A study of Science and Technology doctoral degree holders in Sri Lanka and their contributory patterns

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Background

With the global trend in moving towards a knowledge-based society, the educational qualifications and trained skills of personnel become important since there is a strong link among postgraduate education, research and development (R&D) and economic growth of a particular country. The doctoral degree holders in Science & Technology (S&T) are highly qualified in specialized education with extensive training in research and development. They are capable of conducting independent research. The generated knowledge and technology contribute to innovation, which promotes economic development and social welfare of the people. Therefore, a close study of this knowledge stock and identifying the gaps and constraints for their contributory patterns is important.

Recently there has been increasing focus on identifying the value of postgraduate researchers and their contribution to wider economic, social and cultural impacts. Skills of highly competent individuals can lead to better policy making, enhanced economic growth, and improvements in the health and welfare of the people. Casey (2009) takes an economic perspective to explore the impact of doctorates: in particular, what is a doctorate worth and what is the justification for society to support the production of doctorates.

A project on doctoral studies and qualifications in Europe and the United States was carried out by Sadlak (2004) and it identified eleven main problems with doctoral education in Europe and USA.

Methodology

Recently, a Tracer Study on S&T Doctoral Degree Holders was carried out by the S&T Policy Research Division of National Science Foundation of Sri Lanka. Designed and pre-tested questionnaires were sent to all S&T doctoral degree holders in the R&D sectors in the country during the period 2008/2009. From a total of 1085 doctoral degree holders, 529 (48%) responded. The available data were summarized and analyzed. In addition, an index to represent research output for each respondent was created. Chi-square tests were performed to test for any relationships between a) Major constraints (research) and the field of expertise, and b) Major constraints (administrative) and sector of work. A multinomial logistic regression model to represent influential factors failed to fit the data adequately.

Outcome

S&T sector had a lower percentage of female doctoral degree holders than in the other sectors. Majority of doctoral degree holders were from the age category of 41-50 and it was nearly half (46.9%) of the total PhD holders. Also, life sciences had highest number of PhD holders and there was wide variation in the gender balance across various programs. Only medical sciences had higher female percentage (50.8%) than their male counterparts. Engineering sciences had the lowest female percentage among all study areas.

Most had obtained their doctoral degrees from overseas, with United Kingdom being the country with the highest attraction (26.5%). There was a very low percentage of Asian countries, except Japan which attracted second highest Sri Lankan doctoral students. On average doctoral degree holders took nearly 3 to 4 years to complete, though engineering graduates were the quickest to complete their PhD (2 out of 3 were under 4 years) and in medical sciences and physical sciences, average completion time was 4 to 5 years.

There was a significant association between doctoral degree holder's sector of work and the administrative constraints for conducting research (chi-square with 4 df = 13.038 which was significant at 5% level). But a significant relationship was not evident between doctoral degree holder expertise area and the constraints for conducting research activities. (chi-square with 15 df = 20.355, p = 0.159)

Since there are different types of research outputs, measuring and comparing individual outputs is difficult. Therefore, an index that represents research output was created for each respondent as follows,

	Weights
Refereed publications	3
Non-refereed publications	1
Books/ book chapters	5
Magazines/ Newsletter articles	0.5
Patents	3

The weights used in this study were based on University Grants Commission circular (UGC circular No. 916), which is about the schemes of recruitment/promotion for Associate Professor/Professor in the university sector.

Table 1 shows frequency and cumulative frequency distributions of the output index scores.

Table 1: Distribution of the Output index scores

Index category	Freq.	%	Cumulative %
below 25	121	26.9	26.9
25 <= to 50	114	25.4	52.3
50 <= to 75	80	17.8	70.2
75<= to 100	45	10.0	80.2
100 <= to 125	24	5.3	85.5
125 <= to 150	21	4.7	90.2
150 <= to 175	8	1.8	92.0
175 <= to 200	7	1.6	93.5
200 <= to 225	9	2.0	95.5
225 <= to 250	2	0.4	96.0
250 <= to 275	5	1.1	97.1
275 <= to 300	7	1.6	98.7
300 <= to 325	1	0.2	98.9
350 <= to 375	2	0.4	99.3
425 <= to 450	1	0.2	99.6
450 <= to 475	1	0.2	99.8
over 500	1	0.2	100.0
Total	**449**	**100**	

According to Table 1, most of the doctorates (26.9%) were from below 25 category. Overall, 80.2% had output index of below 100, and the histogram (Figure 1) showed an exponentially decaying pattern.

To find out what factors influenced the decision that doctoral degree holders think they contributed to development in the country, a multinomial logistic regression model was fitted using available factors, and the final model showed that the decision was influenced by Sector, Gender, Research constraints, and the interaction Gender * Research constraints. However, the fitted model not adequate enough to represent the contribution, suggesting further input into this aspect.
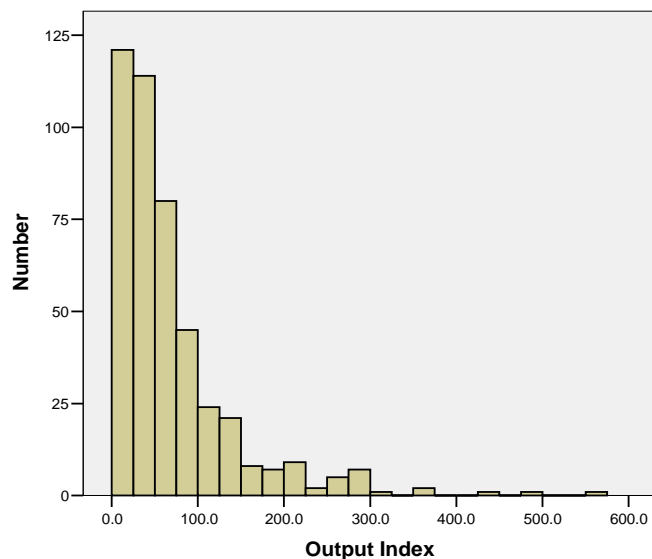

Figure 1: Histogram of research output index

Conclusions

The study revealed that gender wise university sector had a balance in age distribution whereas other two sectors had higher female percentages in younger age categories and younger PhD holders were attracted   to university sector than other two sectors. As per the field of study, life sciences had the most number of PhD holders, whereas gender wise, engineering sciences had the lowest female ratio which is as low as 8 to 1. Most of the students seeking PhD education had a good opportunity to do their studies abroad. Funding problems and more time spent on administrative work were identified as most influential constraints. Further research is necessary to find out reasons for relatively low output scores by the majority.

References

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