Graduates in Malaysia: Is There a Brain Waste?

Norehan Abdullah, Soon Jan Jan, Lim Hock Eam, and Siti Aznor Ahmad

Abstract---This paper aims to examine whether the issue brain waste exists among science and engineering graduates in Malaysia using a sample of research officers. Brain waste is defined as underutilization of one's qualifications and skills in jobs obtained. Results of descriptive statistics reveal that brain waste occurs to some of them in their first, second and third jobs; no brain waste occurs in their current jobs. Thus, their job transitions provide a complete cycle of brain waste. It is found that around twenty per cent of the respondents experience brain waste in their first job (after graduated with their first degree). Brain waste increases to around twenty five per cent in respondents' second job. However, the incidence of brain waste reduces as the respondents move to their third job. The incidence of this phenomenon continues to diminish and it does not occur on their current jobs. Overall, the incidence of brain waste can persist for around three years. Females and those with parents of low education level are more likely to have brain waste. The incidence of brain waste appears to have no substantial difference in terms of age, ethnicity and types of degree (sciences and engineering).

Keywords---Brain waste; graduates, job transitions, research officers.

I. INTRODUCTION

IN 2012, a new year message by the Malaysian Minister of Higher Education (formerly known as Ministry of Education), called for increased effort to produce more researchers, scientists and engineers (RSEs) to achieve the ratio of 100 RSEs in every 10,000 labour force by 2020. While according to UNESCO, the number of researchers in every 1,000 labour force in Malaysia is only 0.86 in 2006 (the most recent year in which the data is available) [1], yet surprisingly, according to an official of the Ministry of Education, studies have shown that between 30-40 percent of graduates are unemployed or are in the field that does not commensurate with what they have studied.

Comparing these factual statistics with the aspiration of the Minister of Higher Education, there appear to be an alarming phenomenon in which science-based university graduates who are supposed to have been trained for high skill occupations, i.e. researchers, scientists and engineers, are not working on jobs in their field of training. This is evidently shown when the 2010 Tracer Study reported that 28.6% of graduates from science-based fields of study are unemployed. [2] In other words, brain waste (which can be defined as a type of job mismatch) may be rampant and rife among these science-based graduates.

The brain waste literature typically looks at how highly skilled international migrants fare in terms of landing themselves jobs that are commensurate with their qualifications. In the literature, brain waste refers to an underemployed educated international migrant, i.e. one who is working on a job which he or she is over qualified in the host country [1], [2], [3], [4], and [5], a sub-utilization of qualified, skilled and experienced labour force [6], waste of talent and skill [7] and [8], or a form of sub-employment, defined by situations the "persons whose job levels in terms of schedules or productivity at work are well below their capabilities and preferences" are found in. A much-cited anecdotal example of brain waste is an immigrant PhD-holder scientist working as a cab driver [9], [1] and [5].

[1] and [3] studies on brain waste are perhaps the leading and most cited papers in the literature. They use as their dependent variable the probability of a highly skilled immigrant obtaining an equally skilled job, looking at the brain waste of immigrants to U.S as the host country in particular.

Out of the total number of qualified immigrants born in Latin American and the Caribbean countries who are living in the United States (a population that accounted for 1.2 million professionals in 2007), only 43% are working in positions that are in line with their training level, while the remaining 57% have to take up jobs that require very low or no qualification at all [6]. In Canada, internationally educated health professionals (IEHPs) such as qualified physicians, nurses, and midwives, find it difficult to practise their profession there due to language and cultural integration barriers, financial difficulties, licensure requirements, and time-consuming immigration bureaucracy; all these translate into the problem of brain waste [10] or what [11] in her earlier pilot study termed as the deskilling of medical immigrants.

Reference [2] shows that brain waste reduces the economic performance of transitional countries in two ways: by reducing the inclination to study at tertiary level among the young generation, and by lowering the number of graduates in the society. Two other negative outcomes of brain waste not included in the theoretical model must be mentioned. As the skilled immigrants work in menial jobs where their qualifications are not properly used, their personal human capital stock depreciates very rapidly. For instance, a young graduate mining engineer working as a waiter in a London restaurant, after five years of emigration would lose a considerable amount of knowledge acquired at the university.

The brain waste literature as discussed above typically looks at how highly skilled international migrants fare in terms of landing themselves jobs that commensurate with their qualification. The studies reviewed here involve the

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[1]http://stats.uis.unesco.org/unesco/TableViewer/tableView.asp
[2]http://www.mohe.gov.my/web_statistik/statistik2010/BAB7_KAJIAN_PEN GESANAN_GRADUAN.pdf

crossing of international borders between countries. In this current study however, we would like to depart from the received brain waste literature. Our point of departure is that the scope of our brain waste definition will be within national border. We will be looking instead at why pure science and engineering graduates are 'wasting' their university education by working in sectors or jobs that do not match their training and skill set.

II. DATA AND METHODOLOGY

The target population is the research officers of MARDI because they have achieved a match between their qualification and job positions. Moreover, they are either science or engineering graduates and hence, a miss-match between their qualifications and job positions creates a waste of brain. It is expected that, although there is no brain waste in their current positions, they might have experienced brain waste in their first few jobs after their graduation. This provides an opportunity for us to trace the completed cycle of brain waste, i.e., from the first job (brain waste or without) until the current job (no brain waste).

Since the list of MARDI research officers is not available, we use a convenience sample. The research officers in Bukit Tangga, Kedah and at the headquarters of MARDI are approached for their consent to participate in this survey. The participation is voluntary and self-administered questionnaire are distributed to the research officers. A total of 75 MARDI research officers (Bukit Tangga, 11; Headquarters, 64) have agreed to participant in this study. The sample characteristics are as presented in Section 4.1. Respondents are asked to recall their memory on the jobs that they had held before and the related information such as skills level, job scopes, salary earned and commencing year. It is important to note that as the present study uses a small sample with non-probability sampling design, the present study is, by nature, at exploratory level.

Methodology

Descriptive statistics analyses are used to analyse the brain waste, including the classification, duration, transition and characteristics of brain waste. Frequency and percentage distributions, central tendency and dispersion statistics such as mean and standard deviation, are the methods employed to achieve the objective of this study.

For the job transitions, we use a cross-tabulation table to construct the job transition matrix as below:

First job to Second job: $\begin{bmatrix} P_{ij} \end{bmatrix} = \begin{bmatrix} P_{11} & P_{12} \\ P_{21} & P_{22} \end{bmatrix}$

P_{ij} represents the probability (in terms of relative frequency) of transit from category i, where i=1 (if brain waste) and i=2 (if no brain waste) in first job to category j, where j=1 (if brain waste) and j=2 (if no brain waste) in second job. For example, P_{11} represents the probability of transit from being brain waste in first job to brain waste in second job; P_{12} represents the probability of transit from being brain waste in first job to no brain waste in second job; P_{21} represents the probability of transit from being no brain waste in first job to brain waste in second job; P_{22} represents the probability of

transit from being no brain waste in first job to no brain waste in second job. The transition matrix of second job to third job is also similarly constructed.

Theoretically, brain waste is defined as underemployed of the educated such as when high skilled labour works in low skilled job. Thus, brain waste can be classified using skills level, salary earned, and job scopes in relation to the qualification or skills acquired.

In the present study, the information on skills level is self-perceived and thus it can be biased as different respondents may interpret the skill level of their jobs differently. For instance, one respondent has interpreted the "manager" job as unskilled. Therefore, we use the aspect of "Salary" which is time period adjusted to determine the classification. In this case for the designation of manager, for a monthly salary of RM1,200 or less in the period 1992 and later or RM1,100 or less in 1991 and earlier, the respondent is classified as brain waste. Classification is also verified by the job scope that underutilizes the skills of the respondents acquired through their first degree. For example, a physics major respondent working as a computer trainer to teach basic computing skills in his/her first job is considered brain waste.

III. RESULTS AND ANALYSIS

Results and analysis are divided into two sections: sample characteristics and analysis of brain waste.

Sample Characteristics

Table 1 to 3 present the sample characteristics of the present study. From Table 1, it is found that there is a good balance in the sample between female (44.59%) and male (55.41%).

With regard to academic qualification detailed in Table 3, majority (79.45%), of the respondents are reported to be science graduates and the balance (20.55%), are engineering graduates.

In terms of age, from Table 2, the respondents have a mean age of around 36 years with actual age ranging from 25 to 59 years. The average salary earned is RM5305 per month. The lowest monthly salary reported is RM2, 700 while the highest is RM11,000.

TABLE I
SAMPLE CHARACTERISTICS

Characteristics		Freq	%
Gender	Male	41	55.41
	Female	33	44.59
Ethnicity	Malay	67	89.33
	Chinese	3	4.00
	India	3	4.00
	Others	2	2.67
Marital status	Single	13	17.33
	Married	61	81.33
	Others	1	1.33
First degree	Sciences	58	79.45
	Engineering	15	20.55
First choice?	Yes	39	52.70
	No	35	47.30
Job position	Principal RO	4	5.41
	RO	61	82.43
	RO (IT)	1	1.35
	Senior RO	7	9.46
	Deputy director	1	1.35

TABLE II
AGE AND SALARY

	Freq.	Mean	Std Deviation	Min	Max
Age	73	36.74	9.54	25.00	59.00
Salary	71	5305.28	1963.56	2700.00	11000.00

In short, the descriptive statistics of the sample vis-à-vis their respective job characteristics reveal that the respondents are not experiencing brain waste in their current jobs. Most of them have worked in MARDI for at least 3 years. Thus, their job transition since graduation from their first degree until their current job should form a complete cycle of brain waste that the respondents have gone through. The analysis of this brain waste is described in the next section.

Brain Waste

This analysis begins with the classification of brain waste, followed by the job transitions of brain waste and characteristics of brain waste.

Table 3 presents the incidence of brain waste. It is observed that approximately one third or 19 respondents experienced brain waste in their first job after graduated with their first degree. For the second job, the occurrence of brain waste reduced to approximately eleven per cent with only 3 respondents reported of facing brain waste. However, the incidence of brain waste persisted as the same three respondents reported of brain waste when they have moved on to their third job.

TABLE III
INCIDENCE OF BRAIN WASTE

	Brain waste (YES)		Brain waste (NO)	
	Freq	%	Freq	%
First Job	19	31.67	41	68.33
Second Job	3	11.54	23	88.46
Third Job	3	42.86	4	57.14
Current Job*	0	0.00	74	100

Note: * current job refers to the job in MARDI which has no brain waste

From the cumulative frequency perspective as displayed in Table 4, it shows that the percentage of brain waste is diminishing and stabilizing at around twenty five per cent from the first job to the third, over a period of around 2.42 years.

On the other hand, Table 5 presents the average duration of holding the jobs. On average, graduates stay on their first job for 1.66 years and this duration of job holding increases with job transition. This reducing trend is also found in the incidence of brain waste (see Table 4).

Thus, in general, a substantial incidence of brain waste occurs in first job; however, it diminishes as the respondents move on to subsequent jobs. On average, brain waste can persist for around two and half years. To gain further insight, we present the brain waste analysis in terms of characteristics of those who are experiencing and those not experiencing brain wastes.

TABLE IV
INCIDENCE OF BRAIN WASTE AND DURATION OF HOLDING THE JOB
(CUMULATIVE)

	Brain waste (YES)		Brain waste (NO)	
	Freq	%	Freq	%
First Job	19	31.67	41	68.33
Second Job	22	25.58	64	74.42
Third Job	25	26.88	68	73.12
Current Job	0	0.00	74	100.00
Duration	Average (yrs)		Average (yrs)	
First Job	1.25		1.83	
Second Job	1.86		4.67	
Third Job	2.42		10.57	
Current Job	n.a.		13.57	

TABLE V
DURATION OF HOLDING THE JOB

Duration (stay)	Average (yrs)
First Job	1.66
Second Job	2.59
Third Job	3.61
Current Job	10.00

Brain waste: job transitions and characteristics

In terms of age, from Table 6, it is found that those who experience brain waste, are slightly younger than those who are not. However, this difference in age appears to be not substantial. For instance, there is only a 0.58 year difference (23.74-23.16). The average duration of holding a job is also higher in the case of a job in which no brain waste occurs than one that has. For example, in the second job scenario, the duration of stay on a job without brain waste is 2.23 years (2.84 – 0.61) longer than on one in which brain waste occurs.

TABLE VI
AGE AND DURATION OF HOLDING JOB BY BRAIN WASTE

	First job		Second job		Third job	
	Yes BW	No BW	Yes BW	No BW	Yes BW	No BW
Age (yrs)	23.16	23.74	23.33	24.52	24.00	30.00
Duration (yrs)	1.25	1.83	0.61	2.84	0.56	5.90

In terms of socio-demographic characteristics of those who are and who are not in brain waste, from Table 7, it appears that females are more vulnerable to the incidence of brain waste. It is found that 35% of female experience brain waste in their first job as compare to approximately thirty per cent for male. This difference is even larger in in the case of second job: 16.67% of female compare to only around eight per cent of male

By ethnicity, it is observed that brain waste in first job occurs only among the Malays - 32.73% experience brain waste compare to 67.27% without brain waste while it is 100% no brain waste for other ethnic groups. This percentage of

brain waste reduces to 11.54% in second job but there is a reverse trend in the third job where the percentage of brain waste occurrence increases to 42.86%.

TABLE VII
CHARACTERISTICS OF BRAIN WASTE

	First job		Second job		Third job	
	Yes BW	No BW	Yes BW	No BW	Yes BW	No BW
Gender						
Male	29.03	70.97	7.69	92.31	25.00	75.00
Female	35.71	64.29	16.67	83.33	66.67	33.33
Ethnicity						
Malay	32.73	67.27	11.54	88.46	42.86	57.14
Chinese	0	100	n.a.	n.a.	n.a.	n.a.
India	0	100	n.a.	n.a.	n.a.	n.a.
Others	0	100	n.a.	n.a.	n.a.	n.a.
Degree						
Engineering	9.09	90.91	0	100	n.a.	n.a.
Sciences	34.04	65.96	14.29	85.71	42.86	57.14

By academic degree, respondents with degree in sciences have higher percentage in experiencing brain waste than engineering graduates. This trend is also observed in subsequent jobs (second and third job). This finding suggests that both sciences and engineering degree holders are subject to the risk of being in brain waste, at various stage of job. However, science graduates are more vulnerable to brain waste compare to engineering graduates.

IV. DISCUSSIONS AND CONCLUSION

This paper aims to study the issue of brain waste among science and engineering graduates by using the respondents' completed brain waste cycle. A brain waste phenomenon does exist among the science and engineering graduates. It is found that almost one-third of the respondents experience some job hopping before they reach a so-called 'no brain waste job'. This term refers to jobs that correspond to their salary. However, almost 45% of the respondents who experience no brain waste are currently working in MARDI as research officers, a post which is also their first job.

Relating to brain waste by respondents' characteristics, females are more likely to have brain waste compare to males. Female graduates, who are vulnerable to incidence of unemployment, are found to be more prone to incidence of brain waste. Even when employment is secured, female graduates are still subject to higher risk of brain waste compare to male graduates. This highlights the "double" risks, namely, vulnerability to unemployment and brain waste, face by female university graduates in Malaysia. Future studies are suggested to investigate in this contention which will enable the authorities especially the Ministry of Education, to draw up an appropriate policy to address this "double" risk problem of female graduates.

Our analysis in the present study reveals that when brain waste occurs, it can last for more than two years. This finding indicates that brain waste occurs even for high market demand degrees (science and engineering based) and it is not a temporary phenomenon.

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