to return home after studies (Baruch et al., 2007). Students from some developing countries may feel pushed to return to their home country after reporting being treated with disrespect by U.S. officials (Altbach, 2004).

Baruch et al. (2007) found that students who perceived the cultural distance between the host country and the home countries to be too large, were more inclined to return to their home countries post-graduation. Their research showed that students who showed this inclination were from China, Taiwan, Thailand, and from countries in Africa, the Arabian Peninsula, and Latin America, while Indian students were least inclined to go home.

Students who study abroad with their families are motivated by opportunities to improve the lives of their families (Carr et al. 2005). This can include educational opportunities for their children, and attitudes of spouses that keep them in the host country. Family can also act as a pull

back home when students wish to return to spouses, parents and other family members (Han et al., 2015; Lee & Kim, 2010).

There will always be a mix of motives for staying or going, that includes individual as well as national factors and events. Events that are currently unfolding in the U.S., including changes in immigration and trade policy are changing the economic and political landscape in the affected countries and may act as potential pushes for student to return to their home countries or look for work in countries other than their host country. This illustrates how dynamic global mobility is.

Country Gross National Income (GNI) Categories

As the number of international students continues to grow, it is important to disaggregate them by home and host country in order to gain a clearer understanding of the social and economic implications of international education (Cantwell et al., 2009). Student flows continue to increase, however the flows are primarily from poorer to richer countries (Dassin et al., 2014).

Cantwell et al. (2009) explored the experiences of international students in a developing host country, examining differences by region of origin. Their study focused on Mexico, an upper middle-income GNI country, as a host country, and looked at how political, economic and academic structures influenced students' orientation towards their studies there. They found that students' experiences and expectations varied by region of origin, with students from North America and Europe more oriented toward short-term study and more interested in the overall experience of studying in Mexico while the students from Latin America were more interested in completing their degree and further education in Mexico. These results touch on some of the differences in experience and intent of students from differing GNI level countries.

In most developing countries, access to higher education is still restricted compared to high income countries, leading to reinforcement of existing social stratification (Dassin et al., 2014). Many countries are implementing programs to overcome disparities created by social stratification in an attempt to help disadvantaged groups participate in higher education, however educational mobility is still limited for many because of regional and socio-economic disparities (Dassin et al., 2014). Because of this, many students who do study outside their home country engage in a form of vertical mobility where they move from countries with too little or poor higher education to countries with quantitatively and qualitatively better higher education (Wachter, 2014).

In 2013, OECD countries received three times more international students into tertiary education than they sent abroad (OECD, 2015). Asian students comprised more than half of the international students enrolled worldwide with the largest number of students coming from China, followed by India and Germany (OECD, 2015). The proportion of international students differed based on level of education, with higher percentages of international students in master's or doctoral level programs (OECD, 2015). This could be a result of lack of capacity for advanced tertiary education in students' country of origin.

Streitwieser (2012) called for more research into the impact of student mobility on local, national, regional, and global social and economic systems, while Dassin et al. (2014) argue that the impact of social and economic systems on global student mobility requires greater understanding. This is a circular argument for students engaging in vertical mobility. Their home country social and economic factors impact the intent to study and stay abroad, while their decisions have implications for their host and home country economies.

U.S. Visa Implications

In the 1970's the U.S. believed that the primary political, economic, and cultural benefits of international education exchange were contingent on students returning to their home country after studying abroad (Myers, 1972). The idea was that students returning to their home country would use their education to improve economic conditions (Carrington, 2013) leading to brain gain for the home country.

This expectation is changing as the job market continues to shift, with a greater need for workers in the U.S. in particular in the STEM fields where there is a dearth of U.S. educated candidates (Bayer Corporation, 2014), however, U.S. visa and immigration policy has not changed to reflect this expectation. Instead, current student visa applicants must demonstrate that they intend to return home after their course of study (Johnson, 2009). In other words, they need to state that they do not intend to immigrate to the U.S. Meanwhile many students know that once in the U.S. they will have the opportunity to apply for a change of status allowing them to stay in the U.S. after graduation (Johnson, 2009).

The 2016 Open Doors Report showed that over one million international students were studying in the U.S. during the 2015/2016 academic year (IIE, 2016). One out of every three international students approved to study in the U.S. ultimately used the Optional Practical Training (OPT) program to stay and work after completion of their studies (Ruiz, 2014), allowing students studying in the U.S. with student (F-1) visa status to work for 12 months to gain practical training (U.S. Citizenship and Immigration Services [USCIS], 2016b). This eligibility granted by the USCIS is intended to provide hands-on practical training in the student's field of study. In 2008, the U.S. Department of Homeland Security introduced a 17 month OPT extension for students in qualifying STEM fields (NAFSA: Association of

International Educators, 2016). Students earning STEM degrees while in the U.S. were made eligible for a possible total of 29 months of OPT. The DHS published a final rule in March, 2016 that strengthened and enhanced the OPT program for international STEM students, lengthening the STEM extension to 24 months for a total of 36 months of OPT for STEM students (USCIS, 2016b).

Students face many challenges when attempting to stay in the U.S. with the biggest obstacle being visa sponsorship. Students studying on an F-1 student visa are eligible to work in the country for 12 months (36 months for STEM) after completion of their degree using OPT, and after that they require employer sponsorship for an H-1B visa (USCIS, 2016b).

The H-1B visa program was included in the Immigration Act of 1990, and is used to employ foreign workers in specialty occupations requiring application of a body of highly specialized knowledge (USCIS, 2016b). These jobs require a bachelor's or higher degree or its equivalent, with many of the H-1B visas issued to candidates after they have studied in the U.S. and have utilized their 12 months of OPT.

Each year 65,000 H-1B visas are made available for the coming fiscal year (October 1-September 30) with an additional 20,000 visas for workers with advanced degrees from U.S. institutions (USCIS, 2016b). How quickly the cap is met depends on demand. In 2015 and 2016 the visa cap of 85,000 was met within one week of the visa filing period (USCIS, 2016b). The speed with which the cap was met in the past few years is one indication that there is employer demand for hiring and sponsoring of international candidates.

Not-for-profit higher education, research, and government research organizations are not part of the pool of 85,000 H-1B visas. Instead, these organizations are able to hire throughout the year with no cap on the number of candidates sponsored (USCIS, 2016b). This means that

many of the international students who are currently earning PhD's will not fall into this pool of 85,000 visas, and instead will have access to the pool of H-1B visas for not-for-profit higher education, research, and government research organizations.

U.S. higher education institutions are educating future leaders for some of world's fastest growing economies (Ruiz, 2014). Leveraging the talents of these students and potential employees can help U.S. markets to compete in the global marketplace by serving as bridges for businesses in the U.S. seeking to tap into the international students' home markets (Ruiz, 2014).

Workforce Development Implications

Globalization is accelerating and is increasing the need for talent in the U.S. and throughout the world. U.S. based MNEs continue to expand their businesses globally while foreign MNEs are expanding operations in the U.S. Nineteen of the top 20 H-1B visa sponsors in 2016 were in the technology or consulting industries, and five of the top 10 sponsoring companies were Indian owned, with offices in the U.S. ("2016 H1B Report," 2016). These companies added opportunities for U.S. citizens as well as candidates from the company's home country.

International students are concentrated in U.S. metropolitan areas and often come from large, fast-growing cities in emerging markets (Ruiz, 2014). According to Ruiz's (2014) analysis of SEVIS data, 45% of international student graduates extend their visas to work in the same metropolitan area as their college or university. Students from emerging economies provide benefits to the companies and metropolitan areas where they work while building global connections to their home cities. Their knowledge of both their home and host country markets is valuable to global expansion of their local home economy and their host economy (Ruiz, 2014).

The growth of MNEs provides economic and workforce development rewards for both home and host countries. Locating MNE's research and development activities in developing countries pushes up the wages of skilled workers in the receiving country (Carrington, 2013). IBM is just one example of global talent growth by a U.S. MNE with research labs all over the world, including Brazil, China, India, and Africa, with the goal of using research and smarter systems to transform business, government, and society (IBM, 2012).

With their understanding of U.S. culture and knowledge of their home markets, international students educated in the U.S. can be attractive candidates for U.S. MNEs in offices in the U.S. and abroad. If enacted, the 2017 immigration ban could increase U.S. brain drain by incentivizing U.S. MNEs to move operations outside the U.S. or to move or hire employees and make investments abroad (State of Washington, et al., v. Donald J. Trump, et al., 2017).

Entrepreneurship may also be affected, with a 2007 study of engineering and technology companies started in the U.S. between 1995 and 2005 finding that in 25% of the companies, at least one founder was foreign-born (Wadhwa, Saxenian, Rissing, & Gereffi, 2007). These immigrant-founded companies produced \$52 billion in sales, employing 45,000 workers in 2005. These professionals can flow between their home and host countries physically and electronically by building networks with colleagues contributing to global brain circulation.

International students who wish to stay and work in the U.S. now have 12-36 months of OPT (U.S. Citizenship and Immigration Services [USCIS], 2016a) allowing them to gain hands on experience, while building knowledge and networks. After completion of their OPT, international students can apply for H-1B sponsorship through their employer, or leave the U.S. for their home country or another host country. Students from the U.S. who are studying abroad may also intend to stay and work in their host country. All of these students may work for an

MNE, work for a local company, or start their own business where they will use their knowledge and connections to continue the process of workforce development through brain circulation.

There are calls for immigration reform that expands the U.S.'s ability to attract the world's talented students and strengthen the economy by increasing the H-1B cap (Ruiz, 2014), or by creating a path to the green card for those students with the education and skills needed in our economy (Han & Appelbaum, 2016; Han et al., 2015; NAFSA, 2016b). These calls point out that countries like Canada are able to use the U.S.'s strict visa policies to recruit international students by marketing their more favorable visa laws (NAFSA, 2016b).

Economic analysis shows that there are overall positive effects from integrating markets, this includes the admission of educated immigrants to developed countries (Carrington, 2013). International students educated in the U.S. use their knowledge of U.S. culture to act as U.S. ambassadors in their home country. Their contributions to the development of their home country through brain circulation help to create societies with greater opportunities, fostering positive change, leading to a safer more connected world (Dassin, 2005).

Brain drain, brain gain, and brain circulation affect and are affected by international students' decisions to stay in their host country or return to their home country. Their decisions to study, and work abroad are affected by the push-pull of many economic, political, and social factors, and have implications for economic and workforce development in both their home and host countries.

Summary, Implications, and Discussion

This chapter presented the most current review of the literature covering global mobility: brain drain, gain, and circulation; push-pull factors; and reasons for study and stay abroad. It

included discussions of country GNI levels, U.S. visa policy implications, and global workforce development implications.

Brain drain and brain gain as they were originally defined are not necessarily the right models for examining international student mobility. Brain circulation may be more in line with how international students interact both socially and professionally. By identifying the push-pull and reverse push-pull factors affecting student decision making related to their intent to stay in the U.S. or leave for their home or another country, we can better identify patterns of mobility.

In spite of visa challenges, the number of international students coming to the U.S. for higher education continues to grow, with a record high 1,043,839 studying in the U.S. in 2015/2016 (IIE, 2016). Work to reform immigration policies overall, and incrementally as with the increase in STEM OPT (USCIS, 2016b) will help to maintain those numbers.

As immigration reform is being developed, it is important that research is conducted to understand international students' goals and motivations. Little research exists that looks beyond international students' experiences as students. There is a need to learn more about the paths that international students take after completion of their studies. A greater understanding of international students mobility post-graduation will have implications for workforce development in the U.S. and abroad, fostering economic and democratic development that is necessary for a more secure world (Dassin, 2005).

CHAPTER THREE

METHODOLOGY

This chapter outlines the methodology that will be used in this study, including the context of the study, description of participants, variables, data collection, and data analysis procedures. This study investigates international, graduate students pursuing STEM degrees in the U.S., and the political, economic, and social factors affecting the intent to stay or go, identifying differences based on students' country of origin within World Bank defined categories of gross national income (GNI) per capita. World Bank GNI categories are presented in Table 3.1. Understanding these differences can impact countries that stand to lose from brain drain, while encouraging the development of brain circulation where high skilled immigrants create social and economic links between countries, opening foreign markets, strengthening infrastructure, and providing new opportunities for growing regions in the world economy (Johnson & Regets, 1998; Saxenian 2002).

This study is a quantitative design that will use ex post facto data from the National Science Foundation (NSF) Graduate Students in Science Survey (GSSS; Han & Appelbaum, 2016). It will examine the relationship between students' intent to stay or go and political, economic, and social push-pull factors (Altbach, 2004; Carr et al., 2005; Lee & Kim, 2010; Li & Bray, 2007; Mazzarol & Soutar, 2002). It will also examine how political, economic, and social factors differ based on World Bank GNI categories (World Bank, 2017).

Student responses in this study will be grouped using World Bank categories based on gross national income (GNI) per capita (World Bank, 2017) (Appendix A). GNI per capita is used because it is closely correlated with other measures of quality of life including: life expectancy at birth, mortality rates of children, and enrollment in schools (World Bank, 2017).

Table 3.1

World Bank Gross National Income (GNI) per Capita Categories

Category	GNI per capita in U.S. dollars
Low-income	< \$1,025
Lower middle-income	\$1,026 - \$4,035
Upper middle-income	\$4,036 - \$12,475
High-income	> \$12,475

Note. Adapted from "World Development Indicators" World Bank, 2017
<http://data.worldbank.org/data-catalog/world-development-indicators>

Countries within each category exhibit varying levels of political, economic, and social factors that affect students' intent to stay, go, or circulate. Because these factors are inherently interrelated, five factors were utilized: Social/Political, Political, Economic, Economic/Social, and Social. In the present case, students from countries with similar interactions of political, economic, and social factors may be expected to have similar intent.

Research Questions

Based on the literature, this study will be guided by the following research questions:

RQ1 What are the political, economic, and social mobility factors that influence international students' intent to stay, go, or not be sure?

RQ2 Is there a significant difference in the political, economic, and social factors between international students who indicate that they will stay, go, or who are not sure?

RQ3 Are the political, economic, and social factors that influence international students' intent to stay, go, or not be sure different for students from countries in different GNI categories?

Background

This study will be conducted using data from a National Science Foundation (NSF) study of international graduate student intent to remain in the U.S. or return home after earning their degree (Han & Appelbaum, 2016). The Graduate Students in Science Survey (GSSS) of international students from ten U.S. higher education institutions (Han & Appelbaum, 2016) provided quantitative data about the factors affecting the intent to stay in the U.S. or go back home or elsewhere. Students from the top ten U.S. institutions hosting international students in the 2013/14 academic year were targeted for the survey (see Table 3.2).

The survey consisted of four categories of questions: 1) basic background information (age, gender, major, year of study); 2) reasons for studying in the U.S.; 3) perceptions of graduate education in the U.S.; and 4) plans after graduation (Han et al., 2015). Respondents to the survey were 787 international graduate students representing 74 nationalities (Han & Appelbaum, 2016). Survey data was made publicly available on the PLOS One website <https://doi.org/10.1371/journal.pone.0118183>. The 2016 GSSS study (Han & Appelbaum, 2016) was a replication of a study completed on STEM students at the University of California Santa Barbara where 166 international graduate students representing 32 countries responded (Han et al., 2015).

Table 3.2

Top Ten U.S. Institutions Hosting International Students 2013/2014 Academic Year

Rank	Institution	City	State	Total number international students
1	New York University	New York	NY	11,164
2	University of Southern California	Los Angeles	CA	10,932
3	University of Illinois-Urbana-Champaign	Champaign	IL	10,843
4	Columbia University	New York	NY	10,486
5	Purdue University-Main Campus	West Lafayette	IN	9,988
6	University of California-Los Angeles	Los Angeles	CA	9,579
7	Northeastern University	Boston	MA	9,078
8	Arizona State University	Temp	AZ	8,683
9	Michigan State University	East Lansing	MI	7,704
10	University of Washington	Seattle	WA	7,469

Note. Adapted from "Will they stay or will they go? International STEM students are up for grabs," by X. Han and R.P. Appelbaum, 2016, Ewing Marion Kauffman Foundation.

Independent Variables

Independent variables were based on: students' reasons for staying in or leaving the U.S. after completion of studies; adjustment challenges that students faced while in the U.S.; students' perceived advantages of studying in the U.S.; students' reasons for studying in the U.S.; students' beliefs about how they feel they were treated by colleagues/faculty in the U.S.; and how they feel they would be treated by colleagues/faculty in their home country. All variables, item responses, and SPSSTM inputs are presented in Table 3.3.

Stay/Go Reasons

The variable stay/go reasons will include responses to the question: Why do you want to stay in/leave the United States? (select all that apply). Response options include: job

opportunities for myself, opportunities for family members, salary, overall quality of life, geographic location, family, friends, professional network, cultural reasons, and social reasons.

Responses are categorical and will be coded 0 to represent not selected and 1 to represent selected.

U.S. Adjustment Challenges

The variable U.S. adjustment challenges will include responses to the question: Please select any challenges you may have encountered while adjusting (select all that apply). Response options include: cultural, social, academic, racial, financial challenges, and I did not encounter any challenges. Responses are categorical and will be coded 0 to represent not selected and 1 to represent selected.

U.S. Education Advantages

The variable U.S. education advantages will include responses to the question: In comparison to your home country, what advantages, if any, do you feel a U.S. education provides (select all that apply). Response options include: better education/knowledge of your field, better advisors/mentorship, better professional network, and better job opportunity. Responses are categorical and will be coded 0 to represent not selected and 1 to represent selected.

Reasons for U.S. Study

The variable reasons for U.S. study will include responses to the question: What factors influenced your decision to do your graduate studies in the United States (select all that apply). Response options include: higher quality of education, lower cost, opportunity to work with specific faculty, future career opportunities, wanted to live in the U.S., proximity to

friends/family, and wanted to experience living abroad. Responses are categorical and will be coded 0 to represent not selected and 1 to represent selected.

Treatment by Colleagues/Faculty U.S.

The variable treatment by colleagues/faculty U.S. will include responses to the question: How do you feel you are treated by your colleagues and professors in the United States in comparison with those in your home country? Responses are on a five point Likert scale where 1 = treated much worse and 5 = treated much better.

Treatment by Colleagues/Faculty Home

The variable treatment by colleagues/faculty home will include responses to the question: How do you feel you would be treated by your colleagues and professors in your home country if you returned? Responses are on a five point Likert scale where 1 = treated much worse and 5 = treated much better.

Dependent Variable

Stay/Go

The variable Stay/Go will include responses to the question: Do you hope to remain in the United States after graduation? Responses will be coded Yes (1), No (2), Do not know/unsure (3).

Grouping Variable

GNI per Capita

The grouping variable GNI per capita will be determined by the student's home country World Bank GNI per capita ranking (World Bank, 2017). Each category will be coded as follows: lower middle-income (2), upper middle-income (3), high-income (4).

Table 3.3

Variables and SPSS Output

Variables: Survey questions	Item responses	SPSS™ input
Stay/go reasons: Why do you want to stay in/leave the United States?	Job opportunities for myself Opportunities for family members Salary Overall quality of life Geographic location Family Friends Professional network Cultural reasons Social reasons	sg_jobself sg_jobfamily sg_salary sg_quality sg_geographic sg_family sg_friends sg_network sg_cultural sg_social
Adjustment challenges: Please select any challenges you may have encountered while adjusting to American educational culture.	Cultural challenges Social challenges Academic challenge Racial challenges Financial challenges	challengecultural challengesocial challengeacademic challengeracial challengefinancial
U.S. education advantages: In comparison to your home country, what advantages, if any, do you feel a U.S. education provides?	Better education/knowledge of your field Better advisors/mentorship Better professional network Better job opportunity	advantagefield advantageadvisor advantagenetwork advantagejob
Reasons for U.S. study: What factors influenced your decision to do your graduate studies in the United States?	Higher quality of education Lower cost Opportunity to work with specific faculty Future career opportunities Wanted to live in the U.S. Proximity to friends/family Wanted to experience living abroad	studyquality studycost studyfaculty studycareer studyliveus studyfriendsfamily studyabroad
Treated by colleagues/faculty U.S.: How do you feel you are treated by your colleagues and professors in the United States in comparison with those in your home country?	Likert scale: 1= treated much worse, 5 = treated much better	treatedUS
Treated by colleagues/faculty home: How do you feel you	Likert scale: 1= treated much worse, 5 = treated much better	treatedhome

would be treated by your colleagues and professors in your home country if you returned?

Stay/go: Do you hope to remain in the United States after graduation?

Yes/No/Not sure

stay

GNI per capita

Lower middle income
Upper middle income
High income

gni_percapita_3

Note. See Appendix B for Variables Grouped by Political, Economic, and Social Factors

Participants.

The sample for the study will be 752 international graduate students representing 74 nationalities (Han & Appelbaum, 2016). Students from the top ten U.S. institutions hosting international students in the 2013/14 academic year were targeted for the study. Student respondents by GNI per capita: 1) low-income $n = 13$; 2) lower middle-income $n = 247$; 3) upper middle-income $n = 357$; and 4) high-income $n = 158$. Because of the small size of the low-income category, the low-income and lower middle-income categories were combined into the lower middle-income category for analysis (combined lower middle-income $n = 260$). All students indicated studying in STEM disciplines, with international students defined as temporary visa holders. In this study, stay refers to students who selected "yes" when asked "Do you hope to remain in the U.S. after graduation?". Go and leave refer to students who selected "no", and not sure refers to students who selected "do not know/not sure".

Data Analysis

This study poses three research questions:

RQ1 What are the political, economic, and social mobility factors that influence international students' intent to stay, go, or not be sure? RQ1 will be answered using descriptive statistics identifying the influencing variables as they are grouped by social/political, political, economic, economic/social and social factors (Appendix B).

RQ2 Is there a significant difference in the political, economic, and social factors between international students who indicate that they will stay, go, or who are not sure? RQ2 will be answered using chi-square testing and analysis of variance (ANOVA) with a significance level $p < .05$.

RQ3 Are the political, economic, and social factors that influence international students' intent to stay, go, or not be sure different for students from countries in different GNI categories? RQ3 will be answered using chi-square testing and ANOVA to compare differences among sample groups. The level of significance for all analyses will be $p < .05$.

Limitations and Delimitations

Limitations of this study include self-reporting of data. Other limitations include uneven number of students by degree level and by GNI per capita level. Survey data also included 49% of respondents wishing to stay in the U.S., 12% wanting to leave, and 39% undecided.

Undecided participants did not provide responses to the question "Why do you want to stay in/leave the United States?" making the large percentage of participants who were undecided an additional limitation.

The study will be restricted to explaining the intent of international, STEM graduate students at U.S. universities. The study will utilize ex post facto data collected by Han and

Appelbaum (2016). It will be assumed that all data were reported correctly by the researchers. The focus of the study will be on students currently enrolled and their intent to stay or go. The current study will not follow students' decisions after completion of studies.

Summary

Chapter Three provided the methodology that will be used to determine the significant contributory factors that influence international students' intent to stay or go: stay/go reasons, adjustment challenges, U.S. education advantages, factors for U.S. study, and students' beliefs about how they feel they were treated by colleagues/faculty in the U.S., and how they feel they would be treated by colleagues/faculty in their home country. Independent, dependent and grouping variables have been presented in this chapter. Descriptive statistics, chi-square analysis, and ANOVA will be used to answer the research questions.

Chapters four and five will present the findings and conclusions respectively. Chapter four will provide data obtained from the analysis using tables and narrative explanation. Chapter five will provide a discussion of findings along with implications for higher education administration, immigration policy, and economic development.

CHAPTER FOUR

FINDINGS

The purpose of this study was to show how international students' intent to stay in the U.S. or leave the U.S. after completion of studies was related to political, economic, and social push-pull factors. It identified differences in factors influencing students' intent based on World Bank categories of Gross National Income (GNI) per capita (World Bank, 2017). The researcher examined data from the National Science Foundation (NSF) Graduate Students in Science Survey (GSSS; Han & Appelbaum, 2016). The GSSS provided quantitative data about the factors related to international students' intent to stay or go. The survey and survey data were made publicly available on the PLOS One website.

Respondents to the survey were 752 international graduate STEM students from ten U.S. research universities. A detailed description of student demographics is presented in Table 4.1. Among the participating students, 366 (48.7%) intended to stay in the U.S., 93 (12.4%) intended to leave the U.S., and 293 (39.0%) were not sure of their plan to stay or leave the U.S. Student respondents were grouped by GNI per capita: with the low and lower-middle categories combined for analysis (Table 4.2). Participating students in this study came from 74 countries, with the majority coming from China (33.6%) and India (27.6%). The top sending countries in this study are listed in Table 4.3 along with each country's corresponding GNI category.

Overall, respondents were representative of international STEM graduate students studying in the U.S. The top four sending countries in the 2015-2016 academic year accounted for 60% of all international students in the U.S., and included China (32%), India (16%), South Korea (6%), and Saudi Arabia (6%; IIE, 2016). Analysis of SEVIS data found that 62% of all F-1 students were from upper middle-income and lower middle-income countries where gross

national income ranges from \$1,000 to \$13,000 annually (Ruiz, 2014).

Master's students made up 65% of all international graduate students in the U.S., while doctoral students accounted for 35% (IIE, 2016). In this study, the reverse is true with doctoral students outnumbering master's students by nearly two to one. In 2013, females accounted for 45% of graduate students in the science and engineering fields in the U.S. overall (National Science Board, 2016); however, in this study, 35% of participants were female.

Table 4.1

Descriptive Statistics for Student Sample Demographic Information

Variable	Categories	<i>n</i>	%
Gender	Male	480	63.9
	Female	261	34.7
	Do not wish to respond	11	1.4
Age	< 18	1	.1
	18-25	3	.5
	26-30	377	50.1
	31-35	277	36.9
	36-40	83	11.0
	41-45	11	1.5
Academic Level	Masters	258	34.3
	Doctoral	494	65.7
Discipline	Computer science	127	16.9
	Engineering	276	36.8

Life sciences	162	21.5
Mathematics	76	10.1
Physical sciences	111	14.8

Table 4.2

Students Stay, Go, Not Sure Responses by GNI per Capita

	Low		Lower-Middle		Upper-Middle		High	
	<i>n</i>	P	<i>n</i>	P	<i>n</i>	P	<i>n</i>	P
Stay	7	61.0	123	49.0	176	52.8	60	38.5
Go	0	3.3	25	9.9	30	9.1	37	23.9
Not sure	4	35.7	103	41.1	127	38.1	59	37.6
Total	11	1.5	251	33.4	333	44.3	156	20.7

Table 4.3

Top Sending Countries with Gross National Income (GNI) Categories

Country	Gross National Income (GNI)	<i>n</i>	%
China	Upper middle	253	33.6
India	Lower middle	208	27.6
Republic of Korea	High	34	4.5
Saudi Arabia	High	27	3.6
Canada	High	20	2.6
Iran	Upper middle	20	2.6
Taiwan	High	19	2.5
Turkey	Upper middle	10	1.4
Brazil	Upper middle	8	1.1
Mexico	Upper middle	8	1.0
Nepal	Low	8	1.0
Bangladesh	Lower middle	8	1.0
Nigeria	Lower middle	8	1.0

All remaining countries had < 1% of participants.

Analysis of Research Questions

The research study is guided by the following research questions:

RQ1 What are the political, economic, and social mobility factors that influence international students' intent to stay, go, or not be sure?

RQ2 Is there a significant difference in the political, economic, and social factors between international students who indicate that they will stay, go, or who are not sure?

RQ3 Are the political, economic, and social factors that influence international students' intent to stay, go, or not be sure different for students from countries in different GNI categories?

RQ1: Push-Pull Factors Influencing Mobility Intent

The first RQ asked: What are the political, economic, and social mobility factors that influence international students' intent to stay, go, or not be sure? Descriptive statistics were used to identify frequencies of variables grouped by social/political, political, economic, economic/social, and social. All dichotomous items were coded 0 = not selected and 1 = selected.

Social/Political Factors

Social/political factors included the variables: geographic location (sg_geographic), cultural reasons (sg_cultural), wanted to live in the U.S. (studyUS), wanted to experience living abroad (studyabroad), and cultural challenges (challengescultural). Table 4.4 shows that 58.2% of international students selected cultural challenges as a variable affecting the intent to stay or go, while 46.8% selected wanted to experience living abroad. This indicates that the majority of students were affected by these two social/political challenges when considering staying or leaving.

Table 4.4

Social/Political Variables Selected

Item	<i>n</i>	%
Stay/Go Reasons		
Geographic location	55	7.3
Cultural reasons	98	13.1
Reasons for U.S. Study		
Wanted to live in the U.S.	158	21.1
Wanted to experience living abroad	352	46.8
Adjustment Challenges		
Cultural challenges	438	58.2

Political Factors

Political factors included the variables: racial challenges (challengesracial), treatment by colleagues/faculty U.S. (treatedUS), and treatment by colleagues/faculty home (treatedhome). Table 4.5 shows that 24.4% of international students selected racial challenges as a variable affecting the intent to stay or go. Table 4.6 shows that scores for how students feel they will be treated by colleagues/faculty in the U.S. and at home had negative skew and kurtosis indicating that students were affected by perceptions of better treatment by colleagues/faculty in the U.S. and home when considering whether to stay or leave.

Table 4.5

Dichotomous Political Variables Selected

Variable	<i>n</i>	%
Adjustment Challenges		
Racial challenges	183	24.4

Table 4.6

Scale Political Variables Selected

Variable	M	SD	Skew	Kurtosis
Treated by colleagues/faculty U.S	3.53	.902	-.019	-.209
Treated by colleagues/faculty home	3.61	.870	-.060	-.235

Economic Factors

Economic factors included the variables: job opportunities for myself (sg_jobself), salary (sg_salary), financial challenges (challengesfinancial), better education/knowledge of your field (advantagefield), better job opportunities (advantagejob), lower cost of study in the U.S. (studycost), and future career opportunities (studycareer). Table 4.7 indicates that the majority of students were affected by better education/knowledge of your field (79.6%), future career opportunities (72.7%) and better job opportunities (63.4%) when considering whether to stay or go.

Table 4.7

Economic Variables Selected

Variable	<i>n</i>	%
Stay/Go Reasons		
Job opportunities for myself	328	43.6
Salary	196	26.0
Adjustment Challenges		
Financial challenges	322	42.9
U.S. Education Advantages		
Better education/knowledge of your field	598	79.6
Better job opportunities	477	63.4
Reasons for U.S. Study		
Lower cost of study	35	4.6
Future career opportunities	546	72.7

Economic/Social Factors

Economic/social factors included the variables: opportunities for family members (sg_jobfamily), overall quality of life (sg_quality), professional network (sg_network), academic challenges (challengesacademic), better advisors/mentorship (advantageadvisor), better professional network (advantagenetwork), higher quality of education (studyquality), and opportunity to work with specific faculty (studyfaculty). Table 4.8 indicates that the majority of students were affected by higher quality of education (85.4%), better professional network (65.1%), and better advisors/mentorship (61.5%) when considering whether to stay or go.

Table 4.8

Economic/Social Variables Selected

Item	<i>n</i>	P
Stay/Go Reasons		
Opportunities for family members	62	8.3
Overall quality of life	285	38.0
Professional network	208	27.7
Adjustment challenges		
Academic challenges	318	42.2
U.S. education advantages		
Better advisors/mentorship	462	61.5
Better professional network	490	65.1
Reasons for U.S. Study		
Higher quality of education	642	85.4
Opportunity to work with specific faculty	263	34.9

Social Factors

Social factors included the variables: family (sg_family), friends (sg_friends), social reasons (sg_social), social challenges (challengessocial), and proximity to friends/family (studyfriendsfamily). Table 4.9 indicates that the majority of students were affected by social challenges (54.0%) when considering whether to stay or leave.

Table 4.9

Social Variables Selected

Item	<i>n</i>	P
Stay/go reasons		
Family	112	14.9
Friends	81	10.7
Social reasons	98	13.0
Adjustment challenges		
Social challenges	406	54.0
Reasons for U.S. Study		
Proximity to friends/family	38	5.1

RQ1 Summary

In summary, the first research question examined the political, economic, and social mobility factors influencing international students' intent to stay, go, or to not be sure. Students were influenced by the social/political factors of cultural challenges, and wanted to live abroad, and the political factors of how students feel they will be treated by colleagues/faculty in the U.S. and at home. Economic factors selected most often included better education/knowledge of their field, future career opportunities, and better job opportunities. Economic/social factors included professional network and better advisors/mentorship. One social factor, social challenges, was selected most often.

RQ2: Differences between Students Who Select Stay, Go, and Not Sure.

The second RQ asked: Is there a significant difference in the political, economic, and social factors between international students who indicate that they will stay, go, or who are not

sure? Chi-square analysis and analysis of variance (ANOVA) were used to identify differences between international students who selected stay, go, or not sure. A one-way ANOVA was conducted on the scale variables treatment by colleagues/faculty U.S. and treatment by colleagues/faculty home. The level of significance for all analyses was $p < .05$. Detailed chi-square analysis results are presented in Table 4.10. ANOVA results are presented in Table 4.11. Forty-nine percent of respondents selected stay, 12% selected go, and 39% selected not sure.

Social/Political Factors

Variables in the social/political factor group that showed a significant association to whether a student would intend to stay, go, or to not be sure were: cultural reasons $\chi^2(1) = 18.42, p < .001$, and wanted to live in the U.S. $\chi^2(2) = 88.46, p < .001$. This indicates that students were more likely to select go than stay for cultural reasons, while students were more likely to select stay if they chose to study in the U.S. because they wanted to live in the U.S.

Political Factors

Variables in the political factor group that showed a significant association to whether a student would intend to stay, go, or to not be sure were: racial challenges $\chi^2(2) = 17.46, p < .001$, treated by colleagues/faculty in the U.S. $F(2, 749) = 23.74, p < .001, \eta^2 = .06$, and treated by colleagues/faculty in students' home country $F(2, 749) = 4.72, p < .01, \eta^2 = .02$. This indicates that students were more likely to select go because of racial challenges. Results also show that students were more likely to stay if they felt they were treated much better by colleagues/faculty in the U.S. They were more likely to go if they felt they would be treated much better by colleagues/faculty in their home country.

Economic Factors

Variables in the economic factor group that showed a significant association to whether a student would intend to stay, go, or to not be sure were: Job opportunities for myself $\chi^2(1) = 42.85, p < .001$, salary $\chi^2(1) = 42.33, p < .001$, financial challenges $\chi^2(2) = 10.29, p < .01$, better job opportunities $\chi^2(2) = 16.70, p < .001$, and future career opportunities $\chi^2(2) = 65.15, p < .001$. This indicates that students were more likely to select stay for job/career opportunities, salary, and financial challenges.

Economic/Social Variables

Variables in the economic/social factor group that showed a significant association to whether a student would intend to stay, go, or to not be sure were: overall quality of life $\chi^2(1) = 61.43, p < .001$, professional networks $\chi^2(1) = 75.46, p < .001$, academic challenges $\chi^2(2) = 10.96, p < .01$, and opportunity to work with specific faculty $\chi^2(2) = 11.83, p < .01$. This indicates that students were more likely to select stay because of overall quality of life, and better professional network. This also indicates that students were more likely to select not sure because of the opportunity to study with specific faculty. While students were more likely to select go because of academic challenges.

Social Variables

Variables in the social factor group that showed a significant association to whether a student would intend to stay, go, or to not be sure were: family $\chi^2(1) = 124.73, p < .001$, and friends $\chi^2(1) = 22.55, p < .001$. This indicates that students were more likely to select go because of family and friends.

RQ2 Summary

In summary, the second research question asked if there was a significant difference in political, economic, and social factors between international students who indicate that they will stay, go, or who are not sure. The analysis showed that there was a significant difference in several factors. Students who selected stay were influenced by wanting to live in the U.S., treatment by faculty/colleagues in the U.S., job opportunities for themselves, salary, financial challenges, better job opportunities, future career opportunities, overall quality of life, and better professional network. Students who selected go were influenced by cultural reasons, racial challenges, treatment by faculty/colleagues in their home country, family, and friends. While students who selected not sure were influenced by the opportunity to work with specific faculty.

Table 4.10

RQ2 Chi-Square Analysis Results

Variable Groups	Items	Stay <i>n</i> (%)	Go <i>n</i> (%)	Not sure <i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>	
Social/Political	Stay/go reasons: Geographic location	yes	40 (10.9)	15 (16.1)	—	1.90 (1)	.168
		no	326 (89.1)	78 (83.9)	—		
	Stay/go reasons: Cultural reasons	yes	63 (17.2)	35 (37.6)	—	18.42 (1)	.000
		no	303 (82.8)	58 (62.4)	—		
	Reasons for U.S. study: Wanted to live in the U.S.	yes	130 (35.5)	6 (6.5)	23 (7.8)	88.46 (2)	.000
		no	236 (64.5)	87 (93.5)	270 (92.2)		
	Reasons for U.S. study: Wanted to experience living abroad	yes	182 (49.7)	47 (50.5)	123 (42.1)	4.34 (2)	.114
		no	184 (50.3)	46 (49.5)	169 (57.9)		
	Adjustment challenges: Cultural	yes	220 (60.1)	49 (52.7)	168 (57.3)	1.80 (2)	.407
		no	146 (39.9)	44 (47.3)	125 (42.7)		
Political	Adjustment challenges: Racial	yes	104 (28.4)	31 (33.3)	48 (16.4)	17.46 (2)	.000
		no	262 (71.6)	62 (66.7)	245 (83.6)		

Table 4.10 Continued

Variable Groups	Items	Stay <i>n</i> (%)	Go <i>n</i> (%)	Not sure <i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>	
Economic	Stay/go reasons: Job opportunities for myself	yes	287 (78.4)	41 (44.1)	—	42.85 (1)	.000
		no	79 (21.6)	52 (55.9)	—		
	Stay/go reasons: Salary	yes	184 (50.3)	12 (12.9)	—	42.33 (1)	.000
		no	182 (49.7)	81 (87.1)	—		
	Adjustment challenges: Financial	yes	176 (48.1)	29 (31.2)	117 (39.9)	10.29 (2)	.006
		no	190 (51.9)	64 (68.8)	176 (60.1)		
	U.S. education advantages: Better education/knowledge of your field	yes	297 (81.1)	77 (82.8)	224 (76.7)	2.63 (2)	.269
		no	69 (18.9)	16 (17.2)	68 (23.3)		
	U.S. education advantages: Better job opportunities	yes	255 (69.7)	62 (66.7)	159 (54.5)	16.70 (2)	.000
		no	111 (30.3)	31 (33.3)	133 (45.5)		
Reasons for U.S. study: Lower cost	yes	19 (5.2)	3 (3.2)	13 (4.4)	.70 (2)	.706	
	no	347 (94.8)	90 (96.8)	280 (95.6)			
Reasons for U.S. study: Future career opportunities	yes	307 (83.9)	41 (44.1)	198 (67.6)	65.15 (2)	.000	
	no	59 (16.1)	52 (55.9)	95 (32.4)			

Table 4.10 Continued

Variable Groups	Items	Stay <i>n</i> (%)	Go <i>n</i> (%)	Not sure <i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>
Economic/Social						
Stay/go reasons: Opportunities for family members						
yes		53 (14.5)	9 (9.8)	—	1.39 (1)	.239
no		313 (85.5)	83 (90.2)	—		
Stay/go reasons: Overall quality of life						
yes		260 (71.0)	25 (26.9)	—	61.43 (1)	.000
no		106 (29.0)	68 (73.1)	—		
Stay/go reasons: Professional network						
yes		203 (55.6)	5 (5.4)	—	75.46 (1)	.000
no		162 (44.4)	88 (94.6)	—		
Adjustment challenges: Academic challenges						
yes		149 (40.7)	54 (58.1)	115 (39.2)	10.97 (2)	.004
no		217 (59.3)	39 (41.9)	178 (60.8)		
U.S. education advantages: Better advisors/mentorship						
yes		240 (65.6)	55 (59.1)	167 (57.2)	5.07 (2)	.079
no		126 (34.4)	38 (40.9)	125 (42.8)		
U.S. education advantages: Better professional network						
yes		254 (69.4)	56 (60.2)	180 (61.4)	5.69 (2)	.058
no		112 (30.6)	37 (39.8)	113 (38.6)		
Reasons for U.S. study: Higher quality of education						
yes		320 (87.4)	78 (83.9)	244 (83.3)	2.44 (2)	.295

Table 4.10 Continued

Variable Groups	Items	Stay	Go	Not sure	χ^2 (df)	p
		n (%)	n (%)	n (%)		
Social	no	46 (12.6)	15 (16.1)	49 (16.7)	11.83 (2)	.003
	Reasons for U.S. study: Opportunity to work with specific faculty					
	yes	132 (36.1)	18 (19.4)	113 (38.6)		
	no	234 (63.9)	75 (80.6)	180 (61.4)		
	Stay/go reasons: Family					
	yes	48 (13.1)	64 (68.8)	—		
	no	318 (86.9)	29 (31.2)	—	124.73 (1)	.000
Stay/go reasons: Friends						
	yes	49 (13.4)	32 (34.4)	—	22.55 (1)	.000
	no	317 (86.6)	61 (65.6)	—		
Stay/go reasons: Social reasons						
	yes	75 (20.5)	23 (24.7)	—	.79 (1)	.373
	no	291 (79.5)	70 (75.3)	—		
Adjustment challenges: Social challenges						
	yes	207 (56.6)	50 (53.8)	149 (50.9)	2.13 (2)	.344
	no	159 (43.4)	43 (46.2)	144 (49.1)		
Reasons for U.S. study: Proximity to friends/family						
	yes	24 (6.6)	4 (4.3)	10 (3.4)	3.48 (2)	.176
	no	342 (93.4)	89 (95.7)	283 (96.6)		

Table 4.11

RQ2 ANOVA Results

Variable Groups/Items Treated by	Stay			Go			Not Sure			<i>F</i> (<i>df</i>)	<i>p</i>	η^2
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>			
colleagues/faculty U.S.	366	3.74	.89	93	3.11	.88	293	3.41	.86	23.74 (2)	.000	.060
Treated by colleagues/faculty home	366	3.67	.96	93	3.77	.77	293	3.50	.77	4.72 (2)	.009	.012

RQ3: Differences Based on Home Country Gross National Income (GNI)

The third RQ asked: Are the political, economic, and social factors that influence international students' intent to stay, go, or not be sure different for students from countries in different GNI categories? Chi-square analysis and analysis of variance (ANOVA) were used to identify differences between how political, economic, and social factors predict students' intent to stay or go for people from different GNI levels. The file was split stay/go/not sure. Chi-square analysis was used to identify differences between nominal variables. A one-way ANOVA was conducted on the scale variables treatment by colleagues/faculty U.S. and treatment by colleagues/faculty home. The level of significance for all analyses was $p < .05$. Student responses showed significant differences within GNI categories and based on the selection of stay, go, or not sure. Chi-square results are presented in Table 4.12 and ANOVA results are presented in Table 4.13.

Lower Middle-Income Countries

Intent to stay. Students in the lower middle-income group were more likely to intend to stay in the U.S. due to positive treatment by colleagues/faculty in the U.S. $F(2, 363) = 6.67, p = .001, \eta^2 = .04$, positive treatment by colleagues/faculty at home $F(2, 363) = 7.58, p < .01, \eta^2 = .04$, job opportunities $\chi^2(2) = 12.71, p < .01$, future career opportunities $\chi^2(d) = 6.71, p < .05$, and financial challenges $\chi^2(2) = 21.82, p < .001$.

Intent to go. Students in the lower middle-income group were more likely to intend to go due to a better professional network at home $\chi^2(2) = 16.13, p = .001$, or for family $\chi^2(2) = 20.74, p < .001$ and social reasons $\chi^2(2) = 14.70, p = .001$.

Not sure of intent. Students in the lower middle-income group were not sure due to positive treatment by colleagues/faculty at home $F(2, 290) = 8.80, p < .001, \eta^2 = .06$, financial challenges $\chi^2(2) = 20.18, p < .001$, or because they felt that the advantage of a U.S. education

was better education and knowledge of their field $\chi^2(2) = 30.71, p < .001$, as well as their choice to study in the U.S. due to its higher quality of education $\chi^2(2) = 57.98, p < .001$.

Upper Middle-Income Countries

Intent to stay. Students in the upper middle-income group were more likely to intend to stay in the U.S. despite cultural challenges $\chi^2(2) = 12.26, p < .01$.

Intent to go. Students in the upper middle-income group were more likely to intend to go if they experienced cultural challenges $\chi^2(2) = 8.01, p < .05$, and because one of the advantages of a U.S. education was better professional network $\chi^2(2) = 16.13, p < .001$. They also intended to leave for family $\chi^2(2) = 20.74, p < .001$ and social reasons $\chi^2(2) = 14.70, p = .001$, as well as their choice to study in the U.S. to experience living abroad $\chi^2(2) = 9.92, p < .01$.

Not sure of intent. Students in the upper middle-income group were not sure due to cultural challenges $\chi^2(2) = 11.72, p < .01$ and social challenges $\chi^2(2) = 22.98, p < .001$. They were also not sure because they felt that the advantage of a U.S. education was better education and knowledge of their field $\chi^2(2) = 30.71, p < .001$, as well as their choice to study in the U.S. due to its higher quality of education $\chi^2(2) = 57.98, p < .001$.

High-Income Countries

Intent to stay. Students in the high-income group were more likely to intend to stay in the U.S. due to job opportunities $\chi^2(2) = 12.71, p < .01$ and financial challenges $\chi^2(2) = 21.82, p < .001$. They also intended to stay because they chose to study in the U.S. due to its lower cost $\chi^2(2) = 15.05, p = .001$ and future career opportunities $\chi^2(2) = 6.71, p < .05$.

Intent to go. Students in the high-income group were more likely to intend to go if they experienced racial challenges $\chi^2(2) = 13.05, p = .001$, academic challenges $\chi^2(2) = 21.22, p < .001$, and poor treatment by colleagues/faculty in the U.S. $F(2, 90) = 14.48, p < .001, \eta^2 = .24$. They were also more likely to intend to leave for job opportunities $\chi^2(2) = 24.88, p < .001$ and

salary at home $\chi^2(2) = 9.82, p < .01$. Finally, they intended to leave because they chose to study in the U.S. to experience living abroad $\chi^2(2) = 9.92, p < .01$, and for better job opportunities $\chi^2(2) = 7.27, p < .05$.

Not sure of intent. Students in the high-income group were not sure because they chose to study in the U.S. due to the opportunity to work with specific faculty $\chi^2(2) = 11.59, p < .01$, and to experience living in the U.S. $\chi^2(2) = 11.35, p < .01$.

RQ3 Summary

In summary, the third research question asked about the differences in factors that influence international students' intent to stay, go, or to not be sure based on students' GNI categories. Chi-square analysis and analysis of variance showed that there are significant differences between GNI categories and students' intent to stay, go, or to not be sure.

RQ3 Chi-Square Analysis Results

Variable Groups	Items	Lower middle	Upper middle	High	χ^2 (df)	<i>p</i>
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Stay/go reasons: Geographic location						
Social/Political	Stay	selected 15 (11.5)	20 (11.4)	5 (8.3)	.499 (2)	0.779
		not selected 115 (88.5)	156 (88.6)	55 (91.7)		
	Go	selected 9 (24.0)	7 (23.3)	2 (5.3)	5.613 (2)	0.060
		not selected 19 (76.0)	23 (76.7)	36 (94.7)		
	Not sure	selected —	—	—	—	—
		not selected —	—	—		
Stay/go reasons: Cultural reasons						
Social/Political	Stay	selected 18 (13.8)	31 (17.6)	14 (23.3)	2.631 (2)	0.268
		not selected 112 (86.2)	145 (82.4)	46 (76.7)		
	Go	selected 9 (36.0)	13 (43.3)	13 (34.2)	.633 (2)	0.729
		not selected 16 (64.0)	17 (56.7)	25 (65.8)		
	Not sure	selected —	—	—	—	—
		not selected —	—	—		
Reasons for U.S. study: Wanted to live in the U.S.						
Social/Political	Stay	selected 43 (33.3)	59 (33.5)	27 (45.0)	2.932 (2)	0.231
		not selected 86 (66.7)	117 (66.5)	33 (55.0)		

Table 4.12 Continued

Variable Groups	Items	Lower middle	Upper middle	High	χ^2 (df)	p
		n (%)	n (%)	n (%)		
Go	selected	2 (7.7)	2 (6.7)	2 (5.3)	.158 (2)	0.924
	not selected	24 (92.3)	28 (93.3)	36 (94.7)		
	Not sure	8 (7.5)	4 (3.1)	10 (17.2)		
	not selected	99 (92.5)	123 (96.9)	48 (82.8)		
Reasons for U.S. study: Wanted to experience living abroad						
Stay	selected	62 (48.1)	92 (52.3)	28 (46.7)	.821 (2)	0.663
	not selected	67 (51.9)	84 (47.7)	32 (53.3)		
Go	selected	6 (24.0)	17 (56.7)	24 (63.2)	9.915 (2)	0.007
	not selected	19 (76.0)	13 (43.3)	14 (36.8)		
Not sure	selected	39 (36.4)	60 (47.2)	25 (42.4)	2.773 (2)	0.250
	not selected	68 (63.6)	67 (52.8)	34 (57.6)		
Adjustment challenges: Cultural challenges						
Stay	selected	65 (50.0)	122 (69.3)	34 (55.7)	12.261 (2)	0.002
	not selected	65 (50.0)	54 (30.7)	27 (44.3)		
Go	selected	12 (48.0)	22 (73.3)	15 (39.5)	8.012 (2)	0.018
	not selected	13 (52.0)	8 (26.7)	23 (60.5)		
Not sure	selected	57 (53.3)	86 (67.7)	25 (42.4)	11.717 (2)	0.003
	not selected	50 (46.7)	41 (32.3)	34 (57.6)		

Table 4.12 Continued

Variable Groups	Items	Lower middle <i>n</i> (%)	Upper middle <i>n</i> (%)	High <i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>		
Political	Adjustment challenges: Racial challenges							
	Stay	selected	30 (23.1)	56 (31.8)	18 (30.0)	2.897 (2)	0.235	
		not selected	100 (76.9)	120 (68.2)	42 (70.0)			
	Go	selected	4 (16.0)	6 (20.0)	20 (54.1)	13.052 (2)	0.001	
		not selected	21 (84.0)	24 (80.0)	17 (45.9)			
	Not sure	selected	14 (13.1)	27 (21.3)	7 (11.9)	3.934 (2)	0.140	
		not selected	93 (86.9)	100 (78.7)	52 (88.1)			
	Economic	Adjustment challenges: Job opportunities for myself						
		Stay	selected	111 (86.0)	124 (70.5)	52 (85.2)	12.710 (2)	0.002
			not selected	18 (14.0)	52 (29.5)	9 (14.8)		
Go		selected	6 (23.1)	7 (23.3)	28 (75.7)	24.875 (2)	0.000	
		not selected	20 (76.9)	23 (76.7)	9 (24.3)			
Not sure		selected	—	—	—	—	—	
		not selected	—	—	—	—	—	
Stay/go reasons: Salary								
Stay		selected	65 (50.0)	88 (50.0)	31 (51.7)	0.056 (2)	0.973	
		not selected	65 (50.0)	88 (50.0)	29 (48.3)			
Go	selected	2 (8.0)	0 (0.0)	9 (24.3)	9.822 (2)	0.007		
	not selected	23 (92.0)	30 (100.0)	28 (75.7)				
Not sure	selected	—	—	—	—	—		
	not selected	—	—	—	—	—		
Adjustment challenges: Financial challenges								
Stay	selected	80 (61.5)	63 (35.8)	34 (56.7)	21.824 (2)	0.000		
	not selected	50 (38.5)	113 (64.2)	26 (43.3)				

Table 4.12 Continued

Variable Groups	Items		Lower middle	Upper middle	High	χ^2 (df)	<i>p</i>
			<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Go	selected		8 (32.0)	9 (29.0)	12 (32.4)	0.102 (2)	0.951
	not selected		17 (68.0)	22 (71.0)	25 (67.6)		
	Not sure	selected	60 (56.1)	42 (33.1)	23 (24.1)	20.179 (2)	0.000
		not selected	47 (43.9)	85 (66.9)	44 (25.9)		
U.S. education advantages: Better education/knowledge of your field							
Stay	selected		110 (84.6)	142 (80.7)	44 (73.3)	3.368 (2)	0.184
	not selected		20 (15.4)	34 (19.3)	16 (26.7)		
	Go	selected	22 (88.0)	22 (73.3)	32 (86.5)	2.690 (2)	0.261
		not selected	3 (12.0)	8 (26.7)	5 (13.5)		
Not sure	selected		88 (82.2)	107 (84.3)	29 (49.2)	30.708 (2)	0.000
	not selected		19 (17.8)	20 (15.7)	30 (50.8)		
	U.S. education advantages: Better job opportunities						
Stay	selected		95 (73.1)	113 (64.2)	47 (78.3)	5.333 (2)	0.069
	not selected		35 (26.9)	63 (35.8)	13 (21.7)		
	Go	selected	18 (69.2)	15 (48.4)	30 (78.9)	7.274 (2)	0.026
		not selected	8 (30.8)	16 (51.6)	8 (21.1)		
Not sure	selected		60 (56.1)	70 (54.7)	30 (50.8)	.425 (2)	0.808
	not selected		47 (43.9)	58 (45.3)	29 (49.2)		
	Reasons for U.S. study: Lower cost						
Stay	selected		2 (1.5)	8 (4.5)	9 (14.8)	15.046 (2)	0.001
	not selected		128 (98.5)	168 (95.5)	52 (85.2)		
	Go	selected	1 (4.0)	2 (6.7)	0 (0.0)	2.394 (2)	0.302
		not selected	24 (96.0)	28 (93.3)	37 (100.0)		

Table 4.12 Continued

Variable Groups	Items	Lower middle			Upper middle			High			χ^2 (df)	<i>p</i>
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)				
Reasons for U.S. study: Future career opportunities												
Stay	selected	113 (86.9)	139 (79.0)	55 (91.7)	6.709 (2)	0.035						
	not selected	17 (13.1)	37 (21.0)	5 (8.3)								
	Go	selected	14 (56.0)	14 (46.7)	12 (32.4)	3.556 (2)	0.169					
Not sure	not selected	11 (44.0)	16 (53.3)	25 (67.6)								
	selected	79 (73.8)	81 (63.8)	38 (64.4)	3.017 (2)	0.221						
	not selected	28 (26.2)	46 (36.2)	21 (35.6)								
Economic/Social												
Stay/go reasons: Opportunities for family members												
Stay	selected	17 (13.2)	26 (14.8)	9 (15.0)	.188 (2)	0.910						
	not selected	112 (86.8)	150 (85.2)	51 (85.0)								
Go	selected	3 (12)	5 (16.7)	1 (2.7)	3.852 (2)	0.146						
	not selected	22 (88.0)	25 (83.3)	36 (97.3)								
Not sure	selected	—	—	—	—	—						
	not selected	—	—	—	—	—						
Stay/go reasons: Overall quality of life												
Stay	selected	94 (72.9)	128 (72.7)	37 (61.7)	3.009 (2)	0.222						
	not selected	35 (27.1)	48 (27.3)	23 (38.3)								
Go	selected	6 (23.1)	7 (23.3)	13 (34.2)	1.369 (2)	0.504						
	not selected	20 (76.9)	23 (76.7)	25 (65.8)								
Not sure	selected	—	—	—	—	—						
	not selected	—	—	—	—	—						

Table 4.12 Continued

Variable Groups	Items	Lower middle			Upper middle			High		
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>	
Stay/go reasons: Professional network										
Stay	selected	75 (58.1)	94 (53.4)	34 (56.7)	.707 (2)	0.702				
	not selected	54 (41.9)	82 (46.6)	26 (43.3)						
	Go	2 (7.7)	3 (10.0)	1 (2.6)	1.626 (2)	0.443				
Not sure	not selected	24 (92.3)	27 (90.0)	37 (97.4)						
	selected	—	—	—	—	—				
not selected	not selected	—	—	—	—	—				
Adjustment challenges: Academic challenges										
Stay	selected	43 (33.3)	78 (44.3)	28 (45.9)	4.539 (2)	0.103				
	not selected	86 (66.7)	98 (55.7)	33 (54.1)						
Go	selected	9 (36.0)	12 (40.0)	32 (86.5)	21.224 (2)	0.000				
	not selected	16 (64.0)	18 (60.0)	5 (13.5)						
Not sure	selected	42 (39.3)	55 (43.3)	18 (30.5)	2.767 (2)	0.251				
	not selected	65 (60.7)	72 (56.7)	41 (69.5)						
U.S. education advantages: Better advisors/mentorship										
Stay	selected	88 (67.7)	115 (65.3)	37 (61.7)	.668 (2)	0.716				
	not selected	42 (32.3)	61 (34.7)	23 (38.3)						
Go	selected	14 (56.0)	18 (60.0)	23 (60.5)	.141 (2)	0.932				
	not selected	11 (44.0)	12 (40.0)	15 (39.5)						
Not sure	selected	62 (57.9)	78 (61.4)	28 (47.5)	3.235 (2)	0.198				
	not selected	45 (42.1)	49 (38.6)	31 (52.5)						
U.S. education advantages: Better professional network										
Stay	selected	88 (68.2)	117 (66.5)	48 (80.0)	3.960 (2)	0.138				
	not selected	41 (31.8)	59 (33.5)	12 (20.0)						

Table 4.12 Continued

Variable Groups	Items	Lower middle <i>n</i> (%)	Upper middle <i>n</i> (%)	High <i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>			
Reasons for U.S. study: Higher quality of education	Not sure	not selected	not selected	not selected					
		6 (23.1)	7 (23.3)	24 (64.9)	.837 (2)	0.658			
	selected	63 (58.9)	78 (61.4)	39 (66.1)					
	not selected	44 (41.1)	49 (38.6)	20 (33.9)					
	Stay	selected	115 (88.5)	155 (88.1)	50 (83.3)	1.107 (2)	0.575		
		not selected	15 (11.5)	21 (11.9)	10 (16.7)				
		Go	selected	21 (84.0)	24 (80.0)	32 (86.5)	0.513 (2)	0.774	
			not selected	4 (16.0)	6 (20.0)	5 (13.5)			
		Not sure	selected	99 (92.5)	116 (91.3)	30 (50.8)	57.975 (2)	0.000	
			not selected	8 (7.5)	11 (8.7)	29 (49.2)			
Reasons for U.S. study: Opportunity to work with specific faculty	Stay	selected	55 (42.3)	57 (32.4)	20 (33.3)	3.424 (2)	0.180		
		not selected	75 (57.7)	119 (67.6)	40 (66.7)				
	Go	selected	6 (24.0)	8 (26.7)	4 (10.5)	3.271 (2)	0.195		
		not selected	19 (76.0)	22 (73.3)	34 (89.5)				
	Not sure	selected	45 (42.1)	36 (32.1)	31 (53.4)	11.589 (2)	0.003		
		not selected	62 (57.9)	91 (71.7)	27 (46.6)				
	Social	Stay/go reasons: Family	Stay	selected	11 (8.5)	26 (14.8)	11 (18.3)	4.329 (2)	0.115
				not selected	119 (91.5)	150 (85.2)	49 (81.7)		
			Go	selected	23 (92.0)	25 (83.3)	16 (43.2)	20.737 (2)	0.000
				not selected	2 (8.0)	5 (16.7)	21 (56.8)		

Table 4.12 Continued

Variable Groups	Items	Lower middle			Upper middle			High		
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>	
Stay/go reasons: Friends										
Stay	selected	13 (10.1)	24 (13.6)	11 (18.3)	2.514 (2)	0.284				
	not selected	116 (89.9)	152 (86.4)	49 (81.7)						
	Go	selected	10 (40.0)	8 (25.8)	14 (37.8)	1.555 (2)	0.459			
Not sure	not selected	15 (60.0)	23 (74.2)	23 (62.2)						
	selected	—	—	—	—	—				
	not selected	—	—	—	—	—				
Stay/go reasons: Social reasons										
Stay	selected	26 (20.2)	40 (22.7)	8 (13.3)	2.445 (2)	0.295				
	not selected	103 (79.8)	136 (77.3)	52 (86.7)						
	Go	selected	12 (46.2)	9 (30.0)	2 (5.3)	14.696 (2)	0.001			
Not sure	not selected	14 (53.8)	21 (70.0)	36 (94.7)						
	selected	—	—	—	—	—				
	not selected	—	—	—	—	—				
Adjustment challenges: Social challenges										
Stay	selected	65 (50.0)	110 (62.5)	32 (53.3)	5.059 (2)	0.080				
	not selected	65 (50.0)	66 (37.5)	28 (46.7)						
	Go	selected	13 (52.0)	15 (50.0)	22 (57.9)	.463 (2)	0.793			
Not sure	not selected	12 (48.0)	15 (50.0)	16 (42.1)						
	selected	40 (37.4)	85 (66.9)	24 (41.4)	22.983 (2)	0.000				
	not selected	67 (62.6)	42 (33.1)	34 (58.6)						
Reasons for U.S. study: Proximity to friends/family										
Stay	selected	5 (3.9)	13 (7.4)	6 (10.0)	2.864 (2)	0.239				
	not selected	124 (96.1)	163 (92.6)	54 (90.0)						

Table 4.12 Continued

Variable Groups	Items	Lower middle			Upper middle			High		
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>	
Go	selected	1 (4.0)	0 (0.0)	3 (7.9)	2.546 (2)	0.280				
	not selected	24 (96.0)	30 (100.0)	35 (92.1)						
Not sure	selected	4 (3.7)	4 (3.1)	2 (3.4)	.061 (2)	0.970				
	not selected	103 (96.3)	123 (96.9)	56 (96.6)						

Table 4.13

RQ3 ANOVA Results

Variable Groups/Items	Lower Middle			Upper Middle			High			<i>F</i> (<i>df</i>)	<i>p</i>	η^2
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>			
Treated by colleagues/faculty U.S.												
stay	130	3.92	0.94	176	3.71	0.82	60	3.43	0.88	6.671 (2)	.001	.035
go	25	3.54	0.77	30	3.40	0.87	37	2.59	0.68	14.480 (2)	.000	.244
not sure	107	3.54	0.82	127	3.39	0.90	59	3.21	0.82	2.948 (2)	.054	.020
Treated by colleagues/faculty home												
stay	130	3.87	1.03	176	3.47	0.93	60	3.80	0.76	7.581 (2)	.001	.040
go	25	3.91	0.70	30	3.65	0.77	37	3.77	0.82	0.754 (2)	.474	.016
not sure	107	3.73	0.76	127	3.42	0.82	59	3.26	0.55	8.796 (2)	.000	.057

Summary of All Results

The results of this study were introduced in this chapter to show how international students' intent to stay in the U.S. or leave for their home country after completion of their studies are related to political, economic, and social factors that differ based on World Bank categories of GNI per capita. Descriptive statistics were used to identify the factors influencing students' intent, while chi-square analysis and ANOVA were used to identify the differences between the factors based on students' stay/go/not sure intent. Chi-square analysis and ANOVA were also used to identify differences based on students' home country GNI category. Chapter five will provide a summary of the study along with a discussion of the findings, further implications, and recommendations.

CHAPTER FIVE

DISCUSSION

This study investigated international, graduate students pursuing STEM degrees in the U.S., and the political, economic, and social factors affecting the intent to stay in the U.S. or leave the U.S. after completion of studies. It identified differences in factors influencing students' intent based on World Bank categories of Gross National Income (GNI) per capita (World Bank, 2017). Further, the research identified differences in the factors based on students' selection of stay, go, or not sure in answer to the question "Do you hope to work in the U.S. after graduation?" This chapter will include a summary of the study, implications based on the findings, and recommendations for future research.

This study employed a quantitative design using ex post facto data from the National Science Foundation (NSF) Graduate Students in Science Survey (GSSS; Han & Appelbaum, 2016). Student responses to the GSSS were grouped using World Bank categories based on GNI per capita (World Bank, 2017). See Appendix A for a list of countries with corresponding GNI categories.

Purpose of the Study

Mobility of highly skilled workers has become an essential component of globalization with a particularly strong impact on innovation in business and technology (OECD, 2008, 2016). Despite the large number of studies on globalization itself, there is a need for micro-level studies on globally mobile individuals; particularly international students who are the personification of globalization (Favell et al., 2007). While there have been calls for more research into the impact of student mobility on social and economic systems (Streitwieser, 2012), Dassin et al. (2014)

have argued that instead the impact of social and economic systems on global student mobility requires greater understanding.

The following research questions guided the study:

RQ1 What are the political, economic, and social mobility factors that influence international students' intent to stay, go, or not be sure?

RQ2 Is there a significant difference in the political, economic, and social factors between international students who indicate that they will stay, go, or who are not sure?

RQ3 Are the political, economic, and social factors that influence international students' intent to stay, go, or not be sure different for students from countries in different GNI categories?

The theoretical framework used was built around the push-pull theory (Altbach, 2004) of influences that affect international student career decision making leading to brain drain (Baruch et al., 2007), or brain circulation (Saxenian, 2005). Looking at push-pull factors through the lens of brain drain and brain circulation allowed for exploration of reverse push-pull (Li & Bray, 2007), or the factors that may push a student from a host country after completion of studies.

Methodology

This quantitative study utilized descriptive statistics to answer RQ1, and chi-square analysis and analysis of variance (ANOVA) to answer RQ2 and RQ3. The results revealed significant differences in the factors selected most often in relation to international students' intent to stay versus leave the U.S. Differences in the factors were also revealed based on students' country of origin within GNI categories.

The results of chi-square analysis and ANOVA revealed significant differences in the economic and social factors influencing students to stay, as well as significant differences in the

social and political factors influencing students to leave. The results of chi-square analysis and ANOVA also revealed significant differences between the three income groups.

Factors Influencing the Intent to Stay or Leave

Descriptive statistics showed that a majority of students selected political and social factors including cultural challenges and treatment by colleagues as influences toward their intent to stay in or leave the U.S. Economic factors selected were related to job opportunities and the U.S.'s academic reputation.

Analysis revealed factors that showed significant associations to whether students intended to stay in the U.S., leave the U.S., or were not sure about their intent to stay or leave. Students' intent to stay in the U.S. was significantly associated with economic factors: most notably with career and job opportunities, and with salary. Quality of life and professional network, both social/economic factors, were also significantly associated with the intent to stay. Students' intent to leave the U.S. was significantly associated with social and political factors. The students who intended to leave, were more likely to leave because of family and friends, and for cultural or racial reasons. The opportunity to work with faculty was significantly associated with students who were not sure about their intent to stay or leave.

These results are in line with previous studies finding that academic reputation is a pull factor to study in the U.S. (Altbach, 2004; Han & Appelbaum, 2016; Lee, 2008; Mazzarol & Soutar, 2002) while job opportunities are a pull factor to stay in the U.S. (Baruch et al., 2007; Carr et al., 2005; Han & Appelbaum, 2016). Conversely, cultural challenges can push students to leave their host country (Han et al., 2015; Lee & Kim, 2010; Li & Bray, 2007). International students in the U.S. may find it hard to overcome cultural challenges including language

differences, and academic and social adjustment issues, leading to their return to home country or a country with less of a cultural gap.

Differences Based on Income Groups

Chi-square analysis and ANOVA showed that there are significant differences between factors affecting students' intent based on their home country GNI category.

Lower middle-income. Students in the lower middle-income group were more likely to intend to stay in the U.S. due to treatment by colleagues/faculty in the U.S., treatment by colleagues/faculty at home, job opportunities, future career opportunities, and financial challenges. They were more likely to intend to leave due to a better professional network at home, or family and social reasons. If they were unsure, it was more likely due to uncertainty about treatment by colleagues/faculty at home or financial challenges, as well as their choice to study in the U.S. due to its higher quality of education.

Upper middle-income. Students in the upper middle-income group were more likely to intend to stay in the U.S. despite cultural challenges. They were more likely to intend to leave if they experienced cultural challenges, a better professional network at home, or for family and social reasons, as well as their choice to study in the U.S. to experience living abroad. If they were unsure, it was more likely due to cultural challenges and social challenges, as well as their choice to study in the U.S. due to its higher quality of education.

High-income. Students in the high-income group were more likely to intend to stay in the U.S. due to job opportunities, future career opportunities, and financial challenges, and their choice to study in the U.S. due to its lower cost. They were more likely to intend to leave if they experienced racial challenges, academic challenges, and poor treatment by colleagues/faculty in the U.S. They were also more likely to leave for better job opportunities and salary at home, as

well as their choice to study in the U.S. to experience living abroad. If they were unsure, it was more likely due to an opportunity to work with specific faculty, and they chose to study in the U.S. to experience living abroad.

These results are in line with what Cantwell et al. (2009) found in their research on study abroad participants from differing income level countries studying in Mexico, an upper middle-income level country. They found that students' experiences and expectations varied by region of origin, with students from North America and Europe, high-income regions, more oriented toward short-term study. While students from Latin America were more interested in completing their degree and further education in Mexico. The results of the current study extend this research, identifying differences between multiple World Bank defined income groups studying in the U.S., a high income country.

The results also expand on Baruch et al's (2007) findings that students from upper middle-income countries like China and Taiwan, where the economy has done well in recent years, have shown greater intent to return home. The results of the current study show that students from the upper middle-income group were only influenced to stay by cultural challenges, but were influenced to leave by family, friends, and professional networks.

The results of the current study found that students from lower middle-income countries were influenced to stay in the U.S. by job opportunities and by favorable treatment by colleagues and faculty in the U.S. and expected unfavorable treatment by colleagues at home. These results also support Baruch et al's. (2007) findings that students from India, a lower middle-income country, were more inclined to stay for job opportunities that would allow them to pay back loans and gain experience that would make them more marketable when they return home.

Discussion

The results of this study showed that 49% of students intended to stay in the U.S., 12% intended to leave, and 39% were not sure whether they wanted to stay or leave. The reasons for students' intent varied based on their home country GNI. Past research has shown that there is a relationship between national economic development and inclination to stay or return (Baruch et al., 2007, Cantwell et al., 2009), however research exploring differences based on World Bank GNI categories is limited.

The results indicate that there are distinctions to be made between push-pull factors affecting international STEM students' intent to stay in the U.S. or leave the U.S. based on home country GNI. While the analysis supports previous research showing that academic and career opportunities influence the intent to stay (Baruch et al., 2007) and cultural and family reasons influence the intent to leave (Han et al., 2015; Lee & Kim, 2010), examining the results based on students' GNI levels provides additional information.

GNI may influence students' intent in more nuanced ways, including effects from reverse push-pull factors that influence the intent to leave the U.S. after completion of studies. Students from countries where the economy is still developing (lower middle-income and upper middle-income) showed effects from social factors including family and professional networks that pulled them back home. Differences exist between the lower middle-income countries and the upper-middle income countries. This may be a result of students from upper-middle income countries seeing greater economic development in their home country, making them less inclined to stay in the U.S. (Baruch et al., 2007). Finally, students from high-income countries showed effects from factors that both pushed them to leave: racial and academic challenges, and treatment by faculty/colleagues in the U.S., and pulled them to return home: job opportunities.

Implications

Higher education professionals can use the results of this study to provide resources for international students, taking into account that not all international students are alike. Developing interventions for high-income students who may experience racial and academic challenges, and feelings that they are not treated well by faculty and colleagues can lead to better academic and retention outcomes. Providing community building opportunities for students from the two middle-income categories can help them develop community and social ties. These actions can lead students to develop greater feelings of attachment to the institution and to their host country.

The results may also be used to encourage an increase in global brain circulation and an increase in brain gain for students' home countries. The current uncertainty about U.S. immigration policy could incentivize MNEs to expand operations outside the U.S. (State of Washington, et al., v. Donald J. Trump, et al., 2017), providing more opportunities for international students who are not sure or who intend to leave. MNEs are part of the current economic growth in upper-middle income countries. The factors influencing intent to leave, and the lack of significant stay influences for students from upper-middle income countries should be taken into consideration by MNEs and other organizations looking to recruit U.S. educated talent for their international operations.

MNE growth is not limited to upper-middle income countries. MNEs are also targeting low-income and lower middle-income countries for growth, as evidenced by IBM's focus on countries in Africa and South America (IBM, 2012). The potential growth of MNEs outside of the U.S. will help accelerate the economic development of low-income, lower middle-income, and upper middle-income countries. This growth may also lead to an increase in students from

the low-income and lower middle-income categories leaving their high-income host country after graduation. As these newly educated professionals flow between their home country and host country, brain circulation will increase, strengthening social and professional connections while creating economic growth.

Identifying the reverse push-pull factors that influence students to leave can allow developing countries to be more targeted when creating programs that incentivize students to return (Han & Applebaum, 2016), leading to brain gain for students' home countries. Greater understanding of the factors influencing the intent to stay or go based on students' home country income level can impact organizations in the U.S. and abroad hoping to recruit international students. In addition, the 39% of students who were not sure are available targets, presenting an opportunity for those organizations and governments who would like to influence the intent to stay or go in their favor. Understanding the differences in influences between students from different GNI categories is important for gaining a better understanding of the economic and workforce impacts of student global mobility.

Finally, these findings are important for consideration in the debate about immigration reform in the U.S. International students are more likely than domestic students to pursue STEM degrees (Han & Appelbaum, 2016; Ruiz, 2012) leaving the U.S. at a loss if these highly qualified candidates are pushed from the country by restrictive visa policies.

Limitations

A number of limitations should be considered when interpreting the results of this study. This study focused on graduate STEM students, with 65% of respondents studying at the doctoral level. Therefore, this study cannot be generalized to international students studying in other disciplines and at other degree levels. This study examined students studying in one

country, and may not be generalized to other host countries. Finally, students in this study were surveyed prior to the 2016 U.S. presidential election, therefore their responses may be different today due to political factors related to changing immigration and visa policies in the U.S. and abroad.

New Lines of Inquiry

This study advances the research on student global mobility, extending the existing research on international students' reasons for study abroad to learn more about the factors influencing their mobility patterns after the completion of studies. Expanding the research to international alumni could provide greater understanding of the long-term results of students' intent upon completion of studies, and could better illustrate the effects of brain drain and brain circulation. A phenomenological study of international student alumni who completed degrees in the U.S., and the factors that affected their decision to stay, go, or circulate upon completion of their studies could provide additional insights by exploring how international graduate students and alumni bring their experiences into the decision to stay in their host country, or return to their home country. Duplicating the current study in other Western countries as well as in developing education hubs like Hong Kong, Singapore, and Dubai can provide insights into the expansion of options for students interested in completing degrees abroad. Finally, duplicating this study in the U.S., including items related to visa and immigration policies, can provide insights into the impact of the current political climate on students' intent.

Conclusion

Global economic and workforce development requires a greater understanding of students' intent to stay in the U.S. or leave the U.S. after completion of studies. The results of this study showed that 49% of students intend to stay in the U.S. primarily for better economic

opportunities, 12% intend to leave for social and political reasons, and 39% were undecided. This educated workforce is important for the growth of the global economy (OECD, 2016, Saxenian, 2002). In most developing countries, access to higher education is still restricted compared to high income countries, leading to reinforcement of existing social stratification (Dassin et al., 2014). Because of this, students who study outside their home country engage in a form of vertical mobility (Wachter, 2014). This vertical mobility can result in the expansion of brain circulation, as globally mobile students from countries of differing income levels circulate, developing social and professional connections throughout the world.

As the number in international students continues to grow, it is important to disaggregate them by home and host country to gain a clearer understanding of the social and economic implications of international education (Cantwell et al., 2009). While brain drain was initially believed to add to international inequality, as wealthy economies grew at the expense of poor economies (Saxenian, 2005), considering these results through the framework of brain circulation provides a different perspective. U.S. higher education institutions are educating future leaders for some of the world's fastest growing economies (Ruiz, 2014). Understanding the effect of reverse push-pull factors on students' intent to leave the U.S. can help countries in these growing economies to attract students upon completion of their degrees

The politics of visa and immigration policies in the U.S. and abroad are under scrutiny with calls for change to support innovation and economic growth (Ruiz, 2014, Saxenian, 2002). Continuing this line of inquiry can lead to a greater understanding of student global mobility and its impact on brain circulation and the global economy. Student global mobility adds to economic development by placing talented professionals all over the globe. This expansion of

brain circulation will result in the growth of all economies leading to greater strength and stability throughout the world.

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APPENDIX A

GROSS NATIONAL INCOME (GNI) PER CAPITA FOR THE 2017 FISCAL YEAR

Gross National Income (Gni) Per Capita for the 2017 Fiscal Year

Country Name	GNI per capita
Afghanistan	Low
Albania	Upper-Middle
Argentina	Upper-Middle
Australia	High
Austria	High
Azerbaijan	Upper-Middle
Bahamas	High
Bangladesh	Lower-Middle
Belgium	High
Benin	Low
Brazil	Upper-Middle
Canada	High
Chile	High
China	Upper-Middle
Colombia	Upper-Middle
Costa Rica	Upper-Middle
Croatia	High
Cyprus	High
Denmark	High
Egypt	Lower-Middle
Ethiopia	Low
Finland	High
France	High
Germany	High
Ghana	Lower-Middle
Greece	High
Hong Kong	High
Hungary	High
Iceland	High
India	Lower-Middle
Indonesia	Lower-Middle
Iran	Upper-Middle
Ireland	High
Israel	High
Italy	High
Jamaica	Upper-Middle
Japan	High

Jordan	Upper-Middle
Kenya	Lower-Middle
Kuwait	High
Kyrgyzstan	Lower-Middle
Lebanon	Upper-Middle
Malaysia	Upper-Middle
Mexico	Upper-Middle
Mongolia	Lower-Middle
Nepal	Low
Netherlands	High
New Zealand	High
Nigeria	Lower-Middle
Pakistan	Lower-Middle
Panama	Upper-Middle
Peru	Upper-Middle
Philippines	Lower-Middle
Poland	High
Portugal	High
Republic of Korea	High
Romania	Upper-Middle
Russia	Upper-Middle
Saudi Arabia	High
Singapore	High
Slovakia	High
South Africa	Upper-Middle
Spain	High
Sri Lanka	Lower-Middle
St Lucia	Upper-Middle
Taiwan	High
Thailand	Upper-Middle
Trinidad & Tobago	High
Turkey	Upper-Middle
Uganda	Low
United Kingdom	High
Venezuela	Upper-Middle
Vietnam	Lower-Middle
Zimbabwe	Low

Low-income economies = GNI per capita of \$1,025 or less in 2015
 Lower middle-income economies = GNI per capita \$1,026 - \$4,035
 Upper middle-income economies = GNI per capita \$4,036 - \$12,475
 High-income economies = GNI per capita \$12,476 or more

APPENDIX B

VARIABLES GROUPED BY POLITICAL, ECONOMIC, AND SOCIAL FACTORS

Variables Grouped by Political, Economic, and Social Factors

SPSS™ Item	Social/ Political	Political	Political/ Economic	Economic	Economic/ Social	Social
sg_geographic	X					
sg_cultural	X					
studyliveus	X					
studyabroad	X					
challengecultural	X					
challengeracial		X				
treatedUS		X				
treatedhome		X				
sg_jobself				X		
sg_salary				X		
challengefinancial				X		
advantagefield				X		
advantagejob				X		
studycost				X		
studycareer				X		
sg_jobfamily					X	
sg_quality					X	
sg_network					X	
challengeacademic					X	
advantageadvisor					X	
advantagenetwork					X	
studyquality					X	
studyfaculty					X	
sg_family						X
sg_friends						X
sg_social						X
challengesocial						X
studyfriendsfamily						X

APPENDIX C
GRADUATE STUDENTS IN SCIENCE SURVEY

VITA

MARGARET (PEGGY) GESING Ph.D.

Old Dominion University
Darden College of Education
Educational Foundations and Leadership
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EDUCATION

Old Dominion University, Norfolk, Virginia

Ph.D. Higher Education

Dissertation: *Student Global Mobility: An Analysis of International STEM Student Brain Drain*

Chair: Christopher R. Glass

Cleveland State University, Cleveland, Ohio

M.Ed., Adult Learning and Development

Miami University, Oxford, Ohio

B.S., Home Economics and Consumer Science