# BRAIN DRAIN:
# THE DETERMINANTS OF MIGRANT INTENTION OF PROFESSIONAL ENGINEERS IN PENANG

Lim Heng Kiang, Junaimah Jauhar, and Hasnah Haron

**ABSTRACT**

*Brain drain issues constitute continuous concern for governments, societies, business organizations and academics. Current professional engineers' shortage issue is the impetus for effective strategies aimed at retaining engineers in their current positions. Engineers' behavioural intentions to migrate are not well understood, especially in the context of Malaysia. This study aims to assess the influence that professional engineers' intent to migrate and the level of migrant intention among professional engineers in Penang. To attain its objectives, a survey was carried out among Electrical and Electronic professional engineers from manufacturing firms in Penang. A total of 104 usable responses were received from the respondents. This study found that a negative significant relationship exists between job engagement and migrant intention of engineers. Organization engagement also was found to be negatively associated with migrant intention of engineers. However, job satisfaction, social welfare, job pay satisfaction and human security are not found to be related to migrant intention of engineers in Penang. In addition, the study found that two of the control variables (age and level of education) have significant with migrant intention of engineers. In this study, age was found to be negatively associated with migrant intention of engineers; while level of education have positive significant with migrant intention of engineers. Furthermore, the study also found that the level of Penang engineers' toward intention to migrate is moderate.*

**Keywords:** Penang, brain drain, migrant intention, professional engineer

## INTRODUCTION

In today's highly dynamic globalization, the world's registered the migration between 1960 and 2005, has rise to an average of 919,302 per country (World Bank, 2010). Brain drain is the global migration of human capital and relates more specifically to the professionals from developing to developed nations such as engineers, doctors, scientists and other highly skilled professionals (Beine & Docquier, 2008; Docquier & Rapoport, 2006).

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The world today is full of advancement in science and technology. The brain drain of professional is not a new phenomenon but globalisation due to rapid IT technology (Commander, Kangasniemi, & Winters, 2004). Malaysia is not excluded in the dilemma with 1,489,168 Malaysians migrate overseas over the 45 year period (World Bank, 2010). The New Economic Model (NEM) reported that over half of 350,000 Malaysians currently are working abroad have tertiary education (The Star, 2010). Table 1 shows that the migration rate of Malaysia, 4.4 is higher among Asia countries.

**Table 1:** Population and Migration Rate

| Countries | Population (in Millions) | Migration Rate |
|---|---|---|
| Malaysia | 22.18 | 4.4 |
| Thailand | 61.20 | 1.2 |
| Sri Lanka | 18.78 | 3.7 |
| Philippines | 75.17 | 6.6 |
| Pakistan | 131.58 | 2.4 |
| Indonesia | 203.68 | 1.4 |
| India | 979.67 | 1.1 |
| China | 1,238.60 | 1.4 |

*Source: Carrington and Detragiache (1998) and World Bank (2001)*

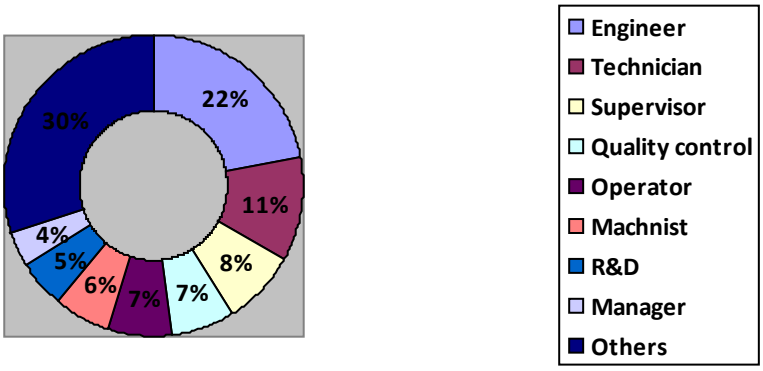
The competition of attractive professional and talent workers seems to be intense and fierce (Mahroum, 1999). In past 15 years, Malaysian government introduced certain programs to attract, facilitate and retain aspiring Malaysian returnees such as Multimedia Super Corridor (MSC) Malaysia in 1996, Returning Expert Programme (REP) in 2001 and recently established Talent Corporation Malaysia to launch a tax incentive by flat rate of 15 percent income tax for five years and Residence Pass in 2011 (Talent Corporation Malaysia, 2011). However, migration increased shows failure of the government to offer sufficient incentives and opportunities to retain its professional workers (Naim & Iftikhar, 2010).

Emigration pressures become stronger, once the labour-scarce countries are opened up by a demand for professional workers (Nayyar, 1997). The developed countries are actively to attract skilled talent through offering a range of incentives and institutional mechanisms (Commander, et al., 2004). In particular, the promoting of General Skilled Migration Program (GSM) whether in the Australia (Department of Immigration and Citizenship Australia, 2011) or, Diversity Visa (DV) Lottery Program (USA Travel State Gov, 2011) has been striking. The focus of this research is to trace the brain drain trends which underlie the severity of setbacks to move up Malaysia to a high income nations.

The engineer professionalism will be the scope for this study. The number of professional engineers could be determine the competence of a country to import, absorb, develop and produce advance knowledge and technologies, important for competitive advantage and sustainable growth (Naim & Iftikhar, 2010). According to Performance Management And Delivery Unit (PEMANDU), there are 1,900 Electrical and Electronics (E&E) companies available in Malaysia. E&E industry is one of 12 National Key Economic Areas (NKEA) which is an important industry to directly and materially contribute economic growth to the Malaysian economy (PEMANDU, 2011). E&E is the single largest contributor to the manufacturing sector (over 33% of output) and employs more than 500,000 workers or

5 percent of the total workforce in Malaysia (NEM, 2010). Based on Bank Negara Malaysia (BNM) annual report 2009, manufacturers in Malaysia face difficulties in the hiring of high skilled workers, to the extent that there is currently a critical shortage engineers about 22 percent (Figure 1). Refer to a report of World Bank (2010), the shortage of skilled workers would affect the development and transformation to turn Malaysia into a high income economy.

**Figure 1:** Skill Shortages Faced by Manufacturers



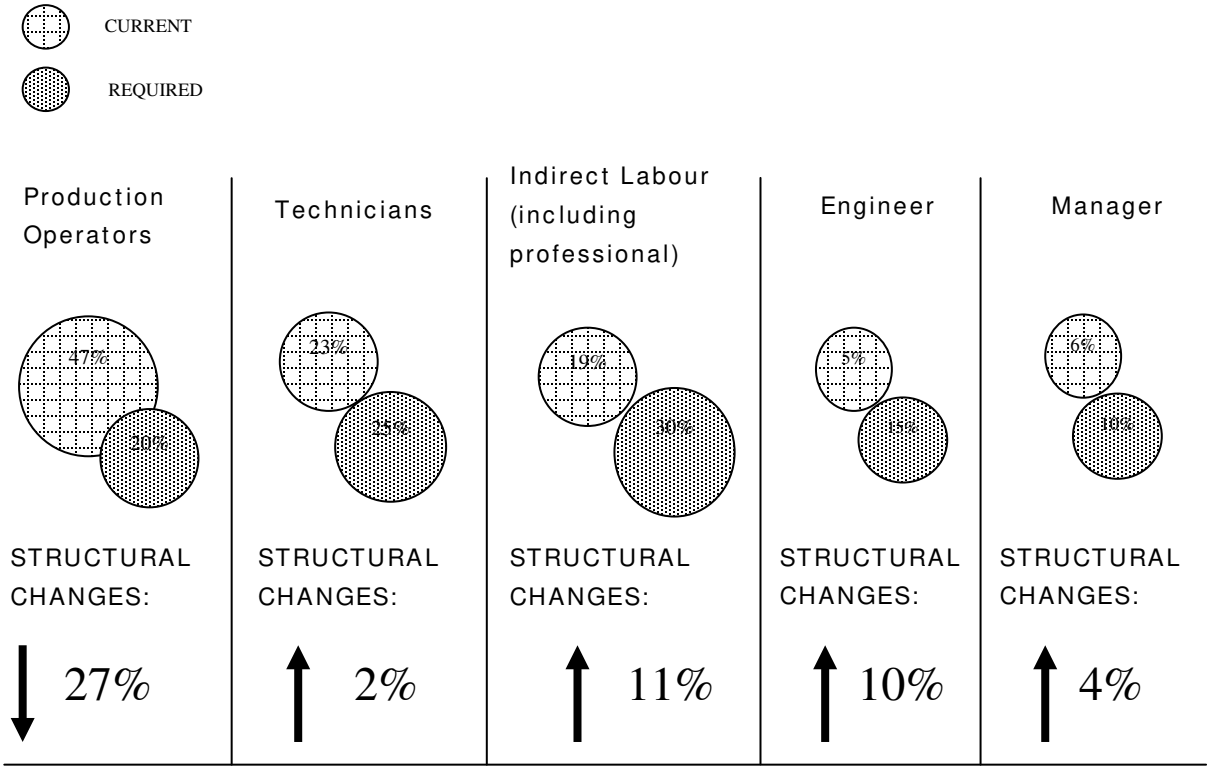

*Source: Bank Negara Malaysia (BNM) annual report 2009*

Brain drain can induce shortages of manpower, for example when engineers emigrate in disproportionately large numbers, thus undermining the ability of the origin country to adopt new technologies (Docquier & Rapoport, 2006). Migration of highly skilled engineers bear down a negative impact for country's economic and social growth (Naim & Iftikhar, 2010). According to Penang Chief Minister Lim Guan Eng, Penang lost out US$3 billion worth of foreign investment because it could not guarantee the adequate supply of experienced Electrical and Electronic (E&E) engineers to the investors (Hassan, 2009). In order to achieve a high-income economy, Penang still required nearly 15 percent of engineers to transform manufacturing industry structure to be a high value-added and higher technology industry (Table 2).

Lower job pay and lack of a national research and development strategy had been cited as important factors that influence brain drain (Tansel & Gungor, 2003). In the human capital approach to migrate, the difference of expected wage level between the source and destination countries is cast as the key determinant of skilled migration (Gungor & Tansel, 2005). According to The World Health Report (2006), searching for an adequate standard of living is the root of decisions to migrate. By a increasing of dissatisfaction with existing job or living conditions, workers' concerns about lack of career prospects, poor management, work overload, poor living conditions and high levels of violence and crime are among the push factors for migration. Prospects for better welfare, gaining experience, a safer environment and family-related matters are among the pull factors for migration. Some previous research studies have included factors of demographic such as gender and age to be important in explaining the migrant intention of engineers (Dalen, Groenewold, & Schoorl,

2004). The behaviour of migration intention is predicted vary for the marital status, gender, education level and working condition (Gubhaju & Jong, 2009).

**Table 2**: Composition of Penang's Workforce, Current and Required




*Note: Based on total employment of 200 workers in 2007 Penang Industry Survey by Yoon Chon Leong. Bizwise Consulting Sdn Bhd. Source: Penang Economic Outlook 2011*

According to Record & Mohiddin (2006), the costs of the brain drain are perceived as being much greater than gains. The costs include loss of public educational investment, intellectual capital and understaffing of services (Sahay & Srivastava, 2005). In addition, source country not only lose out on the investment of training education for local skilled workers, but also have to bear out the high cost for hiring foreign consultants to meet the need of specific development (Naim & Iftikhar, 2010). It is not just economic, social and political progress that Malaysia lost. Malaysian abroad attitudes toward Malaysia shape on how others view the country, willingness of foreigners to invest, travel or collaborate with Malaysia and Malaysian interests. Therefore, the reduction of brain drain can improve the image and reputation of Malaysia.

In line with the transformation of Malaysia to developed nation status amongst the industrialised countries by the year 2020, this study will investigate the factors that will influence the intention of engineers in Penang to leave their native country. This study examines the relationship between migrant intention of professional engineers with five factors, namely job pay satisfaction, job satisfaction, social welfare, employee engagement

and human security. Besides, contextual factors that might influence migrant intention of engineers, such as demographics, will be incorporated too. Hence this study intends to:

- Determine the relationship between six influencing factors, i.e. job pay satisfaction, job satisfaction, job engagement, organizational engagement, social welfare, and human security, on migrant intention of engineers.
- Determine the level of intention of engineers in Penang to leave their native country.

Empirical researches on brain drain issue have primarily focus on the effects, consequences, and factors of human capital flight from developing countries. However, there have been very few research and studies on the causes of brain drain in Malaysia and in particular the engineering professionals are almost non-existent. None focused on the migrant intention of professional engineers in Penang to obtain their views on why they intent to leave and their expectations. Migrant intention of Penang engineers is ambiguous due to the absence of prior studies. As highly skilled engineers appears to become more important to the country economy, the increasing professional-skilled migration which can be represented by other word called "skills shortages" is leading to a growing interest in the determinants and characteristics of professional-skilled migration. Many developed countries have selectively opened their labour markets for specialist skilled immigrants (Regets, 2007). This study evaluates the human resource practices that can be used to maximize the productivity and development by decreasing the migrant intention. The globalization and increasing interconnectedness of the world has serious consequences for every nation (Singh & Papa, 2010).

## LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

### *Migrant Intention of Engineer*

Migration is one of the most enduring features of human experience (Wongboonsin, 2004). The migration is not limited to skilled workers but also affects professional workers. The developing countries often related with industrial dependency and do not yet possess the methods of analysis services and research which are the greatest users of engineers (Essam and Gillian, 1986). The professional workers choose to migrate as a form of human capital investment by migrate to places where they believe their ability and skills can be improved and rewarded (Gubhaju & Jong, 2009).

Migration intention do not necessarily lead to actual migration, but it can be used to forecast the future emigration trends (Grecic, 2002). In general, migrant intention having relatively finding a high income job to achieve a higher living standard and modern values compared to those not intent to migrate (Hendrik, et. al., 2004). According to Giorgi & Pellizzari (2009), high salaries and high job opportunities, rather than the welfare are the key driving forces of migrant intention.

Engineer is a term derives from the Latin word "ingeniator", meaning ingenious person. A professional engineer is a person who devises and implements technologies and systems to improve the living standards of the community, the standards of environmental care and generating wealth for country (Australia, 2004). The migration of engineers between countries with different levels of development has become even more crucial, with the increasingly of global knowledge-based economy which are relying on science and technology skills (Jean & Mercy, 1999). According to Dato' Paduka Keizrul, the previous president of the Institution of Engineers, Malaysia (IEM) (session 2008/2009), Malaysia is experiencing a shortage of experienced engineers by reason of many Malaysian engineers opt to work overseas due to better job pay. For example, a fresh engineer could be earning between S$2,500 and S$3,000 per month in Singapore, and A$4,000 in Australia (*GRADAsia Engineering*, 2009).

The movement of engineers has been one of the key characteristics of the current trend of globalisation (Jackson, 2005). The engineers make their movement decision according to the perception of the reward (Mahroum, 1999). The lack of professional workers felt by Malaysian firms and effect on the innovative capacity of the state (Kofoed & Fonnesbech, 2000). In this study, migrant intention used as an approximation of future emigration decisions is a reasonable research strategy as long as one is aware of the pros and cons of using such stated preferences (Hendrik et. al., 2004).

***Push and Pull Factors Theory***

Empirical researchers have found a set of relatively consistent factors that push people migrate overseas and pull them immigrate into the developed countries. The people will leave when their needs can no longer be fulfilled in a particular environment (Mahroum, 1999). Push and pull factors be able to operate simultaneously which the people can be pushed by environmental descent and pulled by the economic opportunities in destination country (Martens & Hall, 2000). By the way, mostly the people who are high professional qualifications and working experience move under the influence of attractive factors or pull factors (Todisco, Brandi, & Tattolo, 2003).

According to Gungor and Tansel (2007), those several characteristics originate from the environment of the native country are the push factors that motivate individuals intent to migrate abroad. In many cases, brain drain is caused by the individual choice that influences the final decision. Based on the research of Loewenson & Thompson (2005), push and pull factors are interacting each other. No matter how strong the pull factors from the destination countries, the migration decision was made only if there are strong push factors in the native country.

Push factors included poor working conditions, low job satisfaction, security issues, lack of career advancement, poor skill of resources management, low salary structures and social capital; while pull factors are included higher salaries, competitive job environment, health facilities for family and access to better education (Naim & Iftikhar, 2010).

This study evaluates the strength of push and pull factor in stating migrant intention 'out of Malaysia'. Dovlo (2003) states that push factors occur within the native country which motivates professionals to leave. Meanwhile, pull factors are the intentional or not deliberate actions that attract highly skilled individuals from the destination country's policies and actions. According to Grecic (2002), economy instability is one of push factors for the departure of professionals to work elsewhere. The push and pull factors played a relevant role to underline the economic factors for migration (Grecic, 2002). According to Zweig (1997), low level of economic will be as a push factor for academics and other professionals intent to migrate, while the resources and benefits of the developed countries pull them in.

By the way, pull factors may arise due to increasing demand for engineer professionals and welfare programs that offered by destination country. Additionally, those better opportunities in destination country such as better remuneration, greater learning and professional development prospects for individual career advancement are the most attractive pull factors to influence professionals migrate abroad (Gungor & Tansel, 2007).

***Job Pay Satisfaction***

Empirical studies reported the major cause of the brain drain among professional is the job pay satisfaction. Job pay is the determinant of the skilled workers migrate (World Bank, 2011). Economic efficiency in the global labour market and economic transformations resulting from the IT revolution has created a tremendous surge in demand of services and skilled labour and knowledge-based human capital (Rudolph, 2003).

Intention of people to join and leave an organization is based on tangible rewards (James, 2002). Lower job pay is identified as the major contribution of highly skilled migration (Naim & Iftikhar, 2010). Migrant workers intent to get away from their poverty for better income in developed countries (Wongboonsin, 2004). In fact, the people who already had jobs in their native of country have a propensity to migrate as well, being attracted by higher job pay in developed countries to deal more efficiently with certain financial security and have the benefit of higher living standards (Grecic, 2002). The professional engineers are tempted by significantly higher wages and brighter prospects (Muyibi, 2008). The higher education talent will be more integrated with notions of a better living and fixed the salary levels demanded in developed countries by themselves (Bhagwati & Hamada, 1974). Higher job pay that offered by developed countries will increase the probability of emigration (Gungor & Tansel, 2005).

According to Zweig (1997), the lower job pay and lack of economic freedom in native country, along with a poor intellectual atmosphere are the push factors to motivate people to move out. To account for the financial aspect of the migration decision, the attractive income level as a pull factor in destination country was statistically significant (Gungor & Tansel, 2005). For those professional workers, low job pay levels and benefits provide a powerful incentive migrate overseas (World Bank, 2011). This leads to the following hypothesis

H1: Job pay satisfaction is negatively related to migrant intention of engineers.

### *Job Satisfaction*

Job satisfaction play an important role in helping professional engineers gains a sense of commitment to an organization. Job satisfaction which was defined by Kalleberg (2004) as a result of a personal value system which the job make possible satisfaction of one's needs promote the dignity of the human individual, whereas work lacking the characteristics limits the development of personal potential and is, therefore to be negatively valued. The lack of resources, heavy daily workloads and lack of teamwork from supervisors or co-workers all produce dissatisfied employees intent to leave (Barak, Levin, Nissly, & Lane, 2006).

Job satisfaction will affect the performance of workplace productivity and the workers' well being (Pouria, 2011). According to Hemmans (2010), focusing on innovative ways to promote job satisfaction can have a positive retention between professional and their current employer rather than except a higher salary offer from another organization. Lack of job satisfaction will open to movement and migration (Loewenson & Thompson, 2005). According to Alam and Mohammad (2009), satisfaction with the job is either directly or indirectly related to an employee's turnover intentions. Businesses need to know the level of satisfaction of their employees with the purpose of retention, and strength the quality of their services (Pouria, 2011).

Many countries are searching professional workforces, especially engineers, and the competition in talent market is fierce (Pouria, 2011). Pouria (2011) also stated that understanding the feeling of people about their employment which refer to their values, backgrounds and cultures will provide better idea for highly skilled workers retention. Thus, job satisfaction potential to influence engineer's attitudes, intentions and behaviours in an engineering work force. This study hypothesizes that:

H2: Job satisfaction is negatively related to migrant intention of engineers.

### *Social Welfare*

Social welfare is one of factor will influence the individual decision to stay abroad in their origin country. Migrant are net beneficiaries of the welfare country (Razin & Sadka, 1999). In fact, understanding the relationship between social welfare and migration can help to provide a clear information of the mobility pattern of people, firms, and capital resources affects governmental capacities to make available a range of benefits and welfare (Bailey, 2005). Social welfare is a mapping from a set of individual preference relations or utility functions to a societal preference relation over alternative countries of affairs (Chevaleyre, Endriss, Estivie, & Maudet, 2004). Social welfare includes both cash and noncash benefits such as Medicaid and Food Stamps (Borjas, 1996). The generosity of social welfare included all cash benefits such as unemployment benefit, housing benefits, family benefits, taxation of benefits and minimum wages programmes (Giorgi & Pellizzari, 2009). It would create competition among countries to attract skill migrants (Sinn, 2002).

According to Dustmann and Preston (2007), social welfare is the main key to play the relevant role in determination of attitudes to further migration. There was a strong association of highly education with attitudes to social welfare. The international migratory flows of the highly skilled were significantly when there were large gaps in living standards between the origin and the destination countries (Helliwell, 1999). Social welfare is acting as "pulls" (Frey, Liaw, Carlson, & Xie, 1996).

The flow of emigration to developed countries with a comprehensive welfare system such as retirement security, had fascinated both academic and public attention in recent years (Razin & Sadka, 1999). Laamanen and Kotakorpi (2007) examined that high expenditures in health care is positively influencing individuals' life satisfaction. The impacts of social welfare in public health care vary among different groups in the population. Pension system is another important concept of the social welfare countries. Indeed, the aforementioned studies by Razin & Sadka (1999) show that migration may have significant implications to all age groups for the financial security of the pension system. According to Razin & Sadka (1999), pension system is the system which employs payroll taxes on the younger workers with the purpose of funding a uniform demogrant to the aged. The pay-as-you-go tax-transfer system, which is the government pays social security benefit paid to old generation by tariff a flat tax on the income of the young generation (Razin & Sand, 2009). Hence, this study hypothesizes that:

H3: Social welfare is negatively related to migrant intention of engineers.

***Job Engagement***

According to Schaufeli, Salanova, Gonzalez-roma and Bakker (2001), engaged employees will be more active and effective connection with their job, and also responsibility to deal completely with the weight of their job. Job engagement is a encouraging, satisfying, work-related state of mind (Bakker & Demerouti, 2008). According to Kirkpatrick (2006), job engagement defined as a work attitude for those employees' interest in, enthusiasm for and investment in their job. Empirical studies of job engagement in various sectors show that it is related to employee retention (Brown, 1996; Huselid & Day, 1991), and understanding the concept of motivation from job engagement will benefit both employees and employers (Kirkpatrick, 2006).

The professionals who trained abroad in certain specialized areas will become redundant if their countries of origin cannot provide a working platform to practice their expertise they have acquired. Thus, they will stay abroad permanently rather than stay in their countries of origin (Muyibi, 2008). Empirical research reported that there is significant relationship between engagement and work outcomes. For example, engagement is negative significantly to intention to leave (Schaufeli & Bakker, 2004). For those who are overload in their work will have higher tendency to quit their jobs (Barak, et al., 2006). Saks (2006) found that engaged employees likely have more positive mind-set and retention toward the organization. Hence, it is expected that job engagement will be correlate with work outcomes as follows:

H4: Job engagement is negatively related to migrant intention of engineers.

***Organizational Engagement***

Engagement is an important variable of interest to organizations (Avery, McKay, & Wilson, 2007). As noted by Robinson, Perryman and Hayday (2004), organization engagement defined as organizational commitment and organizational citizenship behaviour. Well-being and employees in the workplace is a significant part of an individual's life. Based on 2003 Towers Perrin Talent Report, employee's positive emotions are strongly influenced by the collaboration, teamwork and goals sharing including the objective in work. A two-way communication program can emphasize the positive emotions among employees in an organization. By the engagement, the cost of production tends to be drop.

Moreover, few researches had study measurement of employee well-being to business unit outcomes, such as employee turnover. For those lack a sense of inclusion, the employee will dissatisfy with their position and feeling less committed to the organization (Barak, et al., 2006). The emotional well-being of employees and their satisfaction with their organization affect citizenship at work, turnover rates, and performance ratings (Harter, Schmidt, & Hayes, 2002). Thus, this study hypothesizes that:

H5: Organization engagement is negatively related to migrant intention of engineers.

***Human Security***

The relationship between migration and security is not new (Lahav, 2004). Empirical studies on migration were mainly focused on the human rights approach with little attention on human security. Regarding the migration, the security environment lead to an increase in societal insecurities as predicted (Rudolph, 2003). According to Lahav (2004), the security agenda is attached to societal, personal, national or more basic human security such as physical, environmental, health, and cultural dimensions. Theoretically, human security is the protection of the essential core of all human lives with enhancement of human freedoms and human fulfilment (Wongboonsin, 2004).

As a receiving country, Malaysia has hosted an increasing number of migrant workers. According to 2010 World Bank's Migration and Remittances Factbook, Malaysia has legal immigrant population at 2.4 million and illegal population at one million. Overall, mostly the immigrants are low educated and working in low-end services, assembly-based industries and extractive industries. The migrant workers can be a part of crime-related syndicates (Wongboonsin, 2004). According to Diprose (2008), violence obstructs human freedom to stay safely and securely. Apart from crime, violence is a public security issue, a human security issue, a community issue and a troublesome issue for the international community. By definition from World Health Organisation (2004), violence is the intentional use of physical force exerted against oneself, public people, or against a community, that likelihood resulting in destroy, damage, injury, death, psychological harm, or deprivation. Sexual violence could be occurs by forcing people to perpetrate acts of a sexual nature under

coercive conditions, or it may be symbolic, including the violation of cultural and religious symbols (Diprose, 2008). The rights of migrant workers in host countries will be deteriorate due to the connection made between immigration and criminality (Crepeau, Nakache, & Atak, 2007).

According to Akaha and Vassilieva (2005), migration is critical to attain and protect human security, although human security may be at risk while they are migrating. Human security cover minimum survival requirements and basic psychological needs, socio-economic and political well-being that enables people to move towards positive development on a sustained basis, and the protection of human basic freedoms such as freedom from fear and freedom of opinion that are the heart of life (Wongboonsin, 2004). In fact, a stable economic environment is necessary for attracting investment and sustaining economic growth. Furthermore, when citizens worry about their personal security or whether they will suffer for freely expressing their opinions, their overall wellbeing is diminished (Legatum Institute, 2010). Social issues such as the high crime rate serve as push factors to move overseas (Erasmus & Breier, 2009).

Violence and lack of human security may reduce the sources of income with disability, low job security and safe passage to work (Diprose, 2008). Wongboonsin (2004) discovered that human security is one of the causes of migrant intention. Hence, it is hypothesized that:

H6: Human security is negatively related to migrant intention of engineers.

***Demography***

In the developed countries, the demand for educated human capital are increased to vary for the demographic evolution (Naim & Iftikhar, 2010). Most of the emigrants are young, whereas the older one is less likely will state an intention to emigrate (Dalen, et al., 2004). Age is one of universal factors in people's desire to migrate (Esipova, Ray, & Srinivasan, 2010). Gender is another key dimension of migration patterns and cross-cut by other variable like marital status (Dalen, et al., 2004; Gubhaju & Jong, 2009). For women, the decision to migrate is according to the household needs instead of commit to individual advancement (Gubhaju & Jong, 2009).

The qualification classification purposely to identify the dynamics of migration by refer to levels of education attained (Naim & Iftikhar, 2010). Education is a significant effect on the migrant intention which the influence on the intentions of those highly educated respondents is twice as large as the intention of those with lower educated individual (Dalen, et al., 2004). For those highly educated workers, they are more likely to leave compared to other because they have more employment options available. Hence, those people with higher education are the most likely intent to migrate (Esipova, et al., 2010).

## RESEARCH METHODOLOGY

### *Research Design*

This research study used a quantitative method to measure the independent and dependent variables examined by this research study. Quantitative methodology was used in this study because it can focuses on the understanding of a variety of relationships between independent and dependent variables. The cross-sectional study was conducted using mail questionnaire because of its advantage of covering wide geographical area with less time and cost (Sekaran, 2003).

### *Sample*

The population of this study consists of Electrical and Electronic (E&E) manufacturing firms which cover both island and mainland area in Penang. E&E manufacturing firms were selected because E&E industry is one of 12 National key Economic Areas (NKEA) which is a potential driver to make a quantifiable amount of contribution to the Malaysian economic growth (PEMANDU, 2011). In this study, the sampling frame represents professional engineers of manufacturing firms in Penang. Based on the Danish Trade Council directory, the estimated number of engineers in E&E industry in Penang is 8766 engineers in 2005. Sekaran (2003) suggested that a sample size of 368 is appropriate for a population of 9000. The sample of E&E engineers were selected using purposive and convenience sampling techniques respectively.

### *Pilot Test*

Before distributing the questionnaires, pilot test is used to assess whether a questionnaire is relevant to and easily understood by the respondents, in terms of the concepts and the way phrased in the questions. It is a tool for checking if the questionnaire measures adequately the reality of the respondents and works technically well in practice (Eurofound, 2010). 20 respondents were selected to participate the pilot test. Through pre-testing of the questionnaire, the measures are tested for both content validity and reliability. The questionnaire items were firstly pre-tested for face validity among six academicians. The respondents were asked to evaluate whether the items are clearness of words, readability, and general adequacy of the concepts measured. In the second stage of pilot test, the questionnaire was distributed to 16 engineers who are working in E&E manufacturing companies in Penang. The respondents were asked to answer the questions and feedback on the general structure of the questionnaire. The test shows that Cronbach's Alpha values fall within the range of 0.50-0.90, and met the acceptable level of reliability (Sekaran, 2003).

### *Survey Administration*

Following by pilot test, the questionnaire was distributed to 350 engineers (after excluding the 16 pilot tested engineers), who are working in E&E manufacturing firms in Penang. A covering letter, endorsed by the Graduate School of Business, USM, was attached with each copy of the questionnaire. The letter explains the nature and significance of the study of the questionnaire. The protection of confidentiality of information was clearly stated in the letter.

***Measurement of Variables***

*(a) Demographics*

The questionnaire included demographics indicators for age, gender, marital status, level of education, job position and number of years of service in current company.

*(b) Independent Variables*

*Human Security*: was measured by refer to the perceptions of threat to human security (Diprose, 2008). Responses are on a five-point Likert format ranging from (1) "strongly disagree" to (5) "strongly agree". The items adapted from the study of Diprose (2008) which seek to examine the perception of safety, police performance and justice of the country. The items included: "The judicial system punishes the guilty no matter who are they," "Compared to five years ago, the level of violence in the neighbourhood where you live has increased," "I feel safe walking down the street after dark in the area where I live," "I feel safe when I am home alone after dark," "Violence is used in the political sphere to address their political grievances and achieve their political objectives," "I can generally trust the people who run the government to do what is right," "I believe current government is handling well in reducing crime," "I am satisfied with police performance in terms of the way the police deal with incident report," and "Crime is under control by police in my area."

*Job Satisfaction*: was measured by refer to the worker's subjective perceptions of their working environment significantly reflect objective conditions in their workplace (Currivan, 2000). Responses are on a five-point Likert format ranging from (1) "strongly disagree" to (5) "strongly agree". The items included: "I have the chance to do something which makes use of my abilities," "I have the opportunity to do a number of different things in my job," "My co-workers are willing to listen to my job-related problems," "My co-workers are helpful to me in getting my job done," "My supervisor can be relied upon when things get tough on my job," "I know exactly what is expected of me in my job," and "I find enjoyment in my job."

*Job Engagement*: was measured by a five-point Likert format ranging from (1) "strongly disagree" to (5) "strongly agree". Items were adapted and adopted from the study of May, Gilson and Harter (2004) which assesses responses' psychological presence in their job. The items included: "Performing my job is so absorbing that I forgot about everything else," "I really put my heart into my job," "Sometimes I am so engage my job that I lose track of time," "I do not feel emotionally detached from my job," "Time passes by quickly when I am performing my job," and "The work I do on this job is worthwhile."

*Job pay satisfaction*: was measured by refer to the job pay and competitiveness of pay (Gaiduk, Gaiduk, & Fields, 2009). Responses are on a five-point Likert format ranging from (1) "strongly disagree" to (5) "strongly agree". The adapted items included: "My job pay matches the work that I do," "If I work overseas, I would receive a higher job pay," "Looking at my job pay, the company does not value me as a worker," and "I feel that my work is being valued," Another 3 items were adapted from the research of Dustmann and Preston (2007),

used to measure job pay expectation. The items included: "If I stay in my country of origin, I expect my job pay over the coming year to increase by more than the increase in cost of living," "If I stay in my country of origin, I expect my job pay over the coming year to increase by same as cost of living," and "If I stay in my country of origin, I expect my job pay over the coming year to increase by less than cost of living."

*Social Welfare*: was measured by a set of five-point Likert format ranging from (1) "strongly disagree" to (5) "strongly agree". One item adopted from the one developed by Dustmann and Preston (2007), was related to social welfare concerns cover opinions on generosity of benefits, needs of welfare responses, and preparedness to pay higher taxes to expand welfare provision. The items included: "The government should spend more money on welfare benefits for the poor, even if it leads to higher taxes." Another item adapted from the study of Laamanen and Kotakorpi (2007) to evaluate respondent satisfaction with their life. The item is: "I am satisfied with the life I am living in my country." In additions, two items were adapted from a report that published by PricewaterhouseCoorpers (2009) in expecting the employer's retirement scheme to meet their needs. The items included: "I am hopeful that when I retire in my country of origin, I would be sufficiently funded by my employers retirement scheme (EPF)," and "I am expecting to fund my own retirement through personal investments and saving."

*Organization Engagement*: was measured by a five-point Likert format. The response options for this scale also ranged from (1) "strongly disagree" to (5) "strongly agree". The items were adopted from a study by Saks (2006) that included: "I am proud to inform my friends that I work for this organization," "Being a member of this organization is very captivating," "One of the most exciting things for me is to get involved with activities in this organization," "Being a member of this organization make me having life or spirit," "Being a member of this organization is exhilarating for me," "I am highly engaged in this organization," "The organization views its employees as assets," "The organization makes efforts to identify my strengths and weaknesses," and "Management has created an open and comfortable work environment."

*(c) Dependent Variables*

*Migrant Intention:* The dependent variable is the intention of emigrating to overseas base on the response to the question "What is the factor affecting your current intention about migrating to overseas?" Hence, six items self-constructed and one item adapted from the research of Gungor and Tansel (2007), was used to measure respondents' attitudes toward migrant intention. The Items included: "The human security situation in Penang affects my decision intent to leave Malaysia," "The job pay affects my decision intent to leave Malaysia," "The engagement in current job affects my decision intent to leave Malaysia," "The engagement in current organization affects my decision intent to leave Malaysia," "The social welfare condition in Penang affects my decision intent to leave Malaysia," "I am intent to move to another country to improve my job satisfaction," and "I will definitely migrate and have made plans to do so." Responses were coded in order that a higher score indicates greater effect migrant intention (Abrams, Ando, & Hinkle, 1998).

## RESULT

### *Profile of Respondents*

The sample of the study is 350 engineers after excluding the 16 engineers used for pilot study. The usable response rate is 29.7 percent. 65.4 percent of the respondents are male and 34.6 percent are female. In this study, the respondents majority are in the younger range age between 20-29 years (69.2%), while 25 percent of respondents are in range between 30-39 years, 3.8 percent in range of 40-49 years, and 1.9 percent of respondents are older than 50 years old. Further, the marital status distribution almost balance with nearly half of the respondents (57.7%) are single and another half (42.3%) are married.

In terms of education level, the respondents are relatively well-educated, with the majority of the respondents (84.6%) are Bachelor's degree holder, 3.8 percent are with certificate or diploma, and 11.5 percent of the respondents are Masters Degree holders. As for the job position, nearly half of the respondents (52.9%) hold a position of senior engineer in their firms, while the rest are junior engineer (43.3%), and engineering manager (3.8%).

Regarding the working experience in their firms, the data reveals that about 76 percent of respondents had 1 to 5 years of service in current firms, while the rest were between 6 to 10 years (13.5%) and 10.6 percent of respondent in between 11 to 20 years.

### *Factor Analysis*

Factor analysis has been performed for all the items to evaluate the construct validity. Factor analysis begins with evaluating the appropriateness of the data or correlation matrix. The KMO measure of sampling adequacy is 0.766 and the Bartlett's test of spherecity is significant ($p<0.01$) which indicates the matrix meets the acceptable level of factor analysis and can be factorized.

In this study, only 30 items were found in the range of 0.532 to 0.904 for anti-image correlation, which indicate the items were sufficient correlations. Varimax rotated principal component analysis is conducted on the 30 items to maximize the sum of the variances of the squared factor loadings. The factors only are acceptable if the main loadings values of items are greater than the specified limit of 0.45 and cross loadings below 0.35. As a result, only 17 of 30 items meet the specified limit and loaded into five factors with eigenvalues exceeding 1. The total variance explained by the five factors is 65.09 percent which exceeded the minimum value of 0.60 recommended by Hair et al. (1998).

The extracted five factors correspond to the conceptualized five influences of migrant intention; organizational engagement, human security, job engagement, job satisfaction, and social welfare. The items of organizational engagement and human security loaded in factors 1 and 2, respectively. Similarly, the items of job engagement, job satisfaction and social welfare loaded on factors 3, 4, and 5, respectively. However, all items of job pay satisfaction were found have loading values below the minimum level of 0.45 or have high cross-loadings

above 0.35. Therefore, these items were deleted and job pay satisfaction was removed from the measures of this study.

***Revised Hypotheses***

Based on the result of factor analysis, one variable has been removed. Therefore, the hypotheses of the study have been revised to reflect the changes in the variables. The revised hypotheses reflect the removal of job pay satisfaction as independent variables.

H1: Job satisfaction is negatively related to migrant intention of engineers.

H2: Job engagement is negatively related to migrant intention of engineers.

H3: Organizational engagement is negatively related to migrant intention of engineers.

H4: Human security is negatively related to migrant intention of engineers.

H5: Social welfare is negatively related to migrant intention of engineers.

***Correlation Analysis***

Correlation analysis is a measure of the strength and linearity between two or more variables. The correlation between two variables are considered perfect correlation if the value of Pearson correlation is 1.00. Otherwise, the two variables have no correlation if the value of Pearson correlation is 0.00. Table 3 demonstrates the results of Pearson correlation coefficients for all variables in this study. The correlation coefficients for all variables were below 0.75. Therefore, this study is exclusive of multicollinearity. Refer to the Table 3, five sets of the variables were linear correlation at the 0.01 and 0.05 level. Organizational engagement is linear significantly correlated with job engagement ($r=0.284$, $p<0.01$), job satisfaction ($r=0.258$, $p<0.01$) and migrant intention ($r=-0.105$, $p<0.05$). Job engagement is linear significantly correlated with migrant intention ($r=-0.242$, $p<0.05$). Human security is linear significantly correlated with social welfare ($r=0.194$, $p<0.05$).

Regarding to the direction of the relationship, the correlations among organizational engagement, job engagement and job satisfaction are in the hypothesized positive direction. The correlation coefficient between organizational engagement and job engagement was 0.284, and the correlation coefficient between organizational engagement and job satisfaction was 0.258. The table reveals also that human security is positively correlated with social welfare (.194). On the other hand, migrant intention (IM) is negatively correlated with organizational engagement (-.205) and job engagement (-.242). It implies that the higher organizational engagement or job engagement in the career environment, the less likely intention of engineers in Penang to migrate overseas.

**Table 3:** Pearson Correlation Coefficients for All Variables

| Variables | OE | HS | JE | JS | SS | IM |
|---|---|---|---|---|---|---|
| Organizational Engagement (OE) | 1 | | | | | |
| Human Security (HS) | .108 | 1 | | | | |
| Job Engagement (JE) | .284** | .158 | 1 | | | |
| Job Satisfaction (JS) | .258** | .108 | .192 | 1 | | |
| Social Welfare (SS) | .128 | .194* | .014 | -.033 | 1 | |
| Migrant Intention (IM) | -.205* | -.015 | -.242* | .126 | .059 | 1 |

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

***Hypotheses Testing***

Taking into account the changes hypotheses after factor analysis (cost reductions), there is a total of 5 hypotheses in this study. All 5 hypotheses were tested with discloses the effect of control variables. To test the hypotheses, a two-step hierarchical regression analysis was introduced in this study. In first step, the analysis was related to the effect of control variables on dependent variable. The control variables included gender, age and education level. The purpose of control variables is to isolate the effect of factors, other than those under exploration that may have an effect on the dependent variable. In second step, the independent variables such as human security, organizational engagement, job engagement, job satisfaction, and social welfare were bring in to examine their marginal effect on the dependent variable.

Table 4 presents the regression results of control variables on migrant intention of engineers; while Table 5 presents the results of the regression analysis for the independent variables on migrant intention of engineers. In the first step, age ($p < 0.05$) and education level ($p < 0.05$) have significant effect on migrant intention of engineers. However, gender was found not to be statistically significant. The study also shows that age is negative significantly with migrant intention of engineers. Education level is positive significantly with migrant intention of engineers. The set of control variables explain about 12.1 percent of the total variation in migrant intention. The addition of independent variables in second step explains additional 25.2 percent of migrant intention variance. It means that the set of control variables and independent variables cumulatively explain 37.3 percent of the variance in migrant intention of engineers.

On the other hands, ANOVA table shows that the F-value is 3.994 and independent variables were tested significant ($p < 0.01$). It implies that the appropriate use of multiple regression in this study. Based on the Table 5, it shows that the Durbin Watson value was 1.568. The Durbin Watson value was acceptable as the value fall in range 1.5 to 2.5. Apart for that, this study was considered out of autocorrelations or error terms. Meanwhile, all the value of Variance Inflation Factor (VIF) was reported in the acceptable range from 1.024 to

1.188. Furthermore, there is no multicollinearity problem in the model as all Tolerance values are more than 0.1.

Refer to Table 5, the only two independent variables found to be statistically significant were organization engagement ($\beta$ = -0.205; $p < 0.05$) and job engagement ($\beta$ = -0.209; $p < 0.05$). Job satisfaction is not significant correlated with migrant intention of engineers ($p > 0.05$). Another two variables also were found not to be statistically significant. Therefore, it can be implied that organization engagement and job engagement have a negative significant on migrant intention of engineers; while human security, job satisfaction and social welfare will not influence migrant intention of engineers. As such we accepted hypothesis H2 (job engagement) and H3 (organization engagement), whereas hypotheses H1 (job satisfaction), H4 (human security) and H5 (social welfare) were rejected.

**Table 4:** Multiple Regression Step 1: Control Variables on Migrant Intention of Engineers

| Variables | Correlations Sig. | Standardized Coefficient Beta | Coefficients Sig. | Collinearity Statistics | |
|---|---|---|---|---|---|
| | | | | Tolerance | VIF |
| Gender | .060 | -.135 | .158 | .982 | 1.018 |
| Age | .011* | -.243 | .011* | .994 | 1.006 |
| Education Level | .015* | .213 | .027* | .979 | 1.022 |
| $R^2$ = 0.121 | F-value = 4.569 | | Significance = 0.005** | | |
| Adjusted $R^2$ = 0.094 | Durbin-Watson = 1.568 | | N = 104 | | |

* p < 0.05
** p < 0.01

**Table 5:** Multiple Regression Step 2: Independent Variables on Migrant Intention of Engineers

| Variables | Correlations Sig. | Standardized Coefficient Beta | Coefficients Sig. | Collinearity Statistics | |
|---|---|---|---|---|---|
| | | | | Tolerance | VIF |
| Gender | .060 | -.121 | .189 | .945 | 1.058 |
| Age | .011* | .232 | .011* | .977 | 1.024 |
| Education Level | .015* | .224 | .015* | .964 | 1.038 |
| Job Satisfaction | .101 | .229 | .016* | .905 | 1.104 |
| Job Engagement | .007** | -.209 | .030* | .880 | 1.136 |
| Organization Engagement | .013* | -.205 | .037* | .842 | 1.188 |
| Human Security | .440 | -.019 | .838 | .918 | 1.090 |
| Social Welfare | .274 | .152 | .107 | .915 | 1.093 |
| $R^2$ = 0.252 | F-value = 3.994 | | Significance = 0.000** | | |
| Adjusted $R^2$ = 0.189 | Durbin-Watson = 1.568 | | N = 104 | | |

* p < 0.05
** p < 0.01

## DISCUSSION

### *(a) Hypotheses 1 is rejected*

The study failed to find a significant relationship between job satisfaction and migrant intention of engineers in Penang. This result is not consistent with the finding of Alam and Mohammad (2009) that job satisfaction has a significant relationship with intention to leave. The inconsistency in finding may due to different definition of variables. This study has taken the satisfaction with supervisor, co-workers and job variety in an organization; in contrast with Alam and Mohammad (2009) that include satisfaction with supervisor, job variety, closure, compensation, co-workers and human resource management policy.

### *(b) Hypotheses 2 is accepted*

This study revealed a significant negative relationship between job engagement and migrant intention of engineers, which means that the stronger engagement of engineers in their job, the less likely the engaged engineers' intention to resign and migrate overseas. This finding is consistent with the finding of Saks (2006) and Kirkpatrick (2006) who found that engaged employees likely to be in more positive attitudes and intentions toward their job and stay abroad permanently rather than migrate overseas. No challenging at work place is a relatively new phenomenon of new century in Penang. This might be due to the high expectation of high level education of professional engineers. Refer to the profile of respondents, 84.6 percent of the engineers are Bachelor's degree holder and 11.5 percent of the engineers are Masters Degree holder. The heart of job engagement is employees' attitude and expectations. Most of highly educated professional engineers prefer to have an interesting, challenging job where they feel that they can make a real different to other people's lives. Today, most of the manufacturing firms in Penang still confined to manufacturing, assembling and testing. Penang's economic sustainability is threatened highly-skilled countries with research and design capabilities in the region such as Singapore and Taiwan (OECD, 2008). This may explain the reason why highly educated engineers in Penang are less engaged to their job and intent to leave to find better working platform to maximize their expertise in Electrical & Electronic industry.

### *(c) Hypotheses 3 is accepted*

The study supported the negative relationship between organizational engagement and migrant intention of engineers. This result is consistent to the research finding from Harter, et al. (2002) that the employee who feeling less committed to the organization will affect their citizenship at work and intent to leave. The psychological damage that retrenchments in 2008 global economic crisis cause to decreased loyalty, trust and organizational commitment, lowered motivation and productivity, and increased resistance to leave. It is obvious that retrenchment have a negative effect on employee engagement, as the elements that are needed to create engaged employees are the ones that are adversely affected by the retrenchment of their colleagues. This may explain the reason why engineers in Penang are less engaged to the organization and intent to leave to find better working environment.

***(d) Hypotheses 4 is rejected***

The study failed to find a significant relationship between human security and migrant intention of engineers in Penang. This result is contradictory to the research finding from Erasmus & Breier (2009) and Wongboonsin (2004) that the human security is negatively associated with migrant intention of engineers. Table 6 presents the descriptive statistics for all variables under study. The table shows that human security is the least factor influencing migrant intention of professional engineers in Penang (mean=2.21, standard deviation=0.64). Possible explanation for this result is that the crime rate in Penang has dropped by 26 percent in the first six months of the year 2011, well ahead of the Federal Government's target of 5 percent reduction (InvestPenang, 2011).

***(e) Hypotheses 5 is rejected***

This study found that social welfare is not found to be significant correlated. Table 6 shows that the average impact of social welfare on migrant intention of engineers is low (mean=3.05, standard deviation=0.99). This result is inconsistent with the research finding from Dustmann & Preston (2007) and Giorgi & Pellizzari (2009) that social welfare has an impact on migration decision. Refer to the profile of respondents, majority of the respondents are in the younger range age between 20-29 years (69.2%), which indicated that they were fresh engineers in labour market. Young workers are lack of thought to welfare benefit such as retirement and similar plans (Bloomberg Businessweek, 2010). They also lack of the requisite knowledge to get started the plan and think about something like pension that is 40 years away. Older workers, in contrast, are primary having their compensation in the form of welfare benefit (Bank Investment Consultant, 2011). This may explain the reason why social welfare is not significant in this study.

***Migrant Intention of Engineers***

As indicated earlier, migrant intention of engineers is reflected in the way the respondents relate their behaviour to job satisfaction, job engagement, organizational engagement, social welfare and human security. And that on average the respondents perceived level of migrant intention was reported on moderate (mean=3.23, SD=0.58). Table 6 highlights the descriptive statistics for migrant intention.

**Table 6:** Descriptive Statistics of Variables under Study

| Variables | Mean | Std. Deviation |
|---|---|---|
| Job Satisfaction | 3.98 | 0.56 |
| Job Engagement | 3.41 | 0.76 |
| Organizational Engagement | 3.22 | 0.75 |
| Human Security | 2.21 | 0.64 |
| Social Welfare | 3.05 | 0.99 |
| Migrant Intention | 3.23 | 0.58 |

Note: All variables used a 5-point Likert scale with (1= Strongly Disagree, 5= Strongly Agree)

***Effect of Control Variables***

In this study, the role of control variables is to ensure the results of the study are authentic in reflecting the real effect of study variables. The control variables considered in this study are gender, age and education level. The regression analysis indicates that two of three control variables, age and education level, appear to have an impact on migrant intention of engineers. It is consistent to the research finding from Esipova, Ray and Srinivasan (2010) that age and education is strongly related to people's desire to migrate in the world. Gender has no significant impact on migrant intention of engineers in Penang.

## CONCLUSION

Today, brain drain issues receive primary level of attention at nation level. The attention raises questions concerning to integrate brain drain in country economy transformation to become a high-income nation. Effective integration not only expected to help in generating significant benefits to business organizations, but also will help the nation's economic sustainability by accumulating human capital stock. For Malaysia to fulfil its vision to become a high-income economy by 2020, it will be important to give insights about the underlying factors that lie at the heart of individuals' migration decisions (World Bank, 2011).

In the 21st Century, there is an explosion of higher education enrolment in Malaysia. As a result, there will be increase expectation for getting higher living standards, which will prompt many more engineers in Malaysia intent to search better opportunities in overseas for their living standards expectations. To be sure, understanding these global movements of engineers will be of particular interest to those involved in policy formation at the national levels. The findings of the study support job engagement and organizational engagement are negatively correlated to migrant intention. Hence, decreasing employee engagement in an organization can lead to turnover of professional engineers and migrate overseas that may affect the core competencies of an organization and country, and its able to sustain competitive in the global labour market.

On the other hand, job pay satisfaction, human security, social welfare and job satisfaction were found to be not significantly affecting the migrant intention of professional engineers in Penang. Another finding is that the level of migrant intention among professional engineers in Penang is moderate. The level of migrant intention could be used as a predictor of future behaviour of brain drain in Malaysia. Further efforts are required to address the brain drain. Lastly, it is hope that this study could be serves as a preliminary insight on the migrant intention of professional engineers in Penang.

## IMPLICATIONS

This finding of the study has several implications to the theoretical and practical aspects of management. Theoretically, push and pull factors theory is used to explain the determinants of migrant intention of professional engineers in this study. Specifically, the study added

variables such as job satisfaction, job engagement, organizational engagement, human security, job pay satisfaction and social welfare into push and pull factors theory model to determine whether these factors fit well to predict migrant intention of engineers. This study found that job engagement and organizational engagement are significant in determining migrant intention of engineers, thereby contributing towards confirming the usefulness of the push and pull factory theory model.

The study presents significant practical of managerial implications in an organization. Firstly, as can be seen from the research findings, the engineers were less likely engaged in current job. According to a report from OECD (2008), Malaysia underperforms in R&D activities compared to the OECD average and the South East Asian average. The scientific publications and researcher population in Penang is less numerous. Today, Penang still is dominated by multinational corporations with few linkages to local firms, and a domestic part characterised by low skills and low R&D and innovation intensity. Within this context, Penang is encountering difficulties to translate scientific knowledge into technological capabilities. The government either state government or federal government can take the hint and develop the local entrepreneur.

To increase the engagement among young and highly educated engineers, the future of the manufacturing sector in Penang should not be relied to manufacturing, assembling and testing, but local management in multinational company should encompass more higher value-added activities such as to localise the design activities and to invest their facilities and services to better serve the regional market. A lack of suitable high-productivity working environment in the professional field an individual would wish to work in provides a strong incentive for migration (World Bank, 2011). To move towards a higher value-added plane, Penang local management need to upgrade the research and design capabilities to design more challenging jobs for reducing migrant intention among highly educated engineers.

Lastly, the implications resides in the high number of professional engineers who are intent migrate overseas. In Malaysia, there are more professional engineers already emigrate to overseas than there are professional engineers return back to Malaysia. The overall number of migrant intention of engineers is increasing. Regarding on the lack of brain drain resource in Malaysia, it implies that federal government shall work together with university-based academics to establish National Migration Research Centre, which play role as a resource centre of brain drain related information or statistical data for the county on regional migratory movements and their impacts. The national migration research centre must established to advance the use of research-based support in the debate of brain drain issues, and provides a guideline to complement the policy-oriented and academic-oriented inclinations of government and academic institutions, respectively (Raghuram, Asis, & Piper, 2008).

## LIMITATIONS AND FUTURE RESEARCH

Despite the usefulness of the study findings, there are several limitations in this study. Firstly, the study only focused on Electrical & Electronic manufacturing firms in Penang excluded non-E&E manufacturing firms (e.g. textile, solar, food-processing). Moreover, the issue of whether the results of the study apply to other states in Malaysia need to be considered. Therefore, the results of the study should be treated with concern when applied to non-E&E manufacturing firms or states other than Penang.

Secondly, the study only collected data on professional Electrical & Electronic engineers. In this inquiry, the data did not focus on other valuable professionals. These groups of professionals included mechanical engineers, IT engineers, civil engineers and other specialists, who are very valuable, but also who may intent migrates out of Malaysia. Their absence from the data constitutes an enormous limitation to assess and to address the overview of the Malaysia professionals' brain drain issue.

Thirdly, multiple regression analysis was showing accumulative $R^2$ of 0.373, which means only about 37.3 percent of the variations in migrant intention of engineers, is explained by the model. This highlights the need to identify other relevant factors to explain the remaining variation in migrant intention of engineers that is currently unexplained by the current model. Next, the national statistics in Malaysia did not provide an accurate wave of emigration. Thus, the only way to evaluate the structure of emigration was to collect immigration data in the most important destination countries. The limitation here may bias the finding research.

Research on migrant intention in Malaysia is sorely needed. Even though it is clear that high emigration of skilled workers is a serious problem in Malaysia, but the body of literature in this field is still lacking, primarily due to the limited amount of research that has been conducted. Future research on brain drain can extend over a wide geographical area such as North region or all states in Malaysia. Then, future studies may investigate the factors affecting migrant intention on other professional groups such as architect, mechanical or civil engineers, doctors and IT engineers. By doing this, it will produce a more precise, consistent and nationwide results to the similar study on this field.

To enhance the research findings, future research should develop a model by incorporate other significant independent variables such as political, government governance, regulations, or social based on latest literature from time to time. Empirical studies pointed that political, economy and social are three main aspects to deal with brain drain issues. According to Sylla (2011), political corruption at all levels of government encourages many professionals to leave. Finally, future research could be work together with Department of Immigration and Statistics to investigate the findings of brain drain in more detail. A qualitative research can be conducting to get more insight into the subject and allows asking free-response questions from respondents.

## REFERENCES


Abrams, D., Ando, K., & Hinkle, S. (1998). Psychological attachment to the group: Cross-cultural differences in organizational identification and subjective norms as predictors of workers' turnover intentions. *Personality and Social Psychology Bulletin, 24*(10), 1027-1039.

Akaha, T., & Vassilieva, A. (2005). Crossing National Borders: Human Migration Issues in Northeast Asia. *Tokyo: United Nations University Press*.

Alam, M. M., & Mohammad, J. F. (2009). Level of Job Satisfaction and Intent to Leave among Malaysian Nurses. *Business Intelligence Journal*, 123-137.

Australia, E. (2004). Australia - Malaysia Free Trade Agreement Scoping Study.

Avery, D. R., McKay, P. F., & Wilson, D. C. (2007). Engaging the Aging Workforce: The Relationship Between Perceived Age Similarity, Satisfaction With Coworkers, and Employee Engagement. *Journal of Applied Psychology, 92*(6), 1542-1556.

Bailey, M. A. (2005). Welfare Migration and the Multifaceted Decision to Move. *American Political Science Review, 99*(1).

Bakker, A. B., & Demerouti, E. (2008). Towards A Model of Work Engagement. *Career Development International, 13*(3), 209-223.

Bank Investment Consultant. (2011). Demographics - Not Size - Matter in Retirement Plans: ICI Study. Retrieved 27 September, 2011, from http://www.bankinvestmentconsultant.com/news/ici-study-retirement-plan-demographics-2675882-1.html

Barak, M. E. M., Levin, A., Nissly, J. A., & Lane, C. J. (2006). Why do they leave? Modeling child welfare workers' turnover intentions. *Children and Youth Services Review, 28*(5), 548-577.

Beine, M. A., & Docquier, F. (2008). Brain Drain and Human Capital Formation in Developing Countries: Winners and Losers. *The Economic Journal, 118*(528), 631-652.

Bhagwati, J., & Hamada, K. (1974). The Brain Drain, International Integration of Markets for Professionals and Unemployment: A Theoretical Analysis. *Journal of Development Economics, 1*(1), 19-42.

Bloomberg Businessweek. (2010). Retirement: Gen Y's Empty Piggy Bank. Retrieved 27 September, 2011, from http://www.businessweek.com/investor/content/jul2010/pi20100715_116291.htm

Borjas, G. J. (1996). *Immigration and Welfare Magnets*. Paper presented at the Workshop on the Effects of Immigration on African-Americans.

Brown, S. P. (1996). A meta-analysis and review of organizational research on job involvement. *Psychological Bulletin, 120*(2), 235-255.

Chevaleyre, Y., Endriss, U., Estivie, S., & Maudet, N. (2004). Welfare Engineering in Practice: On the Variety of Multiagent Resource Allocation Problems. . *The Fifth International Workshop Engineering Societies in the Agent World*, 335-347.

Commander, S., Kangasniemi, M., & Winters, L. A. (2004). The Brain Drain: Curse or Boon? A Survey of the Literature. *National Bureau of Economic Research*.

Crepeau, F., Nakache, D., & Atak, I. (2007). International Migration: Security Concerns and Human Rights Standards. *Transcultural Psychiatry, 44*(3), 311-337.

Currivan, D. B. (2000). The Causal Order of Job Satisfaction and Organizational Commitment in Models of Employee Turnover. *Human Resource Management Review, 9*(4), 495-524.

Dalen, H. P. V., Groenewold, G., & Schoorl, J. J. (2004). Out of Africa: What drives the Pressure to emigrate? *Tinbergen Institute, TI 2003*(059/3).

Department of Immigration and Citizenship Australia. (2011). Visas, Immigraton and Refugees. Professionals and Other Skilled Migrants. Retrieved August 1, 2011, from http://www.immi.gov.au/skilled/general-skilled-migration/

Diprose, R. (2008). *Safety and Security: A Proposal for Internationally Comparable Indicators of Violence*. Paper presented at the Centre for Research on Inequality, Human Security and Ethnicity, CRISE.

Docquier, F., & Rapoport, H. (2006). The Brain Drain. *New Palgrave Dictionary of Economics (second edition)*.

Dovlo, D. (2003). The Brain Drain and Retention of Health Professionals in Africa. *Improving Tertiary Education in Sub-Saharan Africa: Things That Work!*

Dustmann, C., & Preston, I. P. (2007). Racial and Economic Factors in Attitudes to Immigration. *The B.E. Journal of Economic Analysis & Policy, 7*(1).

Erasmus, J., & Breier, M. (2009). Skills Shortages in South Africa: Case Studies of Key Professions. *Department Labour Republic of South Africa*.

Esipova, N., Ray, J., & Srinivasan, R. (2010). The World's Potential Migrants: Who They Are, Where They Want to Go, and Why It Matters. *Gallup*.

Eurofound. (2010). *Pretesting of the 5th European Working Conditions Survey Questionnaire*. Retrieved from http://www.eurofound.europa.eu/surveys/ewcs/2010/pretest.htm

Frey, W. H., Liaw, K.-L., Carlson, M. J., & Xie, Y. (1996). Interstate Migration of the US poverty Population: Immigration "Pushes" and Welfare Magnet "Pulls". *Population and Environment, 17*(6), 491-533.

Gaiduk, R., Gaiduk, J., & Fields, D. (2009). Limiting the Brain Drain: Determinants of Employee Organizational Attachment in Lithuania. *Baltic Journal of Management, 4*(2), 149-168.

Giorgi, G. D., & Pellizzari, M. (2009). Welfare Migration in Europe. *Labour Economics, 16*, 353-363.

*GRADAsia Engineering*. (2009). (3 ed.).

Grecic, V. (2002). The Role of Migrant Professionals in the Process of Transition in Yugoslavia. *3*, 253-271.

Gubhaju, B., & Jong, G. F. D. (2009). Individual Versus Household Migration Decision Rules: Gender and Marital Status Differences in Intentions to Migrate in South Africa. *International Migration, 47*(1), 31-61.

Gungor, N. D., & Tansel, A. (2005). The Determinants of Return Intentions of Turkish Students and Professionals Residing Abroad: An Empirical Investigation. *IZA Discussion Paper No. 1598*.

Gungor, N. D., & Tansel, A. (2007). Brain Drain from Turkey: An Investigation of Students' Return Intentions. *Economic Research Center*.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis (5th ed)*. Upper Saddle River, NJ: Prentice Hall Inc.

Harter, J. K., Schmidt, F. L., & Hayes, T. L. (2002). Business-Unit-Level Relationship Between Employee Satisfaction, Employee Engagement, and Business Outcomes: A Meta-Analysis. *Journal of Applied Psychology, 87*(2), 268-279.

Hassan, H. (2009). Brain-drain Debate After Penang Loses $4b deal. *The Straits Times*.

Helliwell, J. F. (1999). Checking the Brain Drain: Evidence and Implications. *Papers 99-3, Institute for Policy Analysis*.

Hemmans, D. (2010). Comparing Salary versus Non-salary Factors Affecting the Voluntary Turnover of IT Sales Professionals. *University of Phoenix*.

Huselid, M. A., & Day, N. E. (1991). Organizational Commitment, Job Involvement, and Turnover: A Substantive and Methodological Analysis. *Journal of Applied Psychology, 76*(3), 380-391.

InvestPenang. (2011). Crime index down 26% in Penang. Retrieved Sept 8, 2011, from http://www.investpenang.gov.my/portal/component/content/article/1-latest-news/1671-crime-index-down-26-in-penang.html

Jackson, J. (2005). *In Search of the Diaspora Effect: Lessons from Taiwanese and Indian 'brain gain' for Jamaican 'brain drain'*. Paper presented at the Annual Conference on Development and Change.

Kalleberg, A. L. (2004). Work Values and Job Rewards: A Theory of Job Satisfaction. *American Sociological Review, 42*(1), 124-143.

Kirkpatrick, C. L. (2006). *To Invest, Coast or Idle: Second-stage Teachers Enact Their Job Engagement*. Paper presented at the The American Educational Research Association Annual Conference.

Kofoed, M., & Fonnesbech, B. (2000). Sustainable Industrial Development in Penang. *Institute of Environment, Technology and Social Studies, Roskilde University*.

Laamanen, J.-P., & Kotakorpi, K. (2007). Welfare State and Life Satisfaction: Evidence from Public Health Care. *University of Tampere and FDPE*.

Lahav, G. (2004). Migration and Security: The role of Non-state Actors and Civil Liberties in Liberal Democracies. *Department of Political Science, State University of New York*.

Legatum Institute. (2010). The 2010 Legatum Prosperity Index. Retrieved 29 March, 2011, from http://www.prosperity.com

Loewenson, R., & Thompson, C. (2005). Health Personnel in Southern Africa: Confronting Maldistribution and Brain Drain. *International Development Research Centre (Canada)*.

Mahroum, S. (1999). Highly Skilled Globetrotters: The International Migration of Human Capital. *Institute for Prospective Technological Studies, Joint Research Center of the European Commission, Seville*.

Martens, P., & Hall, L. (2000). Malaria on the move: Human Population Movement and Malaria Transmission. *Emerging Infectious Disease, 6*(2), 103-109.

May, D. R., Gilson, R. L., & Harter, L. M. (2004). The Psychological Conditions of Meaningfulness, Safety and Availability and the Engagement of the Human Spirit at Work. *Journal of Occupational and Organizational Psychology, 77*, 11-37.

Muyibi, S. A. (2008). Effect of Brain Drain or Skilled Labour Migration on Economic Development: A Global Perspective. *Codewit Publications*.

Naim, S. T. K., & Iftikhar, Z. (2010). Migration of Highly Skilled and its Impact on the Economic and Technological Development of Pakistan and Bangladesh. *South Asia Network of Economic Research Institutes, 10-11*.

Nayyar, D. (1997). Emigration Pressures and Structural Change. *Employment and Training Department, ILO's Migration Branch*.

NEM. (2010). Policies for the E&E Sector. Retrieved 19 July, 2011, from http://www.neac.gov.my/files/Appendix_A_Policies_For_The_E&E_Sector.pdf

OECD. (2008) OECD Review of Higher Education in Regional Development of the State of Penang, Malaysia.

PEMANDU. (2011). Economic Transformation Programme. Retrieved August 8, 2011, from http://etp.pemandu.gov.my/Overview_of_NKEAs_-@-Electronics_and_Electrical.aspx

Pouria, A. (2011). *Job Satisfaction of Engineering Graduates of Iranian Universities in British Columbia.* Capella University, United States - Minnesota.

Raghuram, P., Asis, M. M. B., & Piper, N. (2008). Migration and Development in Asia: Knowledge Frameworks. *Netherlands Organisation for International Cooperation in Higher Education*.

Razin, A., & Sadka, E. (1999). Migration and Pension with International Capital Mobility. *Journal of Public Economics, 74*(1), 141-150.

Razin, A., & Sand, E. (2009). Migration-Regime Liberalization and Social Security: Political-Economy Effect. *NBER Working Paper No. 15013*.

Record, R., & Mohiddin, A. (2006). An Economic Perspective on Malawi's Medical "Brain Drain". *Globalization and Health, 2*(12).

Regets, M. C. (2007). Research Issues in the International Migration of Highly Skilled Workers: A Perspective with Data from the United States. *Division of Science Resources Statistics, National Science Foundation*.

Robinson, D., Perryman, S., & Hayday, S. (2004). *The Drivers of Employee Engagement*: Institute for Employment Studies, Brighton.

Rudolph, C. (2003). Security and the Political Economy of International Migration. *The American Political Science Review, 97*(4), 603-620.

Sahay, A., & Srivastava, J. (2005). *Significance of the Brain Drain in Economic Growth: Case Study on India*. Paper presented at the annual meeting of the International Studies Association.

Saks, A. M. (2006). Antecedents and Consequences of Employee Engagement. *Journal of Managerial Psychology, 21*(7), 600-619.

Schaufeli, W. B., & Bakker, A. B. (2004). Job Demands, Job Resources, and their Relationship with Burnout and Engagement: A Multi-Sample Study. *Journal of Organizational Behavior, 25*, 293-315.

Schaufeli, W. B., Salanova, M., Gonzalez-roma, V., & Bakker, A. B. (2001). The Measurement of Engagement and Burnout: A Two Sample Confirmatory Factor Analytic Approach. *Journal of Happiness Studies, 3*(1), 71-92.

Sekaran, U. (2003). *Research Methods for Business: A Skill Building Approach.* Singapore: John Willey & Sons, Inc.

Singh, N., & Papa, R. (2010). The Impacts of Globalization in Higher Education. *International Journal of Educational Leadership, 5*(2).

Sinn, H.-W. (2002). EU Enlargement and the Future of the Welfare State. *Scottish Journal of Polilical Economy, 49*(1).

Sylla, K. (2011). Addressing The Brain Drain of African Medical Professionals to Western Countries. *Ph.D. dissertation, The University of Akron, United States - Ohio*.

Talent Corporation Malaysia. (2011). Programmes. Retrieved 19 August, 2011, from www.talentcorp.com.my/programmes.asp

Tansel, A., & Gungor, N. D. (2003). *Brain Drain From Turkey: Survey Evidence of Student Non-Return*. Paper presented at the ERF Working Paper Series.

The Star. (2010). Tracing the Brain Drain Trend. Retrieved 16 May, 2010, from http://thestar.com.my/news/story.asp?file=/2010/5/16/nation/6273783&sec=nation

The World Health. (2006). World Health Report 2006. Retrieved 13 April, 2011, from http://www.who.int/whr/2006/whr06_en.pdf

Todisco, E., Brandi, M. C., & Tattolo, G. (2003). Skilled Migration: A theoretical Framework and the Case of Foreign Researches in Italy. *Flinders University Languages Group Online, 1*(3).

USA Travel State Gov. (2011). Diversity Visa (DV) Lottery Program. Retrieved August 2, 2011, from http://travel.state.gov/visa/immigrants/types/types_1322.html

Wongboonsin, P. (2004). *Human Security and Transnational Migration: The Case in Thailand*. Paper presented at the Policy Innovation Initiative: Human Security Research in Japan and Asia.

World Bank. (2010). *International Migration and Development*.

World Bank. (2011). *Malaysia Economic Monitor, April 2011 - Brain Drain*.

World Health Organization. (2004). *The World Health Report 2004*.

Zweig, D. (1997). To return or not to return? Politics vs. economics in China's brain drain. *Studied in Comparative International Development, 32*(1), 92-125.