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IMMIGRATION AND REVERSE BRAIN DRAIN IN SOUTH EAST ASIA

by

Trang T. Tran

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Submitted in partial fulfillment
of the requirements for
Honors in the Department of Economics

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ABSTRACT

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In recent years, governments around the world have shown increasing concerns about *brain drain*, the shift in human intelligence of many of their best educated citizens from developing countries to developed countries, as it causes negative effects on social and economic sectors of the source country. Nonetheless, Kuhn and McAusland (2006) argue that talent might often be wasted at home; migration to more supportive environments raises global innovation. Saxenian (2003) finds that gains may flow back to the developing country via returnees with enhanced skills, personal connections, and ideas for innovation.

This thesis studies the causes of immigration. The study focuses on migrants from South East Asian countries to 50 states in United States excluding District of Columbia. Using a sample from the American Community Survey of people living in the United States, together with the source country data from World Development Indicator, U.S. Department of Agriculture, Bureau of Labor Statistics, International Labor Organization, and Heritage Foundation, this thesis constructs a gravity model of immigration to analyze the factors affecting the immigration flow. The dependent variable of the model is the number of immigrants flowing into each of the 50 states from each of the 8 source countries.

The result shows that for high-skilled immigrants, GDP per capita differentials between U.S. states and the source country, the political factor, population of both the U.S. and the source country, the distance between the destination and the origin, as well

as the corruption freedom index have a positive influence on the immigration flow. On the other hand, income inequality in the U.S. has a negative effect on the immigration flow, suggesting that the immigration flow looks for a more socially balanced lifestyle. This thesis also suggests that the source country's government implement changes to improve the gender inequality as well as the income inequality to mitigate the outflow of residents.

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CHAPTER 1: INTRODUCTION

Immigration has always been a significant issue that governments take into consideration when drafting policies regarding human capital legislation. Although immigration to the United States since World War II has been far smaller than it was in the nineteenth and early twentieth century, it has brought in a population of a different kind, consisting of some of the most highly trained manpower of the sending countries. Logan (1987) identifies four dimensions of this international migration: migration of professionals from (1) developed country to developed country; (2) developed country to less-developed-country; (3) less-developed country to less-developed country; and finally (4) less-developed country to developed country. The fourth trend will be the major focus of this thesis, as governments around the world have shown increasing concerns about *brain drain*, the shift in human intelligence of many of their best educated citizens, from developing countries to developed countries, as it causes the source country a crisis that negatively affects their social and economic sector.

Brain drain occurs not only in a single geographical location but at the global level. Between 23% and 28% of physicians in Australia, Canada, the UK, and the US are international medical graduates (Mullan, 2005, p.1811). In a study of brain drain from Iran to the United States, Torbat (2002) finds that the rate of brain drain for persons with tertiary education is at 11.5% in 1997 (p.280). When looking at small developing states, defined by the UN as states with population below 1.5 million, Beine et al. (2008) find that they experience an extremely high level of brain drain at 43.2% (p.3). In Nigeria, some programs at the University of Lagos – Nigerian leading educational institution – have been halted due to the severe professor shortage as the university's faculty move to

private industries as well as overseas countries (Odunsi, 1996). The region with the highest small-state brain drain (74.9%) is the Caribbean, followed by East Asia and Pacific region with a brain drain of 50.8%, and Sub-Saharan Africa with a 41.7% figure (Beine et al., 2008, p.4). In addition, in 2005, UNESCO reported that over two million students were enrolled in tertiary institutions as foreign students, 54% of which were from Asian countries. The United States is the major destination for Asian students, accounting for almost a third of the total abroad Asian students.

As human capital proves to be one of the cores of economic development, it is thus important to understand and identify the shift of labor from developing countries to the United States, in order to determine the factors that affect immigration and brain drain. At the same time, it is necessary to recognize the efficient usage of talent, as Kuhn and McAusland (2006) argue that talent might often be wasted at home as migration to more supportive environments raises global innovation, and some gains flow back to the poor country through the imports of products with improved technology or lower cost. Furthermore, Saxenian (2003) finds that gains may flow back to the developing country via returnees with enhanced skills, personal connections, and ideas for innovation.

This thesis studies the causes of immigration. The study focuses on migrants from South East Asian countries to 50 states in United States excluding District of Columbia. Using a sample from the American Community Survey of people living in the United States, together with the source country data from World Development Indicator, U.S. Department of Agriculture, Bureau of Labor Statistics, International Labor Organization, and Heritage Foundation, this thesis constructs a gravity model of immigration to analyze the factors affecting the immigration flow. The dependent variable of the model is the

number of immigrants flowing into each of the 50 states from each of the 8 source countries.

Chapter 2 presents the most relevant existing literature on immigration in order to study the issue of immigration and brain drain, the effects that immigration has on the source country's development, the suggested determinants of immigration based on previous studies, and the case studies of South Korea, and China in implementing the policy changes to attract talents back to the source countries. This allows the thesis, in Chapter 3, to set up an empirical model that examines the immigration flow from South East Asian countries to the 50 states in the United States. Chapter 4 discusses the sample as well as the empirical results, which show that for high-skilled immigrants, GDP per capita differentials between U.S. states and the source country, the political factor, population of both the U.S. and the source country, the distance between the destination and the origin, as well as the corruption freedom index have a positive influence on the immigration flow. On the other hand, income inequality in the U.S. has a negative effect on the immigration flow, suggesting that the immigration flow looks for a more socially balanced lifestyle. Chapter 5 concludes the thesis with some policy recommendations for the source country's government. Specifically, this thesis suggests that the source country's government implement changes to improve income inequality to mitigate the outflow of residents.

CHAPTER 2: EXISTING LITERATURE ON IMMIGRATION

This chapter examines various literatures on immigration to determine the extent of immigration and brain drain in developing countries around the world. First of all, the chapter presents the issue of immigration and brain drain. As many scholars argue that the issue of immigration creates severe manpower shortage in the source countries, the chapter will follow by studying the effects of immigrations. Because of these effects, scholars are attracted to study the determinants of immigration, which are categorized into five major factors as suggested by Kao and Lee (1973): economic factors, political factors, social factors, demographic factors, and professional factors. Once the determinants are identified, this chapter proceeds to study the country cases where the government implemented specific measures to either keep talents at home or attract talent abroad to come back and serve the source country.

2.1 The issue of immigration and brain drain

The issue of immigration and brain drain is not recently brought up. Many scholars have attempted to study the immigration flow and assess the brain drain to determine its effects and severity. Kao and Lee (1973) report that 7,818 Chinese students from Taiwan attended American higher educational institutes in the academic year 1968-69 (p. 501). It was estimated that there were 3,545 Chinese doctorates in the United States in 1969 (Kao & Lee, 1973, p. 501). This number is not a part of the 7,818 Chinese students mentioned previously. Meanwhile, Kao and Lee (1973)'s calculation shows that "an average of 1,544 college graduates from Taiwan, equivalent to 18% of its annual graduate output, came to the United States each year. During the same period, only an average of fifty-three returned to Taiwan each year, making the rate of return less than 4%" (p. 501). An early study by the Institute for International Education indicates that,

when 2000 students from Taiwan are questioned of their desire to remain in the United States after the completion of their studies, almost 100 percent of them are in favor of staying. This is very significant since, out of 94,000 foreign students questioned, 11,000 express a desire to remain in the United States, which yields an 11.7% brain drain rate (Kao & Lee, 1973, p. 501).

Carrington and Detragiache (1999), in a study of the brain drain to the United States and other OECD countries, examine the extent of brain drain by looking at the educational attainment level of immigration flow. They classify three broad educational categories: primary (0-8 years of schooling), secondary (9-12 years of schooling), and tertiary (more than 12 years of schooling), and find that immigration flows of individuals with no more than a primary education are quite small, both in absolute terms and relative to other educational groupings. Out of a total of 7 million immigrants, the largest group of immigrants into the United States (about 3.7 million) consists of individuals with secondary education from other North American countries, primarily Mexico.

Surprisingly, the second largest group (almost 1.5 million individuals) consists of highly educated migrants from Asia and the Pacific. Total immigration from South America and, especially, Africa is quite small. It is noteworthy, however, that immigrants from Africa consist primarily of highly educated individuals. Among the Asian countries and the Pacific, Philippines supplies the majority of immigrants, of which mostly hold a tertiary education. Furthermore, both India and Korea have seen more than 300,000 people migrate to the United States, and a striking statistic of more than 75% of Indian immigrants has a tertiary education.

The issue of immigration and brain drain is important in labor economics because it creates severe manpower shortages in the source country. Odunsi (1996) suggests that, in a study of the Nigerian professional immigration, even though the increasing outflow seems small, the issue needs to be addressed to avoid endangerment of development programs in the areas of training, research, technical and human resources. It attracted great interest from development planners in the late 1960s when data revealed that a large proportion of high skilled workers employed in developed countries came from the developing nations (Odunsi, 1996). The following section examines the effects that immigration and brain drain have on the source country's social and economic sectors.

2.2 The effects of immigration

The Interministerial Committee (IMC), instituted by Nigerian Federal Executive Council in May 1973, identifies two patterns of Nigerian brain drain as permanent and temporary. Permanent brain drain includes those Nigerians who have acquired residency status or full citizenship in the recipient country, while temporary brain drain includes those who have extended their stay indefinitely after having completed their training and exhausted the period granted to foreign students to acquire practical experience (Odunsi, 1996). IMC downplays the importance of brain loss to Nigeria as it relies on earlier findings of 6% brain drain rate, and concludes that though "brain drain appears to be a problem in Nigeria, it has not yet reached crises proportion." (Aderinto, 1978, pp. 321-322). Aderinto (1978) argues that although "proportion may be low; the qualitative components of the brain drain might be very significant" (p. 324).

Based on Aderinto's research, Odunsi (1996) suggests that "the increasing outflow of Nigerian professionals to foreign countries though small, if left unchecked

might endanger development programs particularly in the areas of training, research, technical and human resources development” (Odunsi, 1996, p. 199). The flow of professional from Nigeria to developed countries influences the manpower shortages, which might impede Nigeria’s capability in amassing technological innovations, and suppress national growth (Odunsi, 1996). Notably, the number of expatriate personnel in the Nigerian private sector is clearly obvious, possibly due to “1) the pre-arranged understanding between foreign investors doing business in Nigeria and the country’s officials allowing foreign businesses to employ a certain number of expatriate personnel; 2) the increased exodus of Nigerians brought home in the mid 1970s” (Odunsi, 1996, pp. 200-201). More importantly, the underlying reason to the matter is the fact that Nigerian economy does not appear to be able to effectively absorb into the workforce most students graduating from the nation’s universities. Odunsi (1996) notes that many appropriate technically qualified Nigerian graduates have been unable to secure employment in Nigeria, despite the availability of vacant positions, thus resulting in the mass flight of skilled professionals from the country – a process that has suppressed the country’s economic performance and continued dependency. Furthermore, this manpower shortage in Nigeria has promoted mediocrity and incompetence in the delivery of government services, as the government’s inability to fill the vacuum created by the flight of competent professionals has resulted in corruption recruitment practices which severely damage the merit requirements (Odunsi, 1996).

Stark and Fan (2007) extend the literature of brain drain by showing that “in the short run, international migration can result in “educated unemployment” and in over education, as well as in a brain drain” (p. 260). Migration leads to a reduction in the high-

skilled human capital, resulting in a decline in average income in the developing countries. At the same time, they contend that the prospect of migration fuels educated unemployment, as “some educated individuals who would otherwise have taken jobs are lured into further education only to end up unemployed, output shrinks” (Stark & Fan, 2007, p. 260). Stark and Fan (2007) point out that in many developing countries, a large fraction of the educated workforce is unemployed, notably Sri Lanka with half of the country’s fresh graduates being unemployed (p. 260). Similarly, in urban Kerala, India, there is a discrepancy in unemployment rate between the educated and uneducated as the unemployment rate of the educated is among 11% to 25%, while that of the uneducated is among 6% to 8% (Stark & Fan, 2007, p. 260). This demonstrates the inability to utilize the workforce in some of the developing countries.

By examining the relationship between migration and unemployment in a fixed-wage framework, Stark and Fan (2007) show that “the increase in the probability of working abroad results in an increase in the unemployment rate of educated workers in the domestic labor market” (p. 261). Furthermore, as some of the individuals who are encouraged by the possibility of migration to acquire higher education do not immigrate ultimately, the returns to their education could be less than its costs. From their perspective, they are overeducated. That results in social inefficiency if the source country’s economy cannot take off (Stark & Fan, 2007).

Meanwhile, Kuhn and McAusland (2006) argue that talent might often be wasted at home; migration to more supportive environments raises global innovation, and some gains flow back to the poor country through the imports of products with improved technology or lower cost. Furthermore, prospect of migration encourages workers to

acquire more education, which proves to be beneficial in the long run. Stark and Wang (2002) point out that enhanced skills result in a higher per-capita output in the home country when workers who do not migrate end up working at home. Since they acquired skills appropriate to their probable immigration, they become more productive and can thus contribute more to the per-capita output level. Stark and Fan (2007) show that brain drain comes with brain gain, as the higher average level of human capital in the long run can prompt take-off of the economy, thus reducing the unemployment rate.

Specifically, the brain gain can be achieved in three ways. Firstly, due to the intergenerational externality effect of human capital, the children of educated parents will tend to be better educated, resulting in higher level of human capital. Secondly, educated workers become more selective when choosing domestic jobs because of the possibility of working abroad. This results in a better matching system between skills and jobs, thus signifying a decrease in the non-suitable jobs or an improvement in the industrial economic structure. Thirdly, “the prevalence of employment opportunities abroad, where the skill mix and production technologies are vastly different from those at origin, could tilt the type of education sought in new directions; programming instead of engineering, biochemistry instead of law” (Stark & Fan, 2007, p. 265). This might seem counterintuitive as these skills might not be as applicable at home than abroad. Nonetheless, Stark and Fan (2007) argue that “when N individuals acquire skills that are usable abroad, and when the probability of staying at home could be the catalyst for technological change at home; such a change is initiated, or brought forward, by the presence of know-how that without the prospect of migration would have been lacking” (p. 265). This follows the spirit of Say’s Law: supply creates its own demand. Stark and

Fan (2007) further demonstrate the argument by citing the case of India, the country that takes a huge leap into the high-tech service economy. The human capital that trains in technology at the early stage in India becomes precursors of the development of this particular sector. These people acquire the skills locally and brings “abroad” home as this sector grows in India.

2.3 Determinants of immigration

Kao and Lee (1973), in their empirical result on Chinese brain drain, try to address the question of “why Taiwan, a developing country with social stability, rapid and sustained growth, and rising per capita income, should still lose its talented individuals” (p. 502). They also note the increasing gap between the percentage of Chinese specializing in the humanities and the social and behavioral sciences as the percentage of the latter has been rising significantly over the studied period of 1905-1960. With the dependent variable being “propensity to stay in the United States” ranging from 0 to 9, Kao and Lee (1973) select twenty-two significant explanatory factors for their regression experiments. They suggest that these determinants of immigration are divided into 5 categories: (1) economic factors, (2) political factors, (3) social factors, (4) demographic factors, and (5) professional factors.

2.3.1 Economic factors

Kao and Lee (1973) identify 5 possible economic factors that might affect Chinese immigration to the United States: satisfaction with income in the United States, satisfaction with job in the United States, job mobility in the United States, type of present employer, and job offer from Taiwan. The satisfaction with job in the United States is classified as the satisfaction with non-income elements in one’s job. With the

exception of dummy variables for type of present employer and job offer from Taiwan, the other variables are expressed in ranked scale. Surprisingly, the empirical research finds that the job satisfaction in the United States shows negative relationship with the propensity to remain in the United States. It is partly due to further findings which show that the variable is not a significant factor in one's decision-making process, and that one can have a similar degree of job satisfaction (which covers the non-income elements) in the United States and Taiwan. Kao and Lee (1973) also find that the satisfaction with income in the United States is the most significant factor among the above mentioned. This is in line with Tullao (1982)'s findings in a study of unemployed nurses in the Philippines that: "[the low] wages and limited employment opportunities in the domestic market as reflected in the low rate of return to nursing education without migration...and the cost of education are overpowered by the profitability of migration and the wage differential between foreign and domestic market, which make the expected rates of return to nursing education significantly higher than the returns without migration" (p. 45).

In a more recent study about determinants of brain drain and the effect it has on small states, Beine, Docquier, and Schiff (2008) focus on 46 developing states with population below 1.5 million. They show that these states experience an extremely high level of brain drain at 43.2%. This is highly significant as it is 2.8 times as large as the 15.3% overall migration rate (p. 3). In order to estimate the determinants of the brain drain, Beine et al. (2008) regress the rate of emigration of skilled workers on various potential determinants observed in 1990 and 2000. The authors use panel data estimation with random effects with all potential determinants included in the regression to estimate

the model. The emigration rate of skilled workers is defined as the ratio of emigrants to natives or the sum of residents and emigrants. The independent economic factors included in this model are the GDP per capita and its squared value of the source country. The squared value of GDP is used in order to capture the effect that economic growth in developing countries might lead to more migration because of reduced financial restrictions, even if income differentials to destination countries decreases (Beine et al., 2008). The authors find the inverted-U relationship between migration and GDP per capita in source countries: at low GDP levels, income has a positive impact on the migration rate since it eases liquidity constraints; as income increases further, the income difference with the destination countries fall, which reduces the incentive to migrate.

2.3.2 Political factors

Kao and Lee (1973) suggest that political freedom in the United States is one of the most significant factors affecting Chinese (including Taiwanese) decision to migrate to the United States. This is further extended in recent literatures. Beine et al. (2008) use “political stability and absence of violence” and “government effectiveness” to capture the political environment at the source country. The first indicator measures “perceptions of the likelihood that the government in power will be destabilized or overthrown by possibly unconstitutional and/or violent means, including domestic violence and terrorism” (Beine et al., 2008, p. 7). The government effectiveness variable measures “quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government’s commitment to policies” (Beine et al., 2008, p. 8). The result from the empirical research shows that political instability also acts as a push

factor. Interestingly, the government effectiveness seems to favor immigration, which might be due to the fact that the greater the government effectiveness is also likely to i) promote trade, which is likely to require source country individuals to live temporarily abroad, and ii) result in lower costs of obtaining the documents required to leave the country, and the lower migration costs might result in an increase in the emigration of financially constrained individuals” (Beine et al., 2008, p. 23). As the political instability, violation of property rights, and government effectiveness are strongly correlated, two of the three variables are deleted in the parsimonious regressions. The results show that these variables are not as significant in determining skilled migration, although they are significant for the total pool.

In another study of the Lebanese medical students, Akl et al. (2007) note that, in the early 1970s, the main factor influence Lebanese physicians’ decision to migrate was civil instability; thirty years later, the political instability still plays a role in this decision, especially after the armed conflict devastated the country’s civil infrastructure in the summer of 2006.

There are also cases when the political factor serves as foremost push factor for immigration. In a research of Iranian immigration to the United States, Torbat (2002) finds that political factors were the main push force for migration of Iranian individuals. From the year 1981 to 1996, Iran was ranked fifth among countries with the highest number of refugees admitted to the U.S, many of which were some of Iran’s best-educated elite, professionals, technocrats, and wealthy entrepreneurs, causing a severe social loss to Iran (Torbat, 2002). It is estimated that the rate of brain drain from Iran for persons with tertiary education is at 11.5% in 1997 (Torbat, 2002, p. 280). The Iranian

expatriates abroad who have funds are wary of investing in Iran, because of the regime's bad records of confiscating people's assets and the overall political instability of the country, meaning little hope for the regime to absorb capital from foreign investors.

Similarly, in Nigeria's case, the country also undergoes many periods of political instability. Nigeria achieved its independence from Britain in 1960. Nonetheless, the attempt to self-rule and democracy failed due to military coup in 1966 and 1979. A third attempt to establish a democratic political system was unsuccessful because of the interference by the military government of General Babangida. In 1993, General Babangida reluctantly stepped down amidst public protest and condemnation and appointed businessman Ernest Shonekan, as the head of an interim civilian government. That government however, was overthrown by a military coup shortly afterwards, depriving the country of its transition to democracy (Odunsi, 1996). This has caused the disenchantment with the political regime in Nigeria, thus influencing its people's decision to migrate.

2.3.3 Social factors

Kao and Lee (1973) consider several social factors affecting the decision to migrate, including the satisfaction with American way of life, the modern living facilities in the United States, and the lack of identity in Taiwan. The latter two variables are rather self-explanatory; the American way of life is interpreted as the life with a small family, few rigid social norms, more mobility, and more personal freedom (Kao & Lee, 1973). This is indeed one of the most important factors affecting the immigration decision in Kao & Lee (1973)'s study.

Beine et al. (2008) uses the economic freedom variable to capture the social

environment at the source country. The data comes from the indicator of property rights from the general index published by the Heritage Foundation. Beine et al. (2008) also use religious, linguistic and ethnic fractionalization indicator to control for ethnic diversity in origin country. They reason that “such fractionalization may impact the psychic costs of migration (relative to non-migration) and affect the desire of people to leave their country [which is] especially true in developing countries where fractionalization often give rise to ethnic or religious conflicts” (Beine et al., 2008, p. 7). It is interesting to note that the religious fractionalization seems to be a robust determinant mainly for skilled migrants.

Torbat (2002) finds that because of academic freedom, lack of censorship, and the wealth of knowledge that is available through access to advanced technology in the US, the highly educated Iranian individuals are more active and up-to-date in their field, and hence the quality of their work is generally better than that of those in Iran.

2.3.4 Demographic factors

Kao and Lee (1973) look at a number of demographic factors including age, length of stay in the United States, marital status, lack of family ties, country of last residence, and parents’ residing country in order to assess the importance of the demographic factors in determining the decision to migrate. They find that the length of stay in the United States and the lack of family ties in Taiwan are the most significant within this group. It is interesting to note that the length of stay, expressed by the last two digits of arrival year, has an inverse relationship with the propensity to remain in the United States. This means the longer one has stayed in the United States, the higher the propensity to stay in the United States, thus refuting the claim that one grows nostalgic as one stays longer away from one’s home country. Another interesting point raised by Kao

and Lee (1973) is the variable country of last residence, a binary variable used to distinguish scholars from mainland China from those from Taiwan. This variable has a positive relationship with the propensity to stay in the United States, thus signifying that “with the same set of the explanatory variables, those from mainland China have higher propensity to stay in the United States than those from Taiwan” (Kao & Lee, 1973, p. 512). The political force can offer a reasonable explanation as scholars from mainland China cannot return to their home because of the presence of the Communist regime.

Beine et al. (2008) use the following variables as the demographic factors affecting the decision to migrate: population size, geographical distance between the source country and recipient country, colonial links, linguistic proximity, and the size of the country of origin. As expected, they find the negative relationship between the population size and the total and skilled emigration rates. It is demonstrated that the higher the distance, the lower the rate of immigration is as the long distance raises migration costs. Colonial links, on the other hand, ease the cultural difference between the recipient country and the source country (supposedly the recipient country’s former colony) as it gives the potential immigrants the superior knowledge and information on the recipient country, thus lowering the migration costs. The linguistic proximity serves in favor of the immigration rate as the return to foreign human capital is higher in countries sharing the same language or having the same education system. Furthermore, Beine et al. (2008) showed that the size of the country of origin is likely to affect its openness.

Simpson and Sparber (2011) study the flow of immigrants into 48 U.S. states. The empirical results show that the immigration stock, defined as the total number of

immigrants already residing in the host state for more than a year, has a positive influence on the immigration flow. That is, new immigrants are more compelled to migrate to states that already have immigrants from that specific country, possibly due to the network and the ease to adapt to the culture in a new place.

2.3.5 Professional factors

Kao and Lee (1973) study the professional factors that affect immigration decision, and find that the degree of fairness in competition in Taiwan is among the most significant ones. The actual result is expected, as the lower the degree of fairness in competition in Taiwan, the higher the propensity to stay in the United States because skilled workers want to be able to work in a fair environment where they can utilize their skills to maximize profits. Meanwhile, the variable of teaching and research facilities in the United States seems to be rather insignificant one in the model. Kao and Lee (1973) suggest that this might be due to the teaching facilities in Taiwan not being notably worse than those in the United States. This then opens up a new suggestion that teaching facilities in developing country might have a significant effect on the source country's citizens' decision to migrate, as Taiwan's GDP per capita is very significant at the level of \$35,800 by CIA World Fact Book's estimate.

In another study looking at graduating Lebanese medical students, Akl et al. (2007) study the case of Lebanese medical students as Lebanon has the highest physician emigration factor in the Middle East and the 7th highest in the World. They identify students who intend to travel abroad for residency training, and find that the most discussed push factor was the oversaturation of the local job market leading to a fierce competition among physicians. Some students even consider that training abroad has

become a minimum requirement due to the increasing number of students obtaining residency abroad. While this study is rather qualitative than quantitative because of its nature (survey of 23 students with a list of essay questionnaires), it brings about other social aspects of the professional environment such as the role of the academic institutions and their faculty in motivating medical students to migrate, migration network (sets of interpersonal relations that link migrants with relatives, friends or fellow countrymen who give support in various forms including information, financial assistance, accommodation, etc), and emerging factors such as the culture of migration and marketing of abroad training.

2.4 Case study

Meanwhile the government's efforts to bring professionals home have not been successful, given the present political environment in Iran. Although Iran did not yet succeed in their talent management, some success cases are recorded in Asia. Recognizing the significant effect of immigration and brain drain, Asian countries including South Korea and China have taken adequate actions to mitigate the damage as well as encourage immigrants to return to their native countries. Yoon (1992), in his study of reverse brain drain in South Korea in 1992, points out the importance of intellectuals from abroad in building up South Korean technostucture that began to emerge in the 1960s. Soon to realize this importance, President Park, who played an instrumental role in laying the groundwork for the reverse brain drain's success, implemented various policies in the public sector to give repatriates incentives to come back. Government-sponsored strategic R&D institution-buildings were constructed; legal and administrative reforms were executed; repatriates were granted research autonomy

and were able to enjoy material compensations; professional associations of Korean scientists and engineers were established in countries with a significant Korean population (Yoon, 1992). In another study, Saxenian (2003) looks at the brain drain problem in China, especially after the Tianamen Square events, since Mainland Chinese are now the largest and fastest growing group of foreign-born students in U.S. universities. Chinese agencies have sought to increase professional connections and communications with overseas community by sponsoring study tours, conferences, joint research projects and short-term work and teaching opportunities (Saxenian, 2003)

The previously mentioned literature looks at immigration and brain drain from the sending country's perspective. Borjas (1995) studies the immigration from the recipient country's perspective. He asserts that natives benefit from immigration mainly because of production complementarities between immigrant workers and other factors of productions, and these benefits are larger when immigrants are sufficiently "different" from native productive inputs. He uses evidence which suggests that the economic benefits from immigration for the United States are small, on the order of \$7 billion and almost certainly less than \$25 billion annually, to show that these gains could be increased considerably if the United States pursued an immigration policy that attracted a more skilled immigrant flow (Borjas, 1995). This suggests that reverse brain drain policy coming from sending country might have to take recipient country's policy into consideration, especially when they are both competing for talents.

2.5 Conclusion

Based on the previous empirical research, this thesis studies the determining factors of immigration decision from 8 East Asian countries to the 50 states in the United

States, excluding District of Columbia. The thesis looks at data from the American Community Survey of people living in the United States, which gives a broad view of the factors that shed light to the immigrants' profiles, together with the source country data from World Development Indicator, U.S. Department of Agriculture, Bureau of Labor Statistics, International Labor Organization, Heritage Foundation, among other country profiles. In terms of policy proposals, many aspects need to be looked at. South Korea and China are two successful stories, but other East Asian countries need to adapt their policies carefully, as each country has different characteristics, infrastructure system, and human capital resources.

CHAPTER 3: STATEMENT OF THEORY

This chapter describes the econometric model, as well as the dependent and independent variables used in this analysis. The chapter outlines the statistical methodology used in this study.

3.1. Econometric model

To examine the determinants of immigration, this thesis uses the following econometric model:

$$\begin{aligned} \ln(F_{2009,s,h}) = & \alpha + \beta_1 \times DELGDP_{2008,h,s} + \beta_2 \times POL_{2008,s} + \beta_3 \times \\ & \ln(STOCK_{2008,s,h}) + \beta_4 \times \ln(POPUS_{2008}) + \beta_5 \times \ln(POPSEA_{2008}) + \beta_6 \times \\ & \ln(DIST_{s,h}) + \beta_7 \times CORR_{2008} + \beta_8 \times URUS_{2008} + \beta_9 \times URSEA_{2008} + \beta_{10} \times \\ & IIUS_{2008} + \varepsilon \end{aligned}$$

Dependent variable for immigration flow

$\ln(F_{2009,s,h})$ natural log of the flow of immigrants from the source country s to a host state h in the U.S in 2009.

Independent variables

Economic factors

$DELGDP_{2008,h,s}$ per capita GDP differentials between the host state h and the source country s in 2008.

Political factors

$POL_{2008,s}$ the number of major episodes of political violence in the source country in 2008

Demographic factors

$\ln(STOCK_{2008,s,h})$ natural log of the number of immigrants from source country s that have already been in the host state h for more than one year
 $\ln(POPUS_{2008})$ the natural log of the host state's population in 2008
 $\ln(POPSEA_{2008})$ the natural log of the source country's population in 2008
 $\ln(DIST_{s,h})$ the natural log of the geographic distance from the capital of the source country to the capital of the host state

Social factors

$CORR_{2008}$ the corruption freedom of the source country. The higher the level of corruption is, the lower the level of overall economic freedom and the lower a country's score.

Professional factors

$URUS_{2008}$ the unemployment rate in the host state in 2008

*URSEA*₂₀₀₈
*IIUS*₂₀₀₈

the unemployment rate in the source country in 2008
the income inequality in the host state in 2008

As the literature review suggests, the thesis hypothesizes that income differentials, the stock of immigrants, the level of educational attainment of the immigration flow, and the unemployment rate in the source country will have a positive influence on the dependent variable. Meanwhile, the political freedom in the source country, the unemployment rate in the host state, and the income inequality in the host state will have a negative influence on the dependent variable.

3.2. Statistical methodology

In constructing the empirical model, the analysis focuses on immigrants from 8 countries: China, Indonesia, South Korea, Malaysia, Myanmar, Philippines, Thailand, and Vietnam. Simpson and Sparber (2011) suggest the use of gravity model, which was first used by trade economist to analyze bilateral export and import flows.

Gravity models of international trade regress log bilateral trade flows on the economic mass of each trading partner, the geographic distance between them, and other covariates. Since a large proportion of observed flow values equal zero, one attempt would be to estimate a truncated OLS model by dropping the zero-flow observation. In another attempt, the scaled ordinary least square SOLS adds 1 to each flow value before taking natural logs. Another attempt would be to use Eaton and Tamura (1994) threshold Tobit model, or the censored regression model, which censors log-values less than zero. Chapter 4 presents the result using these three techniques.

CHAPTER 4: EMPIRICAL TEST OF THE THEORY

This chapter explains the data sample, and provides a descriptive statistics of the variables.

4.1. Data sources

This analysis uses several data sources, which will be explained in the following sections.

4.1.1. American Community Survey

The analysis uses data from the 2009 American Community Survey Public Use Micro Sample (ACS PUMS) to obtain the dependent variable, $\ln(F_{2009,s,h})$, which is the natural log of the annual estimates of the flow of foreign-born immigrants from the 8 designated Asian countries into the 50 states in the U.S. By focusing on 2009 ACS PUMS, the analysis thus has 400 observations. However, only 165 observations have non-zero immigration flow.

Furthermore, the ACS also provides data for the following independent variables: $\ln(STOCK_{2008,s,h})$, and $IIUS_{2008}$.

Immigration stock is calculated by measuring the number of foreign-born people in each state from each of the 8 countries. Since the decision to migrate in 2009 is influenced by the factors from 2008, the natural log of the stock of immigrants will thus be measured up to 2008.

The income inequality is constructed using the methodology suggested by Borjas (1987): finding the ratio of individual income accruing to the top 10% of the individuals to the income accruing to the bottom 20% of the individuals.

4.1.2. U.S. Department of Agriculture, Economic Research Service and Bureau of Economic Analysis

In constructing the data for $DELGDP_{2008,h,s}$, the analysis collects data for real GDP of source countries from the U.S. Department of Agriculture, Economic Research Service and real GDP of host states from the Bureau of Economic Analysis, then takes the difference to derive at the data for this particular variable. As the analysis excludes District of Columbia (DC) because of its abnormal income in comparison to other states, there are 50 of the host states, and 8 of the source countries.

4.1.3. Center for Systematic Peace

Data for $POL_{2008,s}$ is taken from the Center for Systematic Peace.

4.1.4. U.S. Department of Agriculture and U.S. Census

Population estimates for $\ln(POPUS_{2008})$ and $\ln(POPSEA_{2008})$ are from the U.S. Department of Agriculture (for source countries) and the U.S. Census (for U.S. states).

4.1.5. CEPII Research Center

The distance between the source country and the U.S. states, $\ln(DIST_{s,h})$, is constructed using the Haversine distance formula and latitude/longitude data from the CEPII Research Center (for capital cities of the source countries) and the U.S. Census (for U.S. state capitals).

4.1.6. Heritage Foundation

The data for $CORR_{2008}$ is taken from the Corruption freedom index for year 2008, provided by the Heritage Foundation Data.

4.1.7. Bureau of Labor Statistics and International Labor Organization

Unemployment rate data for $URUS_{2008}$ and $URSEA_{2008}$ are taken from Bureau of

Labor Statistics (for U.S. states) and International Labor Organization (for source countries).

The mean and standard deviation of each variable are reported in Table 1. Additional reported information includes the average age, gender and educational attainment level composition for high-skilled immigration flow. From the summary statistics, it is observed that the flow tends to include more male than female. Furthermore, the flow tends to include people with at least an associate degree than people with no college degree.

Table 1: Descriptive statistics (400 observations)				
Variables	Mean	St Dev	Min	Max
Migration Flow $F_{2009,s,h}$	262.225	819.2965	0	9530
Migration Flow (high-skilled) $F_EDU_{2009,s,h}$	110.565	329.811	0	3639
Real U.S. states GDP, in thousands, 2008	41.985	7.631	29.708	61.673
Real source country GDP, in thousands, 2008	4.432	5.989	0.744	19.716
GDP differentials $DELGDP_{2008,h,s}$, in thousands	37.552	9.701	9.991	60.928
Major violent episodes $POL_{2008,s}$	1.000	1.501	0	4
$STOCK_{2008,s,h}$	14,057	55,593	0	780,470
$POPUS_{2008}$, in millions	6.075	6.734	0.532	36
$POPSEA_{2008}$, in millions	240.141	442.515	27	1320
$DIST_{s,h}$ in miles	10,938	974	8343.38	12434.48
Corruption freedom index $CORR_{2008}$, source country	33	12	19	51
Unemployment rate in U.S. States, $URUS_{2008}$, %	5.3	1.236	3.1	8.3
Unemployment rate in source country, $URSEA_{2008}$, %	5.223	2.866	1.2	9.4
Income inequality in U.S. states, $IIUS_{2008}$	8.399	0.881	6.949	10.76

4.2. Econometric test of the theory

The analysis models the flow of immigrants from source country s to a host state h in year 2008 as specified in the previous chapter. The analysis first looks at the broad immigration flow, and will look at the high-skilled flow after. Table 2 shows the baseline results. Following Simpson and Sparber (2011), the analysis considers three estimation techniques: columns 1 and 2 consider only non-zero immigrant flows and estimates the regression model using truncated OLS; columns 3 and 4 include all immigrant flow by adding one to the flow variable before taking the natural log and then employing OLS; column 5 and 6 use the Eaton-Tamura technique.

Independent variables	$\ln(F_{s,h})$		$\ln(1 + F_{s,h})$		Eaton-Tamura	
	Coef	Standard Error	Coef	Standard Error	Coef	Standard Error
$DELGDP_{2008,h,s}$	1.57e-05	1.36e-05	4.24e-05***	1.49e-05	8.32e-05**	3.55e-05
$POL_{2008,s}$	0.192**	0.091	0.049	0.120	0.365	0.262
$\ln(STOCK_{2008,s,h})$	0.229***	0.053	0.242***	0.051	0.987***	0.162
$\ln(POPUS_{2008})$	0.292**	0.116	1.011***	0.146	1.797***	0.342
$\ln(POPSEA_{2008})$	0.314***	0.084	0.279**	0.138	0.083	0.270
$\ln(DIST_{s,h})$	3.316**	1.575	9.538***	1.611	21.103***	4.167
$CORR_t$	0.016	0.014	0.040**	0.019	0.068*	0.413
$URUS_t$	0.020	0.079	(0.095)	0.099	(0.210)	0.225
$URSEA_t$	0.003	0.058	0.055	0.069	(0.039)	0.153
$IIUS_t$	0.032	0.103	(0.084)	0.144	(0.446)	0.310
Observations	165		400		400	
R^2	0.4580		0.4773		0.1995	

Note: * significant at 10%; ** significant at 5%, *** significant at 1%

4.2.1. Truncated model

From the results, one can observe that the political factor contributes to the immigration flow. As the analysis uses the number of political violence episodes as a

proxy for the political factor, the result follows the hypothesis. Particularly, as the number increases by 1 episode, the outflow of residents to other places increases by 0.192%, all else constant. This is also in line with Beine et al. (2008).

The natural log of the immigrant stock also plays an important role as the coefficient for the variable is significant at the 1% level. As the immigrant stock in the host state increases by 1%, the immigration flow increases by 0.229% on average, holding all else constant.

In addition, the coefficients for the population of the host state and the source country are 0.292 and 0.314 respectively, and are both significant at the 5% level and 1% level, respectively. As the population in the source country increases by 1%, the immigration flow to other places increases by 0.314%, holding all else constant. Since the source country in this analysis tends to have a relatively higher population density, this might imply that residents need to find a place where they are offered better living standards that are not achieved in the source country where it is overly populated. Meanwhile, as the population in the host state increases by 1%, the immigration flow to that state increases by 0.292%, all else constant. This suggests that immigrants tend to be attracted to relatively higher-populated states, possibly because of the job prospects.

Interestingly, while the coefficient for the distance is significant at the 5% level, the coefficient is positive, meaning that as the distance between the two places increases, there will be more immigrants flowing into the host states. This contradicts the literature review by Beine et al. (2008) which says that the increase in distance presents economic costs, thus reducing the number of immigrants.

4.2.2. Scaled Ordinary Least Square (SOLS)

The analysis now looks at the scaled observations, in which a value of 1 is added to the zero-flow. While the regression implies a similar result for the independent variables of the distance and observation, one can observe that in this model, the coefficients for the political factors are not significant anymore. Instead, one can see that the coefficient for the GDP per capital differentials of the host country and the source country is significant at the 1% level, suggesting that as the difference in GDP level between the host country and source country increases by \$1,000, the immigration flow increases to the host country increases by 0.0424%. Interestingly, the coefficient for the corruption freedom index is positive and significant at the 5% level. The lower corruption freedom index implies the more corrupted the source country, which gives residents the incentives to migrate to a less corrupted place. A possible reason for this positive relationship is, because the countries in the study generally have low economic freedom (with the exception of South Korea), a minor change in the economic freedom (by a few points in the index) does not necessarily bring the country into a different category with respect to the level of economic freedom.

4.2.3. Eaton-Tamura

The analysis now continues with the Eaton-Tamura method, which uses the Tobit regression model. Similar to the SOLS, the coefficient for the political factor is not significant, while coefficient for the difference in GDP is. However, this regression model provides a somewhat different result from the SOLS, because while the coefficient of the population of the source country is not significant, the coefficient of the immigrant

stock remains significant at the 1% level, which is in line with the truncated model as well as the literature review provided by Simpson and Sparber (2011).

As the analysis wants to examine the brain drain caused by the immigration of high-skilled workers, the analysis will now continue with a more specific population, specified by immigrants with at least an associate degree, to determine the effects of state-level economic factors.

4.3. High-skilled population

Similar to the previous empirical results, this analysis also uses three different techniques in analyzing the relationship between the independent variables and the dependent variables. Table 3 presents the results.

Independent variables	$\ln(F_edu_{s,h})$		$\ln(1 + F_edu_{s,h})$		Eaton-Tamura	
	Coef	StDev	Coef	StDev	Coef	StDev
$DELGDP_{2008,h,s}$	2.41e-05	1.73e-05	4.66e-05***	1.32e-05	10.8e-05**	5.08e-05
$POL_{2008,s}$	0.205*	0.099	0.223**	0.106	0.829**	0.352
$\ln(STOCK_{2008,s,h})$	0.301***	0.056	0.137***	0.046	1.157***	0.230
$\ln(POPUS_{2008})$	0.433***	0.127	0.922***	0.130	2.320***	0.470
$\ln(POPSEA_{2008})$	0.302***	0.089	0.613***	0.122	0.999***	0.345
$\ln(DIST_{s,h})$	1.428	1.759	5.966***	1.428	19.998***	5.806
$CORR_t$	0.055***	0.019	0.061***	0.017	0.128**	0.059
$URUS_t$	(0.009)	0.093	(0.073)	0.088	(0.239)	0.311
$URSEA_t$	0.110*	0.064	0.098	0.062	0.179	0.215
$IIUS_t$	(0.229)*	0.131	(0.0008)	0.127	(0.278)	0.428
Observations	105		400		400	
R^2	0.4883		0.4188		0.2302	
Note: * significant at 10%; ** significant at 5%, *** significant at 1%						

4.3.1. Truncated model

The results from the truncated model show that the coefficients for the immigrant stock, the population of host state as well as the source country, and the political factor (demonstrated by the number of major violent episodes) are significant. These results are thus similar to those from the total population. Interestingly, the results also provide that the coefficients for corruption freedom, unemployment rate in the source country, and income inequality in the host state are significant. The positive relationship between the corruption freedom and the immigration flow has been explained in previous section. The coefficient for unemployment rate in source country is positive, which goes in line with the hypothesis that the immigration tend to migrate when they see that their job prospects are hurt by the rising unemployment rate. Specifically, as the unemployment rate in source country increases by 1%, the immigration flow increases by 0.11. With regards to income inequality, the coefficient is (-0.229), implying that, as the ratio between the accrued income of top 10 to bottom 20 of a specific state increases by 1, the immigration flow decreases by 0.229%. This suggests that the immigrants look for a more balanced life where income inequality prospect is better.

4.3.2. Scaled Ordinary Least Square (SOLS)

The result from the SOLS method gives some more insight into the influence of economic factor on the flow of immigrants. The coefficient for GDP per capita differentials is positive and significant at 1%, signaling that as the GDP per capita of the host state increases by \$1,000 relatively to that of the source country, the immigration flow to that specific state increases by 0.0466%. Similar to SOLS regression done on the total population, the coefficients for population of both the host state and the source

country, as well as the distance from the host state to the source country are significant with similar implications. Meanwhile, the SOLS regression does not shed light into the influence of the professional factors on the decision to migrate of the high-skilled workers.

4.3.3. Eaton-Tamura

The Eaton-Tamura method yields similar results to the SOLS regression.

4.4. Conclusion

The empirical results demonstrate that for the total immigrant population from 8 countries in the analysis, the Scaled Ordinary Least Square (SOLS) method provides more insights into the factors affecting the flow of the immigrants as the coefficients are significant at a higher level than the other methods. These significant factors include the GDP per capita differentials between the source country and the host state, the immigration stock, population of the U.S. state, population of the source country, distance between the source country and the host state, and the corruption of the source country.

The result shows that there is a positive relationship between the immigrant stock and the immigration flow in a particular state, which suggests that people are more likely to migrate to parts of the country where there is already a network of immigrants from the same source country.

A closer look at a more specific immigrant population, the high-skilled one (defined by immigrants with at least an associate degree, and this population is about 44% of the total immigrant population) demonstrates an interesting finding. That is, the truncated model, in comparison to the Eaton-Tamura model and the Scaled Ordinary

Least Square model, provides significant coefficients for the economic factors.

Interestingly, the coefficient for the corruption freedom of the source country presents a unique case in which it contradicts the literature review. Preliminary data shows that the majority of the high-skilled immigrants move to big states that are known to attract international students due to the intensity of the higher education system (New York, California, Pennsylvania, Texas, and Illinois). Major cities in these states are also known to be the job-hub, which furthers the hypothesis that high-skilled immigrants migrate due to the job perspectives, especially in recent years more and more international college students find jobs in the U.S. right after graduation and eventually migrate.

Furthermore, there seems to be a positive relationship between the distance from the source country to the host state and the flow of immigrants, which does not follow what has been suggested by Beine et al. (2008).

CHAPTER 5: CONCLUSIONS

The thesis aims to identify factors that affect immigration flow into 50 U.S. states (excluding District of Columbia because of its exceptionally high income). The thesis adds to the existing literature on the subject by focusing on the main countries in the East Asia region and studies the recent U.S. immigrants coming from these countries. Furthermore the thesis also looks at not only the broad immigration population but also the high-skilled immigrants to study the determinants of these workers' decision to migrate, in order to recommend policy to source country's government to reserve brain drain.

The independent variables used by this analysis are divided into five (5) categories: economic factors, political factors, demographic factors, social factors, and professional factors. By looking at the broad immigration population from China, Indonesia, South Korea, Malaysia, Myanmar, Philippines, Thailand, and Vietnam, the empirical results demonstrate that the most influential factors affecting flow of immigration are the GDP per capita differentials between the host state and the source country, the immigration stock or the number of immigrations already residing in a specific state for more than a year, the political factor of the source country, and the population of both the source country and the host state.

By looking at the high-skilled immigrant population, the result shows that, besides from factors that affect the total population, the high-skilled immigrant population is also sensitive to economic factors including the income inequality of the host state, and unemployment rate in the source country. On the other hand, income inequality in the U.S. has a negative effect on the immigration flow, suggesting that the

immigration flow looks for a more socially balanced lifestyle.

It is also rather interesting to observe that the distance between the destination and the origin have a positive effect on both the total immigrant population and the high-skilled population, which contradicts the previous study done by Beine et al. (2008).

Furthermore, as the income inequality in the U.S. has a negative effect on the immigration flow, meaning that the immigrants tend to look for states with a lower income inequality index, the source country can look into improving the income inequality in their country. This can be done by improving the living standards of the poor, which can be done through various means of economic empowerment. As job prospect in the source country and the immigration stock in the host state also influences the immigration flow, the government can grant immigrants living abroad incentives to come back and invest in the country (similar to the case of Korea), which in turn creates job prospects for the residents.

One of the limitations that the analysis encounters includes the lack of immigration data. The analysis can only be performed on people who already migrated and might/might not have become a citizen, yet it does not account for people who have migrated to the U.S. and decided to come back to their source country, or to move to another country. This will serve as a limitation to the immigration analysis for quite some time as this type of data is not readily available yet. Princeton University has spearheaded a project aiming to answer this question but it is still a pilot project, and the data is only limited to one wave of immigration.

In order to expand the empirical research, the analysis might be able to look into ACS data from year 2000-2008 to get a broader pool of observations, thus helping the

results to be more statistically significant. By expanding the number of observations, the analysis can also take into consideration the destination and origin effects. This analysis does not include the destination and origin effects because the preliminary round of testing with dummy variables created for 8 countries was rather insignificant. An increase in the number of parameter estimates for a small sample affects the degree of freedom, which can be mitigated by including a bigger sample.

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