

Factors Affecting Brain Drain of Sri Lankan Engineers

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Abstract

Migration has been a feature of mankind, from the dawn of civilization. In the modern day migration, skilled migration that referred to as brain drain has become a prime topic of discussion. In the context of Sri Lanka, under skilled migration, migration of engineers can be identified as a major problem to the country.

The main objective of the paper is to identify the factors affecting brain drain of engineers graduated from 2006 to 2016 based on 3 main areas, holding (factors holding engineers from migrating), leaving (factors affecting leaving decision for migrating) and returning factors (factors affecting migrant engineers to return back to the country) under endogenous and exogenous sub categorization.

The factor identification was done by a pilot survey via interviews, using qualitative analysis, with a sample of 12 engineers, selected with convenient and snowball sampling techniques. The dominance of each factor is ascertained by an online questionnaire, from a sample of 264 engineers, selected through simple random sampling, using mixed analyzing techniques.

It was revealed that 49% of the participants are in the process of migration. Further in results, 47 factors were identified under the 3 main areas of migration decisions. Out of decision to stay (holding factors), exogenous factors were dominant over endogenous factors. Out of the decision to leave (leaving factors), endogenous factors were dominant over exogenous factors. Out of the decision to return (returning factors), exogenous factors were comprehensively dominant over endogenous factors.

Keywords; brain drain, skilled migration, engineers, Sri Lanka.

Introduction

Since the dawn of civilization, from the time when the ancient human beings moved to Asia from Africa, in 70,000 BC, the story of mankind has been featured with migration (National Geographic Society, 2017). With the formation of great civilizations such as Indus valley, Egyptian, etc. strong centers of knowledge, power and culture were formed, that promoted both inward migration by attracting people from other nations and outward migration by expanding territories through conquering of other nations (Ancient History Lists, 2016). These migrations helped to transfer knowledge, capital and labor across the nations, benefitting both donor and receiving countries, since there were no scarcity of resources.

In the modern day world, migration is not as simple as it was in the past. As at 2015, 244 million international migrants were recorded with an increase of 29.5% compared to 2000. USA, Germany, Russian Federation, Saudi Arabia, United Kingdom, UAE, Canada, France, Australia and Spain are the top 10 countries hosting the highest number of international migrants (United Nations, 2016). These are developed countries with high income category (World Bank, 2013). India, Mexico, Russian Federation, China, Bangladesh, Pakistan, Ukraine, Philippines, Syria and Afganistan are the top 10 donor countries of international migrants (United Nations, 2016). Except for China and Russian Federation, these donor countries are developing countries with lower or middle income category (World Bank, 2013). Hence the migration trend of the modern world is mainly from developing countries to developed countries.

After the 2nd world war that ended in 1945, there was a boost in the economies of Europe, America and East Asia, as a result of the massive development of the industrial sector (Zeitlin, 2000). Subsequently, extensive demand and opportunities were created for the skilled human capital. Nevertheless, most of the human capital was badly destroyed by the war, a gap was created between demand and supply of skilled workforce. As a way out, policy alterations were done by these countries to attract skilled workforce of the other countries, triggering significant flow of skilled migration (Hollifield, 1992).

This category of migration, where professionally, technologically and academically qualified (skilled and educated) persons migrating to developed or fast developing countries from their own under developed countries, is referred as brain drain (Cambridge University Press, 2017). The introduction of the term, brain drain, was initially demarcated in 1963 by Royal Society, United Kingdom, as the migration of scientists to USA from UK, forming substantial negative economic consequences to UK (Plume, 2012). Subsequently, the term was used, to describe migration of skilled professionals in general.

Numerous factors can be identified, that promotes brain drain. One major factor is the development of the higher education system of most of the countries to global standards, which are defined by different international bodies. Most of the higher education institutions and universities in various countries are inter-connected and the qualifications awarded through these institutions are globally recognized. Further, most of these education programs in developing countries are not conducted in their native languages, but conducted in English medium. Hence there are no qualification or language barriers for these professionals, and they can work anywhere in the world, as global professionals.

Another major factor that can be identified, is the immigration policies adopted by developed countries to draw more skilled professionals. As an example, Australia has introduced their own targets to attract scientists, engineers, doctors and other professionals by lowering the discrimination against skilled immigrants over others (Commonwealth of Australia, 2014).

The contradictory question is whether the professionals created in developing countries, by the education systems, are suited to cater the actual requirements of these countries. In other words, up to what level, these professionals could use their full potential, knowledge and skills, if they work and stay in their mother country, against the low economic and technological condition of the particular country. These professionals may use their full potential, knowledge and skills, if moved to a developed country. In addition, they could obtain higher remuneration and living standards.

Brain drain has been recognized as a problem in Sri Lanka since 1960s (Anas & Wickremasinghe, 2009). Further, there was a huge contribution for brain drain of

especially for Tamil professionals, by the civil war which continued for about 20 years in Sri Lanka (Gallina, 2007).

It is assessed that, there are more than 2 million Sri Lankans migrated to other countries for foreign employment and number of migrations in 2015 alone is 263,307 (Ministry of Foreign Employment, 2015). This is a drop of 12.4% with reference to 2014. But considering skilled migration, during 2015, 6,257 number of professional have migrated, which is an increment of 16% from previous year (Central Bank of Sri Lanka, 2015).

Hence, annually more than 5,000 professionals, who play top leadership roles in both private and public sector organizations, migrate from Sri Lanka. These professionals comprises with scientists, engineers, management executives, lawyers, doctors, etc.

Out of these professionals, more than 40% are in the field of engineering and the trend of migration is increasing at a rapid rate after 2009 (Ministry of Foreign Employment, 2015).

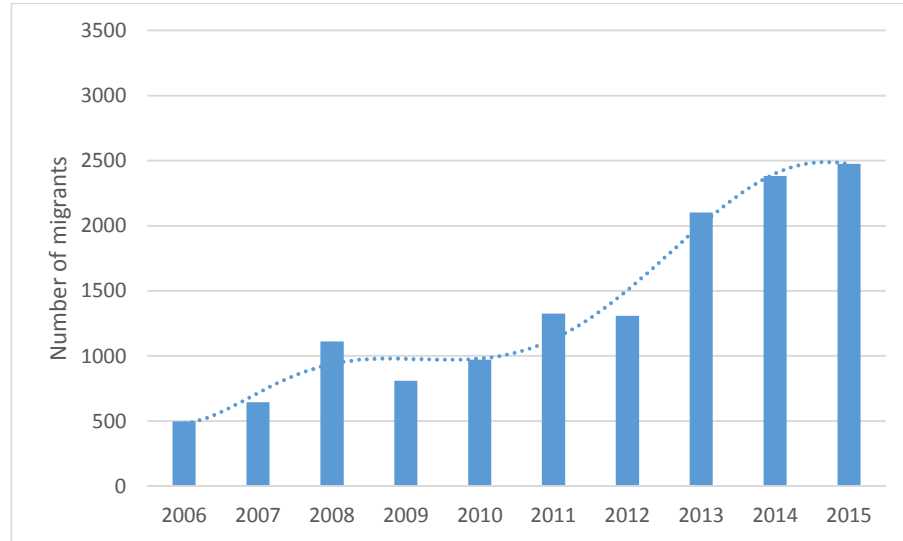


Figure 1: Annual migrations from Sri Lanka in the field of Engineering
(Ministry of Foreign Employment, 2015)

Sri Lanka is a country where free education is established. By 2015, there were 10,144 government schools, with 233,883 school teachers for 4,129,534 students (Statistics

Branch - Ministry of Education, 2015) and 15 government universities with 5,897 lecturers for 123,134 undergraduate and postgraduate students (University Grants Commission - Sri Lanka, 2015). Funding for this massive education system is totally done by the government, which is 7% to 9% of the government expenditure (Central Bank of Sri Lanka, 2015). Engineers are a valuable product of this massive investment of free education system.

Apart from that, out of about 300,000 students who sit for GCE (O/L), about 80% get through for GCE (A/L), from GCE (A/L) about 50% qualify for university, but due to restrictions in the universities only 10% enter into universities. Less than 0.5% with best results enter into government engineering faculties (Statistics Branch - Ministry of Education, 2015). Hence after going through a tough filtering process, government universities accept only 0.5% of students to become engineers. Hence only some of the best students with best brains can become engineers through this system and these brains should take the leadership role on countries development targets.

It is clear that engineers are a valuable asset to the country, and number of engineers are migrating from Sri Lanka with an increasing trend, that can be considered as a national level problem. Why these engineers migrate to other countries? In more elaborated words, what are the factors affecting the decision to stay and work for the county, migrate or return migrate?

Through this paper, it is expected to find answers to these questions. For the purpose of limiting the boundaries, the consideration is only based on the BSc Engineering degree holders, who graduated from government universities, during the last 10 years from 2016 (2006 to 2016).

The objective of the research is to identify the dominant factors affecting migration of engineers, graduated during the specified period of time from local universities. These factors are identified from 3 areas; holding factors, leaving factors and returning factors.

- Holding factors are factors affecting engineers to stay in the county without migrating. In other words, engineers who have not migrated and have no intention to migrate, have selected that decision so because of holding factors.
- Leaving factors are the factors affecting engineers to migrate to other countries. In other words, engineers who have migrated or have intention to migrate, have selected that decision because of leaving factors.

- Returning factors are the factors affecting engineers to return back to the country, after migrating to another country. In other words, migrant-engineers who have returned back or have intention to return back, have selected that decision because of returning factors.

In all these 3 areas, factors will be identified through factor categorization of endogenous and exogenous factors. Endogenous factors are industry related factors while exogenous factors are outside the industry related factors.

The other objective is to ascertain the dominant factors in each area out from endogenous and exogenous categorization.

Literature review

Brain drain or skilled migration is a prime topic of discussion with ample of literature on different theoretical and practical aspects. Considering the fact that the aspects of the engineering profession is similar to other professionals, the general literature on brain drain can be used to analyze the different approaches.

One school of literature describes skilled migration as a beneficial phenomenon. Migration promote use of professionals to the maximum advantage in global context (Kuhn & McAusland, 2006). Most of the latest technological advancements have been performed by migrant professionals to developed countries from developing countries benefiting entire world (Saxenian, 2006). Economic growth can be achieved for the source region through human capital formation (Ha, et al., 2016), a brain bank with a diaspora effect (Agrawal, et al., 2011), circular migration (Boncea, 2015), return migration (Dustmann, et al., 2011) and remittances (Docquier & Rapoport, 2012). Similar studies have done in Sri Lanka (Karunaratne, 2007) on receiving remittances as foreign exchange from skilled migrants.

There is another school of literature that discuss on the negative impacts of brain drain. Negative consequences (McCulloch & Yellen, 1977), vicious cycle of brain drain (Benassy & Brezis, 2012) and shortage of skilled professionals (Mackey & Liang, 2012) were analyzed in these literature.

The controllability of brain drain is discussed by another school of literature. These include, brain drain tax (Bhagwati & Hamada, 1982), developed tax models (Wilson, 2008), use of mentoring (Geber, 2013), cost of remittances verses benefit analysis (Hussain, 2015), etc. to control skilled migration.

Other literatures could be found that discuss the different dimensions of brain drain such as, internal brain drain (Petrin, et al., 2014) and brain drain from developed countries like Italy (Biondo, et al., 2012) and Germany (Cuhls, 2007).

Apart from all these schools of literature, there are significant amount of literature on factors affecting brain drain, which is the subject are of this paper.

During early studies on factors affecting brain drain, it was identified that the migration patterns are correlated with earnings. In other words, if remittances for the professionals are higher than the parent countries, professionals tend to migrate (Borjas, 1987). Accordingly it was highlighted that remittances are the only reason behind brain drain.

Nevertheless, later researches introduced more multifaceted models on factors affecting brain drain, such as the push-pull and endogenous-exogenous model presented in a study on brain drain of doctors to Australia from South Africa (Oberoi & Lin, 2006). Push factors stand for the reasons that push the persons from the mother nation, for example political influence, corruption or insufficiency of conditions. On the other hand, pull factors stand for the reactions of the persons on superior conditions of another country, causing them to migrate. The paper highlight another factor categorization as endogenous and exogenous factors. Endogenous factors are created inside the particular system of industry and exogenous factors are created external to the particular system of industry.

The same push-pull categorization was employed with Migration Systems Theory, to four categories; not migrating, intention to migrate, in the process of migrating, and already migrated, to determine the brain drain patters from Jamaica (Parkins, 2010). The main factors were identified as social and economic opportunities, education skill mismatch, crime and violence, etc.

Number of literature could be found on factors affecting the leaving decision of skilled migrants. A negative relationship was identified on highly cited researchers migrating to developed countries, compared with per capita GDP, population and education level

of the home state (Weinberg, 2011). When migration of skilled health workers from sub-Saharan Africa countries to UK and USA from 1975-2004 is considered (Okeke, 2013), migration of physicians increase by approximately 3.4 to 3.6%, in the following period, relating to a decline of temporary 1% in GDP per capita. The effect was significant over economic condition, of underdeveloped states with reference to the physician migration. After recession, physicians from Greece started to migrate due to limitation of budgets for researches, over-taxation, reduction of income and insecurity of jobs, as a result of the country's economic crisis (Ifanti, et al., 2014). In a similar study (Nurse, 2004), it was highlighted that, prime factors of skilled migration as economic decline, poverty and social displacement, widening inequality, crime and political crisis in underdeveloped countries.

Further studies could be found on exogenous or macro-economic factors that affect skilled migration. When international migration data was analyzed from 1990 to 2000 (Docquier, et al., 2007), a strong negative correlation have been identified, between the population of the country on percentage of skilled migrants. In other words, underdeveloped countries having thin population shows a higher percentage of contribution on skilled migration. Apart from that, for countries with instable political conditions and fractionalized religious and ethnic status, greater brain drain rate is observed. On the other hand, the pattern of skilled migration is higher from countries with nearby proximity to developed countries (such as OEDC countries).

In the context of Sri Lanka, economic fluctuations after Tsunami and the civil war were the major contributors of exogenous factors for brain drain, by 2007 (Gallina, 2007).

Another set of literature claim that industry related micro economic or endogenous factors are more dominant on brain drain. Other than the gaps in remittances numerous other reasons were found that affect the migration choice of stay, migrate or return during a study on Africa (Clemens, 2009). The main factors affecting migration are endogenous factors such as progression of professional career and exogenous factors such as gaps in work facilities and safety for the families, rather than gaps in the income. Similar results were obtained from Pacific region (Gibson & McKenzie, 2011), that there were more motivation to migrate by factors related to career objectives (such as specialized governance and prospects to conduct research) and factors associated with family and quality of living standards, than financial benefits.

With reference to the pull factors, the consideration on selection of the country is based on the absolute difference of remunerations between low and high skilled workers, instead of comparative return to proficiency (Grogger & Hanson, 2011). The destination country is selected referring to several factors, other than remunerations and rates of unemployment. Endogenous factors such as the employment protection and coverage of unions and exogenous factors such as unemployment benefits, education system and health care, has extensive impact on the selecting the country (Geis, et al., 2008). According to international migration branch, Geneva, the pull factors created by policy changes in developed countries such as recruitment policies, employment conditions, remunerations and better information, motivate skilled migrants to look for career opportunities in developed countries (Lowell & Findlay, 2001). In addition, internal brain drain from provinces or states of thin population and international brain drain from countries with thin populations showed similar rates. Hence skilled migrants are more attracted to highly populated areas (countries, provinces or states) from thin populated areas (Clemens, 2009).

Not many literature could be found on returning factors. In Philippine, return-migration rate has a correlation with exchange rates, where the return rate of migrants reduce by 1.4%, for 10% improvement of exchange rate (Yang, 2006). Hence the economic condition of the parent nation has an influence over return migrants.

Brain drain and factors affecting brain drain had been a topic of interest in Sri Lanka since late 1970s (Nesiah, 1978). These initial literature discussed on policy level issues (exogenous factors) that need to be addressed such as international agreements on controlling skilled migration. By 2010, brain drain of Sri Lankan scientific community was analyzed using push-pull factor categorization (Anas & Wickremasinghe, 2010). Better career prospects and further studies were identified as major endogenous factors affecting these migrations. The majority of migrants out of these scientific communities are in the field of engineering while the main hosting countries were USA and Australia. The majority of migrants have stated that they have an intention to return back, if the anticipated demands are sufficiently fulfilled.

In general, there are several factor categorizations on factors affecting brain drain in different literatures. Subsequently, the factor categorization used for this research is as illustrated bellow;

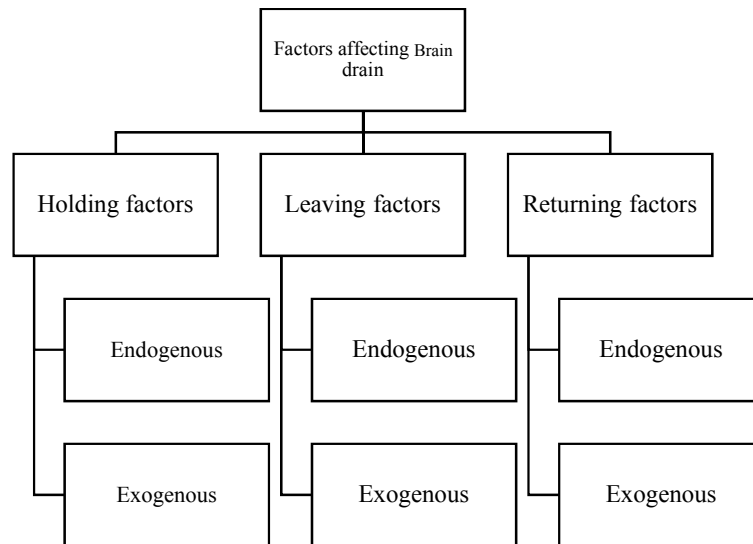


Figure 2: Selected factor categorization

Methodology

The total population for the research is 12,332 engineers graduated from Sri Lankan government universities from 2006 to 2016 (University Grants Commission - Sri Lanka, 2015).

The research was conducted in two parts.

Part 1

Part 1 is a pilot survey that was conducted to recognize the factors affecting skilled migration under areas of holding, leaving and returning decisions. The sample was selected using convenient and snowball sampling techniques out of the specified population. 12 engineer were selected using mentioned techniques, comprises of 6 non-migrant, 3 migrated and 3 return-migrant engineers. 15 to 20 minutes of semi-structured one on one interviews were conducted in order to collect the primary data. Open ended questions were given and the questionnaire was designed to identify the big picture in detail. Notes were taken in a pre-designed format.

Qualitative data analysis techniques were used, to analyze the data for the purpose of finalizing a list of factors in each area, by converging similar reasons (factors) to form single factors each, independent of each other.

From part 1 of the survey, it is expected to identify;

l amount of holding endogenous factors symbolized by $HoEn_1, HoEn_2, \dots, HoEn_l$

m amount of holding exogenous factors symbolized by $HoEx_1, HoEx_2, \dots, HoEx_m$

n amount of leaving endogenous factors symbolized by $LeEn_1, LeEn_2, \dots, LeEn_n$

p amount of leaving exogenous factors symbolized by $LeEx_1, LeEx_2, \dots, LeEx_p$

q amount of returning endogenous factors symbolized by $ReEn_1, ReEn_2, \dots, ReEn_q$

r amount of returning exogenous factors symbolized by $ReEx_1, ReEx_2, \dots, ReEx_r$

Part 2

Part 2 is an online survey that was conducted to determine the dominant factors in each area under endogenous and exogenous factor categorization. A sample of 264 engineers were selected through simple random sampling techniques with a confidence level of 90% and margin of error of 5%.

Primary data collection was done through an online questionnaire from the selected sample. The questionnaire was designed with close ended questions consists of priority selection boxes and selective drop down lists. The answers to the questions were logged in an excel sheet, in tabular format. All the finalized factors identified during the part 1, was included to the questionnaire, to rank from 1 to 5 in priority selection boxes.

For part 2, the determination of the dominance of factors was conducted with a sample of N engineers as described below;

According to the priority marked by the survey participants, under each factor, it was weighted (w) as zero points to no priority, 1 points to priority 5, 2 points to priority 4, 3 points to priority 3, 4 points to priority 2 and 5 points to priority 1.

The weight received by i^{th} factor by j^{th} participant is designated by " $factor_i w_j$ "

For example: for the i^{th} leaving exogenous factor the weight given by j^{th} participant is designated by $LeEx_i w_j$ consists of an integer value from 0 to 5)

By using these, the dominance percentage is defined for each factor. For example, the equation for calculation of dominant percentage for leaving exogenous factors is;

$$\text{Dominance percentage } LeEx = \frac{\sum_{j=1}^N \sum_{i=1}^p LeEx_i w_j}{\sum_{j=1}^N \sum_{i=1}^n LeEn_i w_j + \sum_{j=1}^N \sum_{i=1}^p LeEx_i w_j} \times 100\% \quad (1)$$

For all the other factors (*HoEn*, *HoEx*, *LeEn*, *ReEn*, *ReEx*), the dominance percentages were calculated using the same method. The result are used to compare the dominance of factors, compared with each other, in line with the stated objectives.

Example, dominance of endogenous verses exogenous factors on leaving decision can be compared using dominance percentages *LeEn* Vs. dominance percentage *LeEx*.

Apart from that, the dominance percentage of I^{th} leaving exogenous factor (*LeEx_I*) out of total leaving exogenous factors is;

$$\text{Dominance percentage } LeEx_I = \frac{\sum_{j=1}^N LeEx_I w_j}{\sum_{j=1}^N \sum_{i=1}^p LeEx_i w_j} \times 100\% \quad (2)$$

Data Analysis

Ascertaining of holding, leaving and returning factors were conducted distinctly though non-migrants, migrants and return-migrants of the sample.

The holding factors were ascertained through responses of the 6 engineers who are non-migrants. Accordingly 16 holding factors with 8 endogenous and 8 exogenous factors were ascertained that hold engineers to the country.

Table 1: Holding factors

#	Factor	Category
1	Patriotism	Exogenous factors
2	Family commitments	
3	Simple working culture	
4	Cultural influence	
5	Age restrictions	
6	Health restrictions	
7	Legislative issues	
8	Policy restrictions	

9	Job satisfaction	Endogenous factors
10	Income satisfaction	
11	Restriction to change the job stability	
12	Fear of career uncertainty	
13	Capacity limitations	
14	Employer bonds	
15	Uncertainty on matching qualifications	
16	Legislative flexibilities and freedom over professionals	

The leaving factors were ascertained through responses of the 3 engineers who are migrants. Accordingly 16 leaving factors with 8 endogenous and 8 exogenous factors were ascertained that promote engineers to migrate.

Table 2: Leaving factors

#	Factor	Category
1	Lack of job satisfaction	Endogenous factors
2	Higher remuneration and wages	
3	Opportunity for education and career development	
4	Poor work conditions	
5	Use of full potential	
6	Freedom to work	
7	Work recognition	
8	Different career part	
9	Obtain experience and return back	Exogenous factors
10	Quality of life	
11	Explore the world	
12	Political influence and corruption	
13	Better opportunities for children	
14	Friend/family influence	
15	Change monotonous life	
16	Access better elderly healthcare	

The returning factors were ascertained through responses of the 3 engineers who are return-migrants. Accordingly 15 leaving factors with 4 endogenous and 11 exogenous factors were ascertained that promote engineers to return.

Table 3: Returning factors

#	Factor	Category
1	High Taxation	Exogenous factors
2	High living expenditure	
3	Legislative restrictions	
4	Family commitments	
5	Cultural issues	
6	Patriotism	
7	Miss-match of lifestyle	
8	Differentiation	
9	Maturity	
10	Loneliness	
11	Legal restrictions (other)	
12	Job de-satisfaction	Endogenous factors
13	High work load	
14	Not finding a job	
15	Legal restrictions (time bound)	

Reference to the data analysis of part 2, following charts illustrates the descriptive analysis of the demographics on the sample for the online survey;

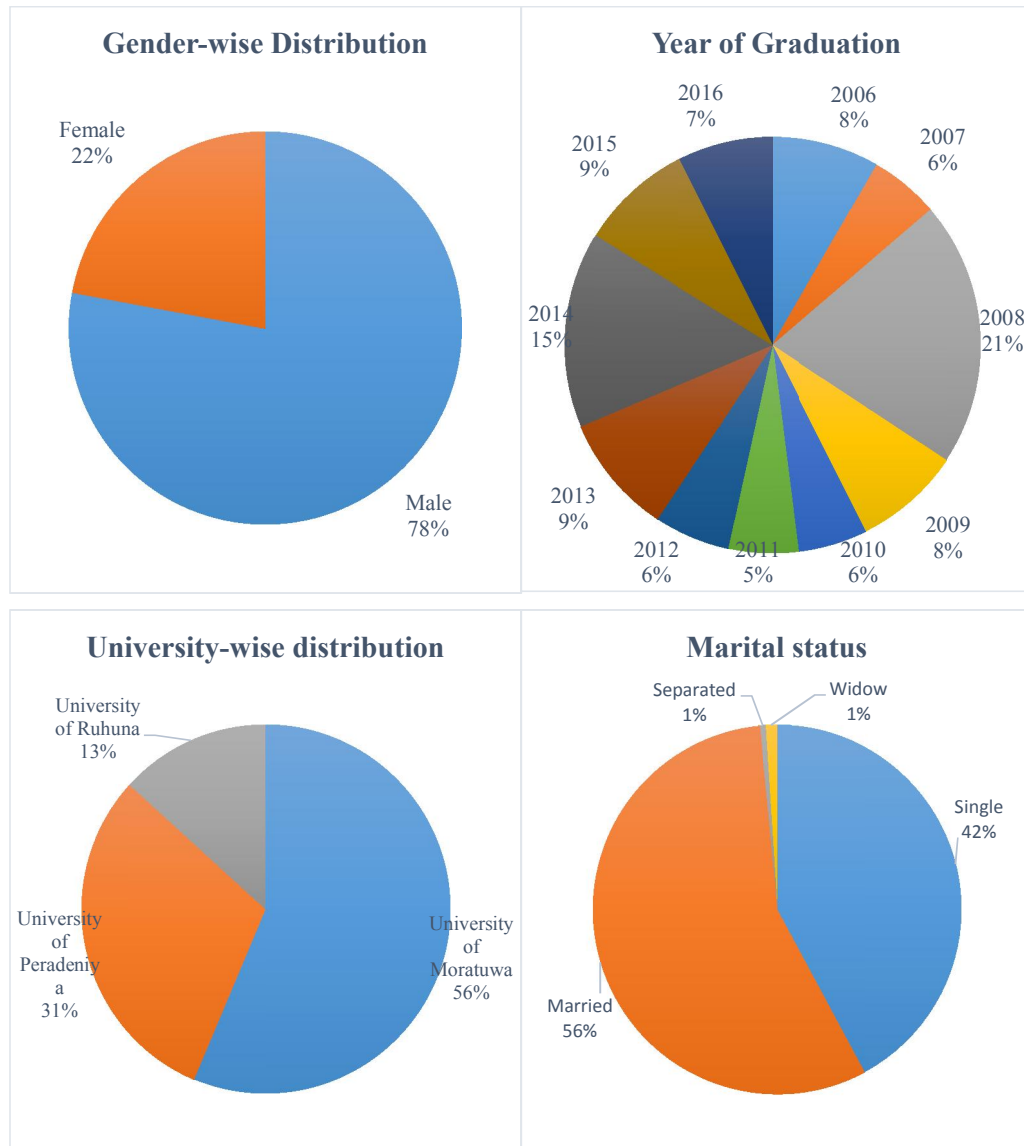


Figure 3: Demographic distributions

From the total sample 81% are non-migrants and 19% have already migrated. Out of non-migrants 31% (20% from the total sample) have intention to migrate. Hence 49% of the total sample of engineers (19% migrated and 20% intention to migrate) are in the process of migrating. 46% of the total sample have no intentions to migrate. 5% from the total sample are return-migrants. Out of migrants 44% (8% from the total sample) have intention to return someday, while 56% (11% from the total sample) have no plans to return.

According to the results, out of holding factors, prime dominance is with exogenous factors (65%) over endogenous factors (35%). When exogenous factors are considered, family commitments is leading (38%) while patriotism (30%) and simple working culture (15%) placed 2nd and 3rd positions.

Leading endogenous holding factor is Job satisfaction (39%).

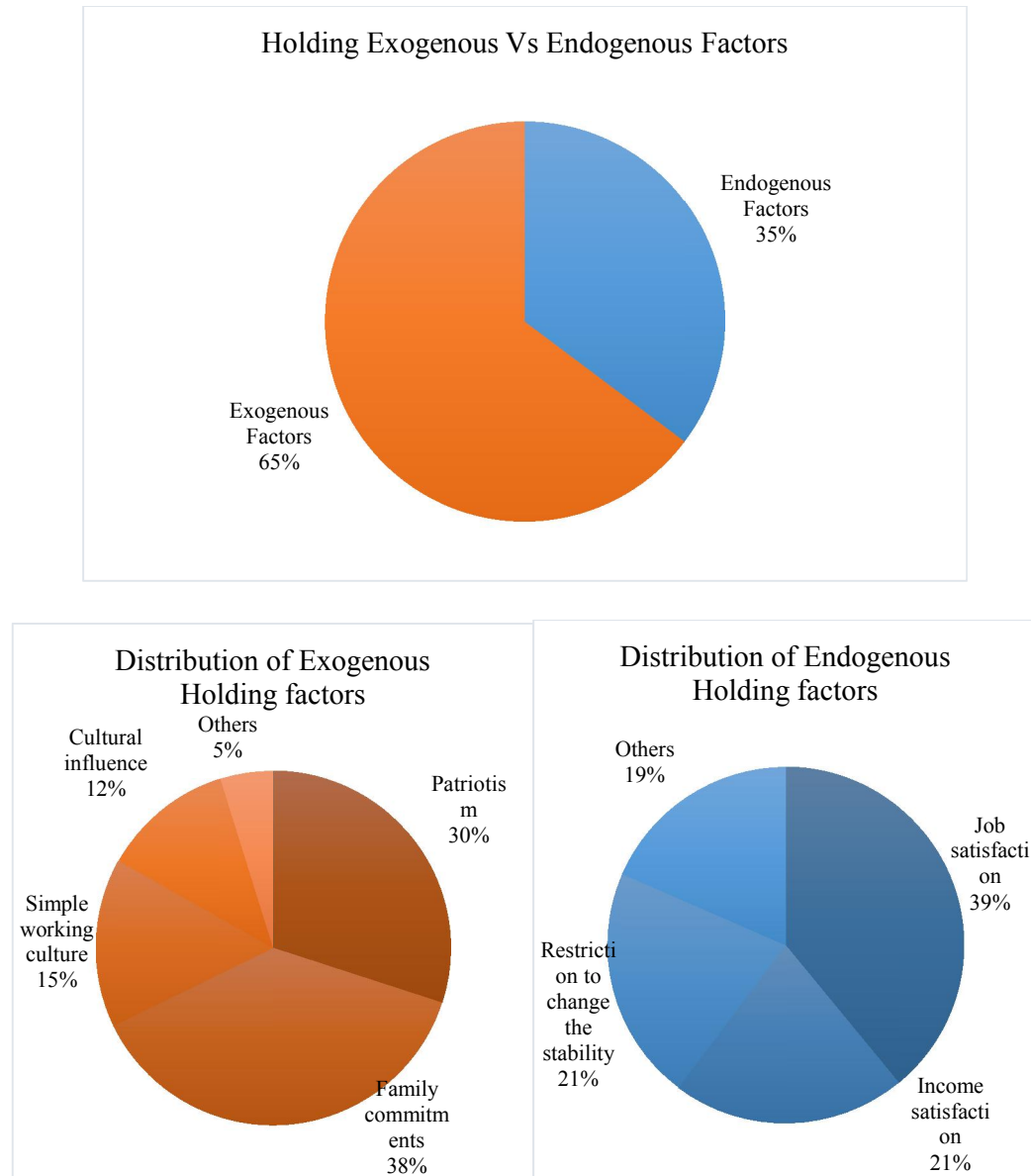


Figure 4: Holding factors dominance distribution

With reference to leaving factors, endogenous factors (61%) are dominant over exogenous factors (39%). Considering the endogenous factors, the prime factor for migration is higher remuneration and wages (26%) while opportunity for education (22%) and use of full potential (13%) are 2nd and 3rd prime factors.

Considering exogenous factors, the prime factor for migration is quality of life (23%) while political influence and corruption (20%) is the 2nd prime factor.

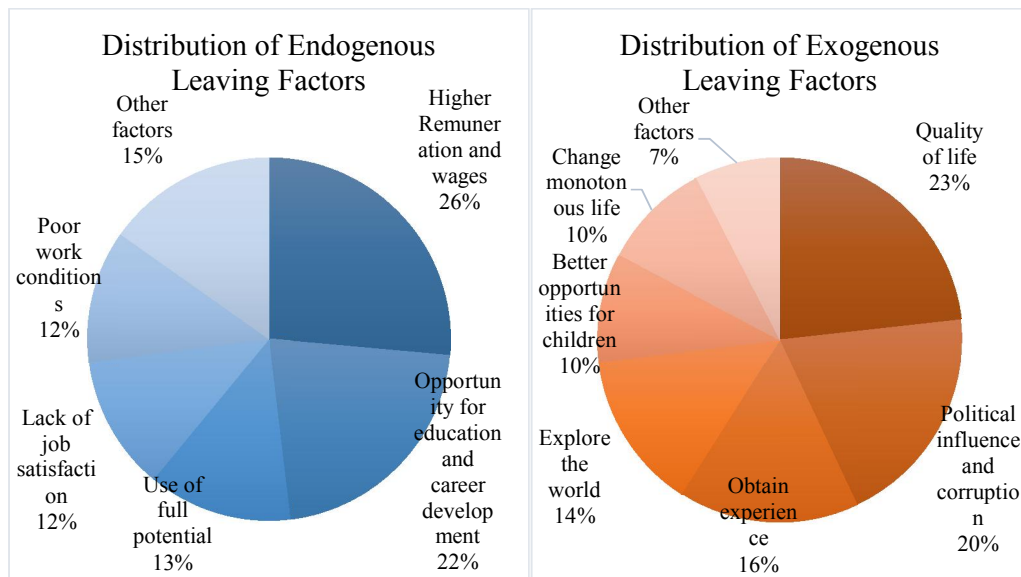
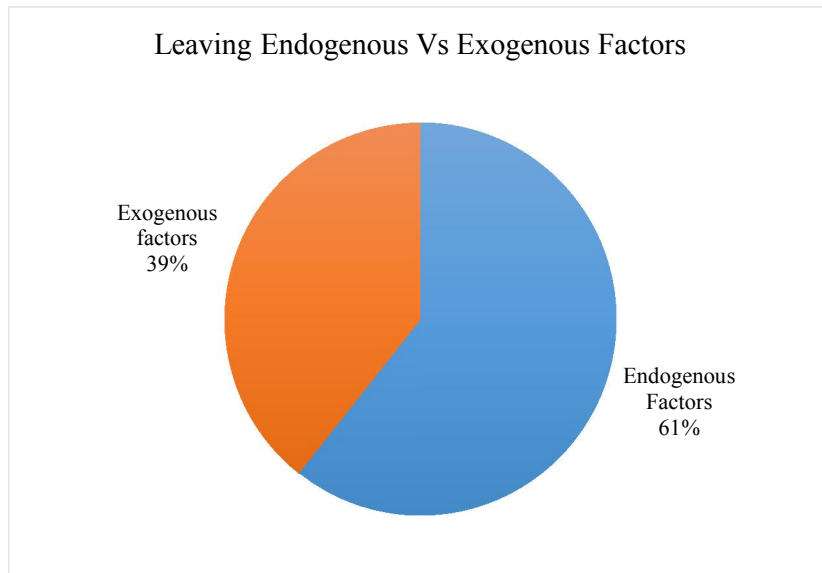


Figure 5: Leaving factors dominance distribution

Considering returning factors, exogenous factors (91%) are comprehensively dominant over endogenous factors (9%). Family commitments (36%) is the prime factor out of exogenous factors, while patriotism (22%) and maturity (16%) ranked 2nd and 3rd respectively.

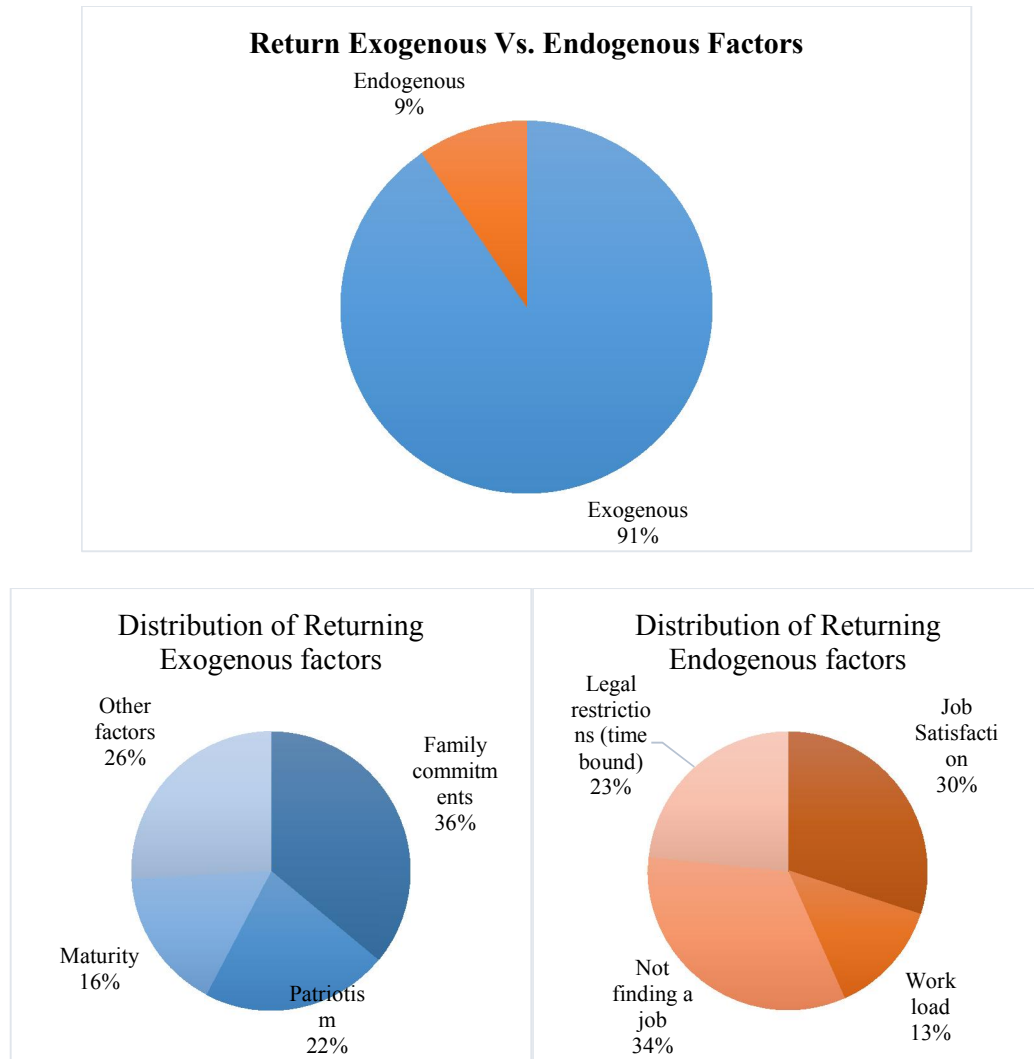


Figure 6: Returning factors dominance distribution

During the survey it was revealed that, there are several special patterns and characteristics between migrants and non-migrates in job role, higher education, age, marital status, gender and income.

When it comes to the job role, out of non-migrants, majority (70%) are doing *Engineering Management* related jobs. On the other hand out of migrants majority (56%) are doing *Purely Engineering or R&D (Research and development)* related jobs.

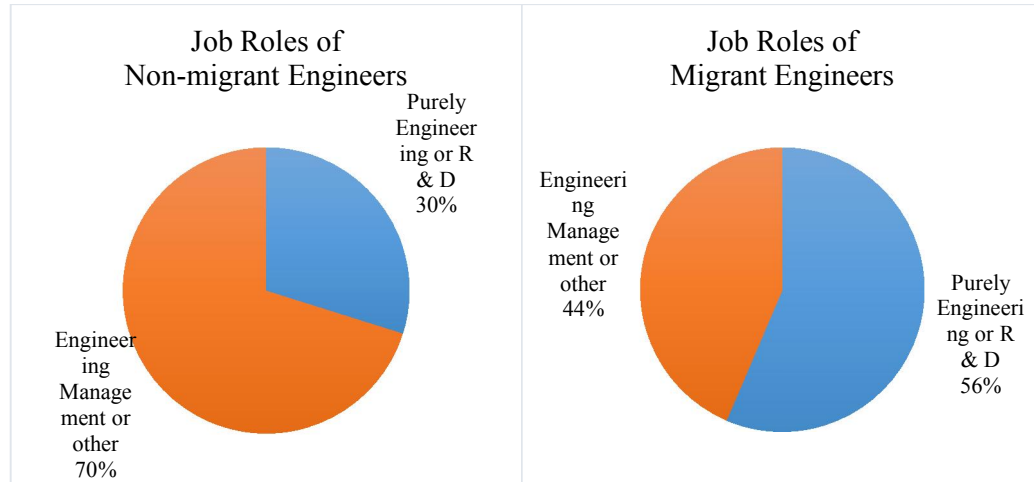


Figure 7: Comparison of job role of migrant verses non-migrant engineers

Considering higher education, out of the migrant engineers, 57% have obtained MSC or higher education, while only 26% of non-migrant engineers have obtained up to that qualification. There are only 2% of non-migrants holding PhDs while the percentage for migrants is 26%.

Apart from that, out of the engineers who have migrated for higher education, only 28% have returned after completion of the education, while the balanced 72% have not returned back after obtaining the desired education qualification.

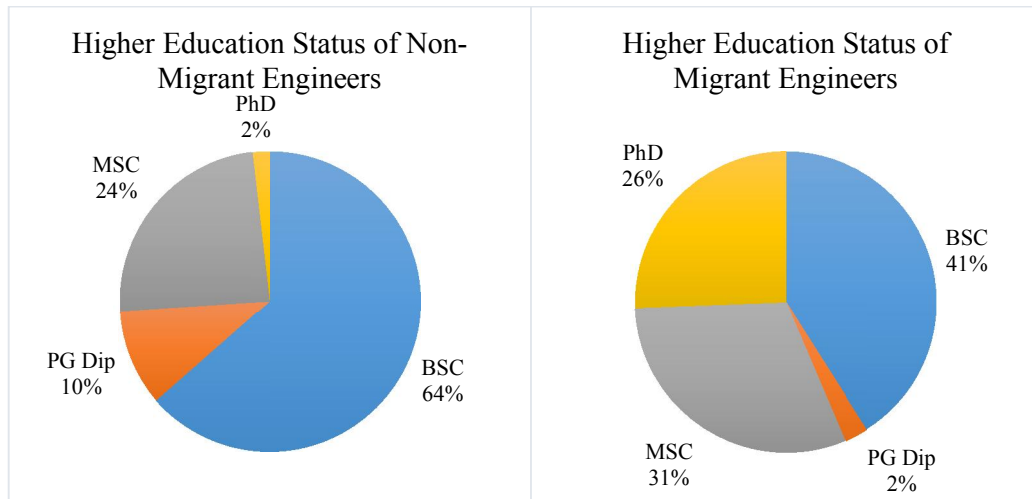


Figure 8: Comparison of higher education migrant versus non-migrant engineers

When age is considered, up to age of 27 years, majority of engineers (above 70%) have either migrated or have intention to migrate. However after age of 28 years, the percentage of engineers with plans to migrate decreases to 40% and shows a decline trend thereafter.

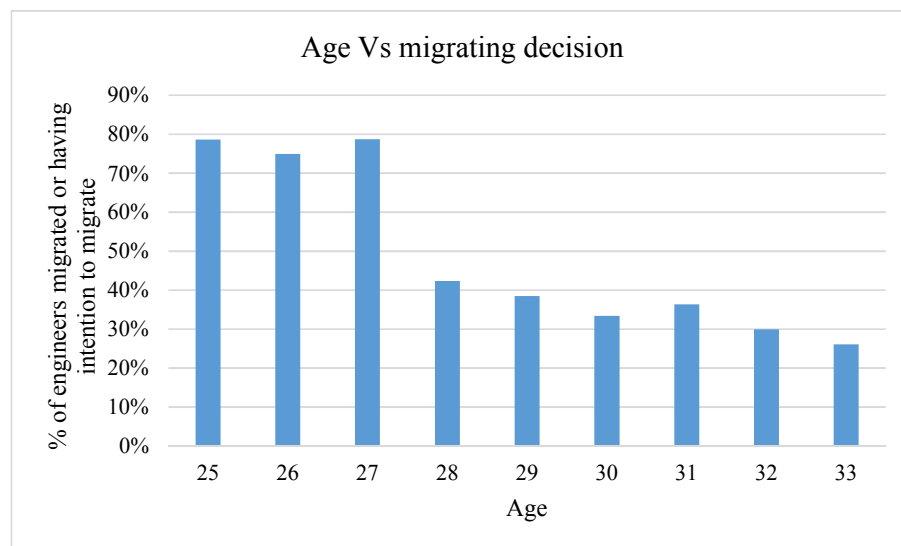


Figure 9: Age versus migration intention

When it comes to marital status compared to intention to migrate, singles (51%) have more intention to migrate than married (25%). Considering gender males (40%) are more tend to migrate than females (36%).

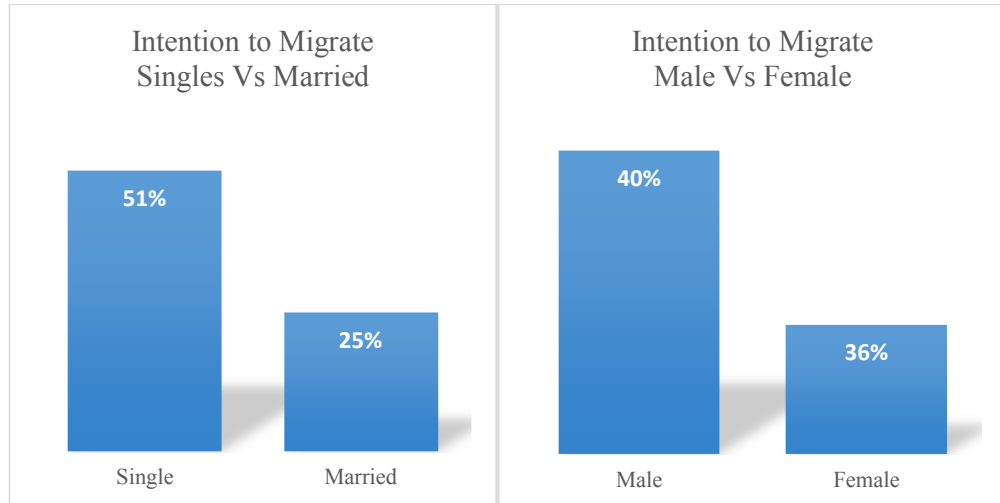


Figure 10: Marital status and gender wise intention to migrate

Considering the income difference of migrants vs. non-migrants, when the salaries are compared with graduated year on year basis, a migrant engineer is taking more than 3 times the salary of a non-migrant engineer, in average.

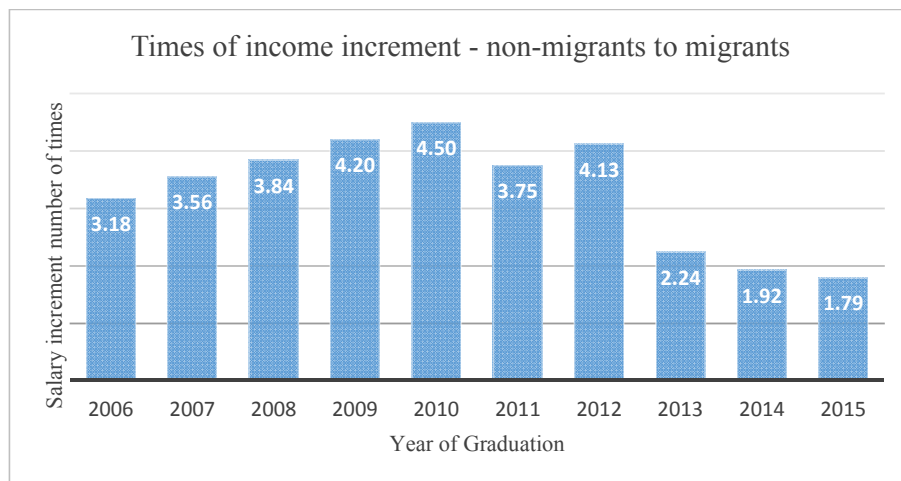


Figure 11: Times of income increment non-migrant to migrant

Discussion and conclusion

Yes. The situation in Sri Lanka regarding brain drain of engineers is perilous. Out of the sample 49% of the engineers are either migrated or in the process of migration. This implies that, about half of the engineers graduated during the last 10 years, are leaving the country without serving the mother nation. (Note: this statement and all the findings are applicable to the total population limited to the specified confidence level and interval).

It has been declared that, 16 factors, comprises of 8 endogenous and 8 exogenous factors, affect the non-migrant engineers to work in the country without migrating. On the other hand, another 16 factors, consist of 8 endogenous and 8 exogenous factors, promote the migration decision of engineers. Apart from that, another 15 factors, including 11 exogenous and 4 endogenous factors, attract the migrants back to the country.

What made non-migrant engineers to stay in the country without migrating (prime holding factors)? According to the results, the engineers who are not migrating are doing so, mainly due to exogenous or outside the industry related reason. In other words, the prime factors for these engineers to be non-migrants, are not that they are satisfied with their income or job roles in the industry, but due to external commitments, in either family or country level.

This conclusion can be further supported by the other demographic characteristics of the results. Less percentage of married engineers (25%) have intention to migrate, while high percentage of singles (51%) have intention to migrate. Apart from that until the age of 27, majority of engineers (more than 70%) have intention to migrate, while after age of 28 less percentage of engineers have intention to migrate. An argument can be made that, the family commitments increase with age and marriage, and with these commitments, they tend to stay.

The other area, is the prime factors considered by the migrating engineers, to take the decision of leaving the country (prime leaving factors). Why engineers migrate? The results suggest that the prime reasons for the migration decision are endogenous factors. In other words, engineers migrate, not mainly due to exogenous factors such as political

influence, corruption or living conditions, but due to industry related factors such as income, higher education for career development and use of full potential.

The demographics of the results, supports this conclusion. Most dominant endogenous factor stated during the survey is to obtain higher income. The research shows that an engineers who have migrated are getting more than 3 times the salary in average than a non-migrant engineer graduated in the same year.

The 2nd major factor for migration is the opportunity for education for career development. According to the results, out of non-migrants, only 26% have obtained an MSC or higher qualification, with only 2% of PhD holders. On the other hand, 57% of migrants have obtained an MSC or higher qualification, with a PhD percentage of 26%. The question is that, only 28% of engineers having their last qualification abroad, have returned back to the country. This concludes that, engineers migrate considering the opportunities for higher education, and majority of them are not returning back after achieving the desired qualification.

Use of full potential is the 3rd main factor identified. This is to say that engineers migrate because they cannot fully utilize the technical knowledge and skills that they have gathered during university education, if they work in Sri Lanka. But if they migrate, they could use their full potential. According to the survey results, 70% of the non-migrant engineers are not working in the capacities of pure engineering or research and development jobs, but doing more management and administration related occupations. Subsequently, after obtaining technical qualifications in different fields of engineering, majority of engineers do not have the luxury to use full capacity of that technical potential. On the other hand, large portion of migrant engineers (56%) are doing pure engineering and R&D jobs, that they can use their full potential of technical knowledge and skills.

The final area is the factors affecting the return migrants (returning factors). The returning decision is comprehensively on exogenous factors. In other words, the main reason for the Sri Lankan migrant engineers to return, is not that they are not satisfied with the job or not finding a suitable job, but because of family commitments or patriotism.

On recommendations, to prevent engineers from migrating, the controllable factors can be addressed, out of the identified factors. The 2nd dominant leaving factor is for higher

education. Hence the higher education system of local universities can be developed, to offer world class PhDs in wide range of disciplines, to retain some of the engineers who migrating for higher education. 3rd dominant leaving factor is use full potential. To address this, more investments should be allocated on R&D (research and development) and engineering development projects, to create more job in R&D and pure engineering fields. This will not only create jobs for the engineers to use their full potential, but also direct the country towards sustainable development. Apart from that, engineers can be empowered with more knowledge and skills on management and business administration, during the university education, so that they can be easily assigned with the management roles, in line with the available job market. As the 2nd dominant factor both in holding and retuning areas is patriotism, programs can be conducted to boost the patriotism of engineering undergraduates, such as proper communication of the actual cost, spent by the government, for the degree courses.

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