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Higher Education Research Output: The Influence of Experience on Research Productivity
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ABSTRACT In an increasingly globalised context of higher education, universities are tasked with providing the solutions to societal challenges through their research outputs. However, a lack of knowledge of what constrains or enables these outputs can impose a cost on societal stakeholders. At the heart of the issue of how learning, or experience, contributes to the individual research output of academics is the question of what type of learning, or experience, is most effective. In the absence of evidence in the educational literature that specifically relates research productivity to different forms of experience, or human capital, this study tests theory that predicts these relationships in the context of a large South African research university.

Bivariate and multivariate statistical testing, correlation analysis, partial correlation analysis and hierarchical linear regression analysis are applied. Results suggest that research productivity is relatively robust to work experience other than that of being a researcher, that membership of professional associations is positively related to research productivity and that years of formal education is not. It is concluded that research productivity might represent specific human capital, a form of tacit learning, that may primarily be accessible only through a process of 'learning by doing'. On the basis of these findings, it is recommended that research incentive systems be used to incentivise collaborations between more experienced researchers and their colleagues, as this might be an important mechanism to enable tacit knowledge transfer.

I. INTRODUCTION

According to the World Economic Forum survey, South Africa has the fifth-worst education system in the world (World Economic Forum, 2012). However, according to the same survey, South Africa also has the fifteenth-best business or management schools in the world (World Economic Forum, 2012). If management research is considered to be of use to solve the problems facing societies, then this context might reflect a paradox.

Two dimensions to this paradox seem evident. Firstly, the research produced by academic institutions might not be 'reaching' the stakeholders who need it most; the death valley phenomenon (Kobayashi, Nakamori and Wierzbicki, 2007). The term "death valley" refers to "the fact that many results of academic research remain unused, they lie forgotten on academic shelves" (Kobayashi et al., 2007:358). Secondly, not enough quality research may be emerging from universities, specifically universities in the South African context; constraints to research productivity exist.

This paper relates to the second of these issues; how research productivity can be enabled. In order to provide insights into how research productivity could be improved, this research attempts to provide insight into how different types of experience, in different contexts, are related to research productivity. In this research it is argued that work experience in contexts other than research work, or general human capital (Becker, 1994), has little influence on an academic's research productivity. Further, it is argued that years of education, including higher degrees, also has little influence on research outputs. In contrast, it is argued that research outputs are a form of specific human capital, or experience that is not a result of learning in

another contexts (Becker, 1994). Further, it is argued that research productivity is a form of tacit knowledge (Nonaka, 1994), or knowledge that cannot be effectively developed, or converted, from codified, or explicit, knowledge sources. If research productivity is relatively robust to the influence of general human capital, then certain implications flow from this. This paper provides a new perspective of how research productivity might be enabled in contexts where it perhaps cannot be 'taught' and can only be 'learned' through the experience of doing it.

Whereas much literature exists that relates to the relationships between experience and job performance, absent from the literature is evidence of the influence of different forms of experience on research productivity as a form of job performance.

This research, therefore, attempts to address these deficiencies in the literature by investigating the relationships between different forms of experience, that proxy relative differences between specific human capital and general human capital (Becker, 1964), and research productivity. Seven measures of research productivity are used, in order to obtain a holistic perspective of relationships that vary by type of research output. A composite measure of research output, termed gross research productivity, and six subordinate measures are tested in terms of their relationships with different types of experience. These six subordinate measures are: (i) South African Department of Higher Education accredited journal publications, termed Department of Education (DOE) or local journal article publication; (ii) Thompson Reuters Institute for Scientific Information (ISI) and ProQuest International Bibliography of the Social Sciences (IBSS) accredited journal article publications, termed international journal article publication; (iii) conference proceedings publications; (iv) conference paper presentations; (v) book chapter publications and (vi) book publications. The gross research productivity item is a composite variable, comprising (i); (ii); (iv) and (v); a composite of 'same size' outputs that specifically reflects quantity (not quality) of research output. On the basis of the findings, recommendations are made for theory and practice, with the aim of providing insight into how the research productivity of academics might be better enabled in such a context. The problem statement is now introduced.

Problem Statement

Much theory exists about how job performance can be influenced by an individual's subjective experience of the working context. Perceptions of inequity (Adams, 1963; 1965); job satisfaction (Arvey, Bouchard, Segal and Abraham, 1989; Aydogdu and Asikgil, 2011); self-efficacy

(Bandura, 2006) and a host of other factors have been shown to influence job performance. However, despite this large volume of literature, what is not clear is the relative influence of specific and general human capital on research productivity. A lack of knowledge of the relative contribution of working experience in other contexts to research outputs represents a cost. This cost might accrue to individual academics, to universities, or ultimately to society itself. Knowledge of the extent to which research productivity is associated with tacit versus more explicit, or specific or general human capital forms of job experience would provide an understanding of how to better enable more efficient and effective research. The aim of this research is therefore to investigate the relationships between research productivity and different forms of experience in this context. The objective of the research is to test theory that relates different types of research productivity to different types of experience in this context. The research question posed is therefore '*what is the relationship between different types of experience and research productivity?*' The study is important for the following reasons. Firstly, it allows for an understanding of what types of experience may contribute to research output, *relative to each other*. Secondly, it may allow researchers to focus their energies on the more productive forms of experience in order to develop their research productivity. Theory that relates to these relationships is introduced as follows.

Theory and Hypotheses

Experience and learning are considered to represent forms of human capital, according to human capital theory (Becker, 1964). Human capital therefore extends to any investment in learning or experience that can contribute to a return in the form of increased productivity to an individual (Becker, 1964). This conception extends not only to formal education but also to factors such as migration, or even improvements in health care (Becker, 1964). Over time, experience specific to a certain task context is expected to develop. Such experience can take the form of specific human capital, where this knowledge, or learning, cannot be transferred to (and contribute to productivity in) other work contexts (Becker, 1964). Alternatively, it can take the form of general human capital which can be transferred to (and contribute to productivity in) other contexts (Becker, 1964). The critical notion in this regard is that time-related accumulated knowledge will be expected to represent an investment in human capital (Becker, 1964). However, deriving from Becker's (1964) theory is the implication that different types of learning-related human capital might be associated with different contexts of work experience.

The influence of age represents the accumulation of all learning investments in an individual over time. Although age may act as a proxy for human capital related experience, it however also includes the influence of other factors that might not primarily be associated with human capital. For instance, in testing eminent university scientists, McClelland, Atkinson, Clark, and Lowell (1953) found a negative correlation (-.39; n=61; $p<0.01$) between age and themes coded from TAT stories relating to Achievement imagery. This is but one dimension of changes over time that may have no relationship to human capital accumulation. Similarly, biological changes are another dimension of age that cannot be considered to be directly related to human capital. There is therefore a tension between different bodies of theory as to what the expected relationship is between age and research productivity. However, it is argued that the influence of Human Capital theory is a dominant effect, where all the Specific Human Capital and General Human Capital endowments, or learning, that an individual is exposed to are embodied in age. Age, therefore, in a bivariate manner, is expected to reflect such endowments. As such, age, in a bivariate sense, is expected to contribute to higher levels of research productivity within the broad range of working life. The learning effects associated with age are expected to dominate the influence of the purely biological effects of age. Hence, hypothesis a is offered; that *there is a significant association between age and research productivity*.

According to Human Capital theory, years of full-time working experience is expected to represent an accumulation of learning investments (Becker, 1964). These learning investments can be taken to represent general human capital in the case of learning that increases productivity in different contexts (Becker, 1964). Total years of working experience if years as a researcher are controlled for are expected to reflect general human capital. Of specific interest, in this context, is the relative contribution of general versus specific human capital to the different measures of research productivity. Hypothesis b is therefore offered; that *there is a significant association between total years of working experience and research productivity.* In this instance general human capital is taken to represent total (years of) working experience net of years of experience as a researcher. Years of experience as a researcher are taken to represent specific human capital in this context. Conversely, hypothesis c is also offered, that *there is a significant association between years of experience as a researcher and research productivity*. An academic, however, might have moved from another institution. It might be possible that differences in experience in different institutions may account for some of the variance in

research productivity. Hypothesis d is therefore tested; *that years of experience within the institution are significantly associated with research productivity*. Years of experience in this specific institution, with other research experience and age controlled, would be expected to indicate the relative extent to which experience within this particular institution specifically contributes to research productivity. The influence of exposure to the cultural context of the organisation (House, Hanges, Javidan, Dorfman, & Gupta, 2004) of the institution itself is also expected to be picked up by a measure of the time spent working for the institution. Person-organisational fit is expected to increase over time (Erdogan & Bauer, 2005), which may also contribute to increased research productivity.

Exposure to other contexts is yet another type of experience. In an increasingly globalised context of knowledge creation, interconnectivity between researchers is expected to significantly increase research productivity (Swan, 2007). If cultural, economic and political differences are expected to be found between countries, then individuals born in such different countries will be expected to reflect such differences. Certain countries have been found to be associated with extensive networks of emigrants (Light, 1984; Shapero and Sokol, 1982; Wilson and Martin, 1982). It is argued that individuals that are born in such countries would be more likely to build international linkages with other academics on a global basis. Such networks have also been found to be associated with social capital, or the resources that are available to individuals by virtue of their membership of groups (Wilson and Martin, 1982; Coleman, 1988). International collaborations and a greater exposure to the globalised networks of research are expected to be positively associated with the number of countries a researcher has lived in over time. This is taken to potentially represent another form of human capital, or learning. Hypothesis e is therefore offered; *that years spent in other countries is significantly associated with research productivity*.

Different types of working experience may also have different effects on research productivity. Experience in different types of organisations is expected to expose individuals to different practices and to cultural norms (House et al., 2004). Experience gained from working in a multinational corporation might offer experience which is aligned with globalised trends in work experience. As such, this exposure is expected to be associated with learning, as a form of human capital (Becker, 1964). Hypothesis f is therefore also tested; that *experience of working for a multinational company is significantly associated with research productivity*.

Membership of professional networks is also expected to be associated with the social capital advantages typically related to network membership (Burt, 2001; Coleman, 1988; Lin, 2001). These networks can offer members advantages in terms of access to resources (Coleman, 1988), research collaborations ((Hara et al., 2003; Rachal et al., 2008; Rynes et al., 2001) or access to information and knowledge that could contribute to research productivity. Hypothesis g is therefore tested; that *membership of a professional association is significantly associated with research productivity*.

According to human capital theory, research productivity is also expected to be a function of years of formal education (Becker, 1994). Formal education reflects an investment in individuals, in the form of learning skills, knowledge and attitudes, which are, in turn, expected to directly influence an individual's work, job or task productivity (Becker, 1964). It is argued that such knowledge, skills and attitudes contribute to mental or cognitive ability. Increased investments in Human Capital can enable learning about 'how to learn' (Schmidt & Hunter, 1992); the relationship between formal education and research productivity is expected to be positive. Hence, the final hypothesis, hypothesis h, is offered; that *years of formal education are significantly associated with research productivity*. Age, total years of working experience, years of experience as a researcher, years of experience of working for the institution, years spent in other countries, experience working for a multinational company, membership of professional networks and years of formal education are all taken to represent different dimensions of experience, or human capital, following Becker's (1964) human capital theory. Having considered theory that relates different forms of experience to research productivity and having derived hypotheses in order to test this theory, the methodology applied in this study is now discussed.

II. METHODOLOGY

The population of the study included all the full-time lecturing staff of the University of the Witwatersrand; a population of about 883 full-time permanent academic staff and about 1300 staff including part-time staff. A purposive comprehensive sampling process was used. Research assistants were used to sample the entire institution. The response rate was about seventeen percent if all staff; part-time and full-time are included. Refusals were unconditionally respected. For Schmitt and Drasgow (2002:4): "more sophisticated tools should never be used when a simple mean, standard deviation, frequency table, correlation, regression analysis, or plot of the

data is sufficient to answer a research question". This research followed this principle, as the research questions were appropriate to the use of correlation, partial correlation analysis, t-tests and multiple linear regression were used. Bootstrapping was applied to all the testing. A sample size calculation was used, which indicated that inferential statistical testing was appropriate for the sample in order to test relationships at the five percent level of significance. The five percent level was taken to be the cut-off point at which the chance of making a Type I error, or rejecting a true null hypothesis was taken to be equal to the chance of making a Type II error, or rejecting a false null hypothesis (Edwards, 1984). The sampling protocol was applied in a uniform way. Staff were given self-addressed envelopes containing the questionnaires, which could be returned using the university's internal mail system. Scales were tested prior to use as the instrument underwent piloting. Scales were carefully derived from previous research precedent and carefully developed (Murphy and Davidshofer, 2005). Content, construct and face validity were ensured at all steps of the questionnaire development process. Validity and reliability were considered to be important aspects of the design of the instrument (Murphy and Davidshofer, 2005; Bryman, 2004).

The data analysis used SPSS software. The relationships between the different dimensions of experience-related effects and research productivity were tested using partial correlation analysis. The influences of other time-related aspects were 'partialled' out of the relationship between each of the variables where appropriate in order to investigate relationships. A hierarchical linear regression model was run, which tested the associations between each of the experience variables and each of the measures of research productivity over and above the influence of a range of covariates. The factors included as covariates were justified on the basis of the research productivity literature. These variables are generalised job satisfaction, a self-efficacy item that related specifically to the measure of research productivity, negative and positive affectivity, locus of control, gender, span of control (the number of staff reporting to an individual), masters degree students supervised, dependent children, a preference for quantitative methods, South African origin and English as a home language. The multiple linear regression process allowed for a perspective of the relative strength of the associations of certain of the experience items with research productivity, as well as a perspective of the relative strength of these associations versus those of the other covariates in the model. In order to prevent singularity and multicollinearity only certain of the experience items were included in the

multiple linear regression analysis. The primary objective of the multiple linear regression analysis was to determine the relative importance of experience in terms of its association with research productivity; relative to the other categories of variables that had been identified from the literature as having associations with research productivity. The results of the testing are reported and discussed as follows.

III. RESULTS AND DISCUSSION

The measures of central tendency and statistical dispersion of each of the experience variables are shown in Table 1, together with those of the other variables included in the multiple linear regression analysis. These statistics are shown for the research productivity measures in Table 2. As can been seen from Table 1, the mean age of an academic in this context is 40.67 years. Interestingly, females are the majority in the sample. The mean tenure of an academic in the institution is 6.39 years, with a mean of 10.2 years of experience as a researcher. Most (81%) academics reported being a member of a professional association. The mean number of years of education of an academic was 19.3 years; 7.3 years of education after schooling. The results of the testing of the hypotheses are reported and discussed as follows.

[INSERT TABLE 1 HERE]

Hypothesis a: There is a significant association between age and research productivity.

Age was found to be significantly associated with gross research productivity; DOE journal article publication; international journal article publication; conference proceeding publication; conference presentation; book publication; and book chapter publication, according to bootstrapped zero-order tests of association. These results are found to support Becker's (1964) human capital theory prediction that, over time, investments in learning that are proxied by age are expected to result in increased productivity. According to the results of tests of partial correlations, however, the significant and positive zero order correlations for all of the research productivity variables with age were no longer significant when years as a researcher were controlled, with the exception of book publication and book chapter publication. These results suggest that specific human capital (Becker, 1964), or learning that is specifically related to actual research experience, may be more significantly associated with research productivity. When total work experience is used as the control variable, DOE article publication (.166;$p<.083$) and international journal article publication (.129;$p<.053$) are found to be weakly associated with age.

[INSERT TABLE 2 HERE]

This further analysis supports the notion that it is not the influence of total work experience but the influence of experience as a researcher that is primarily associated with higher levels of research productivity in the form of journal and conference outputs. When years of working for the institution are used, instead, as the control variable, age is found to be significantly associated with all the measures of research productivity except book chapter publication. This also indicates the importance of years of experience as a researcher over and above the influence of years of experience within the specific institution in associations with research productivity. When the association of age with gross research productivity was tested, over and above the influence of the covariates (Table 3), age was found to account for an increase of 47% of the variance explained in gross research productivity by the model. The standardised regression coefficient of age was the largest in the model, followed by self-efficacy and then gender. Interestingly, job satisfaction and masters degree supervision were no longer significant after age entered the model. This might indicate that these variables might have 'taken up' the influence of age in their multivariate influence in the first model. The addition of the age variable to the covariates in the model with total journal articles as the dependent variable was found to be associated with an 81.8% increase in the R squared value (Table 4). Notwithstanding these increases, the contribution of age to these models was overshadowed by the influence of years of experience as a researcher, which were found to be associated with an increase of 96.8% in the R squared value for the gross productivity model and 193.5% in the total journal production model.

[INSERT TABLE 3 HERE]

Hypothesis b: There is a significant association between total years of working experience and research productivity.

Years of full-time experience, or years of total work experience across different types of work, were found to be significantly associated with all the measures of research productivity. However, when the influence of age was controlled for, total work experience was only found to be positively associated with conference proceedings; conference presentations, book chapter publication and weakly associated with gross research productivity; the 'lower level' measures of research output not including journal articles. When years as a researcher were held constant, total work experience was only found to be significantly associated with book publication, yet with no other of the research productivity measures. This result suggests that total work

experience contributes some dimension of general human capital (Becker, 1964), or experience is effective in producing a return in other working contexts, only to book publication. This finding supports the conception that research productivity in the other categories of research output may largely be a function of specific human capital (Becker, 1964); research productivity might primarily associated with learning that might only be obtained as a researcher, through 'learning by doing' or the development of tacit knowledge (Nonaka, 1994).

[INSERT TABLE 4 HERE]

When total years of experience are added to the equation (Model 3 in Table 3 and Table 4), because they include the effect of years of experience as a researcher, their inclusion in the model is found to explain an increase of 39.68% in the value of the R Squared statistic of gross research productivity and 74.68% in total journal article publication. However, this is a weaker effect than the 98% and 193%, respectively, found for years of experience as a researcher.

Hypothesis c: There is a significant association between years of experience as a researcher and research productivity.

Years of experience as a researcher is found to be significantly associated with all the measures of research productivity except book publication. After the influence of age and, in turn, experience with the institution, were controlled for, these associations were still found to be significant. The results of this analysis are taken to support the notion that research productivity is primarily associated with specific human capital, according to Becker's (1964) conception; where learning investments associated with the research context, and not experience beyond this research context, primarily contribute to these dimensions of research productivity. This result is taken to support the other results that suggest that research productivity might therefore be a function of tacit knowledge endowments, which are context specific (Nonaka, 1994). As discussed above, the inclusion of years of experience as a researcher into the model in addition to the covariates was found to be associated with an increase in the R Squared value of 98% when gross research productivity is the dependent variable and 193% when total journal articles are the dependent variable. Years of experience as a researcher has the strongest association with research productivity of all the experience variables.

Hypothesis d: Years of experience within the institution are significantly associated with research productivity.

Years of experience of working for the institution were found to be significantly associated with all the measures of research productivity except book publication. When years as a researcher were controlled for, or held constant, years of working for the institution were found to be significantly associated with DOE article publication yet not significantly associated with any of the other measures of research productivity. Person-job fit becomes better aligned over time with experience in the institution (Erdogan & Bauer, 2005); this might be reflected in the association between years of experience in the institution and DOE journal article publication. This result might also suggest that the human resources regime of the institution may be incentivising DOE article publication. If DOE accredited journals are given the same weighting in promotional assessments as are ISI/IBSS articles then the institution itself might be creating an incentive for staff to focus on DOE journal publication instead of ISI/IBSS journal article publication. The R Squared value of the model (Model 5 in Table 3 and Table 4) with years of experience within the institution included increased by 42.06% with gross research productivity as the dependent variable and 98.7% with total journal articles included as the dependent variable.

Hypothesis e: Years spent in other countries an individual has lived in is significantly associated with research productivity.

The number of other countries an individual reported having lived in for over a year was found to be significantly associated with conference proceedings publication and the publication of book chapters. When South African origin was controlled for, conference proceedings publications, but not book chapter publication, were found to be significantly associated with countries lived in for over a year. Relationships that span national borders might offer some form of social capital advantage (Coleman, 1988), which might accrue in the form of conference proceedings publications. When tested using multiple linear regression analysis together with the covariate factors, the direct associations between countries lived in and all the measures of research productivity were, however, all not found to be significant. This might indicate that the net effect captured in the bivariate relationship might possibly be better explained by the influence of one or more of the other covariate variables included in the analysis.

Hypothesis f: Experience of working for a multinational company is significantly associated with research productivity.

Individuals with experience in a multinational company were not found to be more, or less, research productive. This dimension of learning, which is considered to represent a dimension of

Human Capital (Becker, 1964), was therefore not found to be associated with research productivity. This result might be taken to support the previously discussed results which suggest that research productivity is a form of specific human capital, and that only experience in the research context is likely to primarily contribute to research productivity.

Hypothesis g: Membership of a professional association is significantly associated with research productivity.

Membership of professional associations was found to be associated with gross research productivity; international article publication; local journal article publication; conference proceedings publication; conference presentations and book chapter publication. Membership of these associations might confer advantages associated with membership of networks (Burt, 2001; Coleman, 1988; Granovetter, 1973; Lin, 2001). According to the multiple linear regression analysis results, with covariates included, membership of professional associations was found to be associated only with book chapter publication, and weakly. These results suggest that the other factors in the multiple linear regression analyses might better explain the relationship between professional association membership and these dimensions of research productivity. However, due to the complexity of the multivariate nature of such testing, the bivariate positive associations between professional associations and these dimensions of research productivity were not discounted. It is suggested that academic researchers might benefit from joining such academic and professional networks with a view to using these linkages to build collaborative publishing linkages or other linkages that might support research productivity. It is also acknowledged that more research-productive individuals might be more inclined to join professional associations. Further research is recommended into the causal mechanisms that underlie this relationship.

Hypothesis h: Years of formal education are significantly associated with research productivity.

According to the Pearson tests of association, years of formal education were found to be weakly associated with higher numbers of conference presentations, yet were not found to be associated with any of the other measures of research productivity. When years as a researcher are controlled for, however, the association between years of education and each of the research productivity measures is found to not be significant. This result might indicate that the formal education process may not offer the specific human capital requirements associated with research productivity (Becker, 1964) which might not translate into the learning investments necessary for

research productivity. However, individuals with higher levels of cognitive ability are expected to 'learn faster' or have a curvilinear or multiplicative relationship between cognitive ability and the influence of experience (Schmidt & Hunter, 1998). If this were the case, then individuals with higher endowments of cognitive ability would be expected to finish their higher degrees in a shorter period of time, which might militate slightly against the positive association between years of education and research productivity. Notwithstanding this potential effect, it is considered problematic if years of education are indeed not associated with research productivity. This would also suggest that years of education do not represent the specific human capital required for research output. Worryingly, these years of education typically include postgraduate research. If years invested in higher degrees obtained by academics in this context are not associated with research productivity then these results challenge the assumption that the type of research undertaken in higher degrees is aligned with that required for journal article publication.

V. CONCLUSIONS AND RECOMMENDATIONS

The research question posed in this paper was the following: '*What is the relationship between different types of experience and research productivity?*' In the absence of evidence in the literature as to the relative contribution of different forms of human capital (Becker, 1964) to research productivity in the South African context, this research attempted to add to the higher education literature by providing insight into these relationships. It is concluded that research output may be a function of specific human capital (Becker, 1964), or learning investments that are context specific, in this context. General human capital (Becker, 1964), or learning investments that derive a return to an individual in the form of increased productivity in other contexts does not seem to relate to research productivity; working experience other than research experience does not seem to obtain a return in terms of research productivity. Research productivity might represent a form of 'tacit' knowledge (Nonaka, 1994), which cannot easily be learned, but is perhaps primarily accessible through 'learning by doing'. It is recommended that training programmes for academics focus on this 'learning by doing' as a primary mechanism for developing research productivity. A proactive approach may need to be applied; formal incentives may need to be given to senior and more experienced academics in order to incentivise them to work together with more junior, or inexperienced, colleagues. It is argued that if little in the way of these incentives exist then 'learning by doing' through collaboration in

research output may be difficult to achieve. It may take time and effort for an experienced researcher to invest in the tacit knowledge (Nonaka, 1994) development of others. This might be enabled if universities commit to allocating resources toward this end. Subsidies as they stand in this institution incentivise the opposite. Individuals that collaborate have to share their research incentives. If such incentives were increased for collaborations then the perverse influence of these incentives might be reversed; more collaborations may result. Similarly, more experienced researchers may need to be incentivised to collaborate with relatively less experienced colleagues. It is argued that if this were done then the transmission of tacit knowledge may become more effective in this context. The influence of years of experience within the institution was found to perhaps incentivise individuals to publish in DOE journals instead of ISI/IBSS journals. In order to increase the international currency of research conducted in these institutions, it is recommended that publication incentives for ISI/IBSS journal publications be increased relative to DOE publications. The international linkages of an academic might be associated with higher outputs in terms of conference proceedings publications. It is recommended that academics be further enabled, and encouraged, to attend international conferences and to publish conference proceedings. Experience of working in a multinational company might not constrain research output for individuals that choose a subsequent academic career. If academics that are members of professional associations also publish more then it is recommended that academic departments encourage linkages with professional associations, and proactively attempt to leverage these relationships to improve research productivity. The lack of a significant association between years of formal education and research productivity is troubling. Further research is recommended into this relationship. It is recommended that higher degrees be better aligned with the standards of journal publication. If students were required to submit an article based on their higher degree research as a completion requirement, then this alignment might be better enabled. It is stressed, however, that the requirement should be submission, and not acceptance, because it is understandable that higher degrees are typically an individual’s first exposure to research.

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8. TABLES

Table1. Descriptive Statistics: individual Performance Factors 2

Variable	Mean	Standard Deviation	Variance	Skewness	Kurtosis
Negative Affectivity	17.75	6.63	43.9	1.33	1.85
Positive Affectivity	38.13	6.87	47.2	.954	11.22
Locus of Control	69.56	10.6	112.8	-.398	.649
Age	40.67	10.56	111.4	.420	-.337
Gender 1=male*	47%	-	-	-	-
People reporting (span of control)	2.7	6.4	41.54	4.623	26.31
Masters supervised	6.19	9.55	91.27	4.623	8.11
Other countries lived in	1.21	1.45	2.11	1.66	3.19
Full-time work experience	14.6	10.69	114.3	.769	-.086
Years as a researcher	10.2	8.84	78.18	1.6	2.79
Years working for the institution	6.39	6.74	45.39	2.44	8.4
Multinational experience*	21%	-	-	-	-
Membership of professional associations*	81%	-	-	-	-
Years of formal education	19.3	4.39	19.28	-1.242	2.58
Preference for quantitative methods =1*	45.6%				
Dependent children	1.09	1.28	1.64	1.33	.324

South African origin (by birth)*	56%				
English home language	53%				

*means of binary variables are instead reported as percentages

Table 2. Descriptives: Individual Performance Factors 3 and Research Outputs

Variable	Mean	Standard Deviation	Variance	Skewness	Kurtosis
Accredited DOE journal articles	4.27	10.1	102.8	5.83.4	43.36
Accredited ISI/IBSS journal articles	7.19	14.69	215.8	3.4	13.33
Co-authored	4.78	10.95	119.94	3.6	13.8
Conference proceedings	3.42	6.05	36.62	3.29	12.56
Conference presentations	8.82	16.67	278.7	4.66	28.9
Books	1.05	6.8	46.27	13.9	202.38
Book chapters	1.7	3.27	10.7	4.99	33.6
Total units: gross research productivity	21.97	35.67	1272.48	3.233	11.95

Table 3. Results of Hierarchical Regression Analysis: the associations of different experience effects on gross research productivity over and above the influence of covariate factors

Statistic	Model 1 Covariates only	Model 2 + Age	Model 3 + Total Work Experience	Model 4 + Experience as a Researcher	Model 5 + Years of Experience in the Institution	Model 6 + Years spent in other Countries	Model 7 + Experience in a multinational company	Model 8 + Membership of professional association/s	Model 9 + Years of formal education
Constant	-37.788	-88.528**	-58.275^	-.59.48*	-50.009^	-36.005	-38.7	-39.467	-38.856
Job Satisfaction	-1.297(-.145)*	-.908(-.101)	-.903(-.101)	-1.229(-.137)*	-.773(-.086)	-1.367(-.152)*	-1.233(-.137)*	-1.295(-.144)*	-1.292*
Self-efficacy	.098(.292)**	.099(.296)**	.102(.303)**	.061(.182)**	.090(.269)**	.10(.298)**	.097(.288)**	.092(.273)**	.097(.289)**
Negative Affectivity	-.046(-.009)	.188(.035)	.282(.052)	.095(.018)	.219(.041)	-.034(-.006)	-.025(-.005)	-.095(-.018)	-.053(-.01)
Positive Affectivity	.137(.026)	.184(.035)	.073(.014)	.513(.099)	.281(.054)	.164(.031)	.143(.027)	.139(.027)	.138(.026)
Locus of Control	.277(.082)	.215(.063)	.268(.079)	.348(.103)	.153(.045)	.276(.081)	.295(.087)	.253(.075)	.273(.080)
Gender	13.047(.182)*	12.729(.178)*	12.905(.180)**	9.439(.132)*	12.572(.176)**	13.889(.194)	12.961(.181)*	13.249(.185)*	13.136(.183)*
People Reporting	.336(.061)	.165(.030)	.215(.039)	.006(.001)	.277(.050)	.371(.067)	.315(.057)	.299(.054)	.333(.060)
Masters supervised	.627(.167)*	.264(.071)	.161(.043)	-.089(-.024)	.146(.039)	.644(.172)	.656(.175)*	.617(.165)*	.628(.168)

Dependent Children	-1.516(-.054)	-3.035(-.109)^	-3(-.107)^	-2.864(-.102)	-1.327(-.047)	-1.368(-.046)	-1.312(-.047)	-1.699(-.061)	-1.502(-.054)
Preference Quantitative versus Qualitative Methods	2.559(.052)	2.209(.045)	1.787(.036)	2.719(.055)	2.12(.043)	2.345(.047)	2.668(.054)	2.601(.053)	2.589(.052)
South African origin	-2.156(-.030)	-.889(-.012)	-2.767(-.038)	-.971(-.013)	-3.769(-.052)	-4.404(-.061)	-2.046(-.028)	-1.046(-.015)	-2.035(-.028)
English home language	9.378(.131)^	6.636(.093)	5.435(.076)	5.864(.082)	4.922(.069)	9.37(.131)	9.295(.130)^	8.961(.125)^	9.386(.131)^
The specific experience factor		1.179(.348)**	1.214(.363)**	2.359(.582)**	1.993(.373)**	-1.709(-.070)	-7.724(-.089)	8.188(.090)^	.087(.011)
R Squared (Adjusted R Squared)	.252(.209)	.349(.308)	.352(.312)	.496(.465)	.358(.318)	.255(.209)	.260(.213)	.259(.213)	.252(.205)
Change in R Squared		.097(.099)	.100(.103)	.244(.256)	.106(.109)	.003(0.00)	.008(.004)	.007(.004)	0.00(-.004)
F value	5.891**	8.611**	8.749**	15.837**	8.961**	5.504**	5.636**	5.623**	5.415**
Change in F value		2.72	2.858	9.946	3.07	-.387	-.345	-.268	-.476

^p<.10; *p<.05; **p<.01. Variable values in brackets are the standardised regression coefficients.

Table 4. Results of Hierarchical Regression Analysis: the associations of different experience effects on total journal article publication over and above the influence of covariate factors

Statistic	Model 1 Covariates only	Model 2 + Age	Model 3 + Total Work Experience	Model 4 + Experience as a Researcher	Model 5 + Years of Experience in the Institution	Model 6 + Years spent in other Countries	Model 7 + Experience in a multinational company	Model 8 + Membership of professional association/s	Model 9 + Years of formal education
Constant	-4.837	-.40.123*	-18.198	-19.459	-13.788	-4.238	-5.374	-5.883	-4.971
Job Satisfaction	-.784(-.143)^	-.514(-.094)	-.527(-.096)	-.738(-.135)*	-.401(-.073)	-.808(-.148)^	-.747(-.136)^	-.783(-.143)*	-.784(-.143)*
Self-efficacy	.053(.258)**	.054(.263)**	.055(.270)**	.028(.137)*	.047(.230)**	.053(.261)**	.052(.254)**	.049(.239)**	.053(.257)**
Negative Affectivity	-.207(-.063)	-.044(.-.014)	.007(.002)	-.122(-.034)	-.013(-.004)	-.203(-.062)	-.195(-.059)	-.238(-.072)	-.208(-.063)
Positive Affectivity	-.083(-.026)	-.050(-.016)	-.125(-.039)	.171(.054)	.022(.007)	-.074(-.023)	-.079(-.025)	-.082(-.026)	-.083(-.026)
Locus of Control	.092(.044)	.048(.023)	.086(.041)	.140(.067)	.000(.000)	.091(.044)	.102(.049)	.077(.037)	.091(.044)
Gender	7.14(.163)*	6.919(.158)*	7.048(.161)*	4.708(.108)^	6.792(.155)*	7.423(.170)*	7.089(.162)*	7.266((.166)*	7.151(.164)^
People Reporting	.136(.04)	.017(.005)	.058(.017)	-.086(-.025)	.093(.027)	.148(.044)	.124(.037)	.114(.034)	.136(.040)
Masters supervised	.126(.055)	-.126(-.055)	-.178(-.078)	-.357(-.156)^	-.226(-.099)	.132(.058)	.143(.063)	.120(.053)	.126(.055)
Dependent Children	-.515(-.030)	-1.572(-.092)	-1.483(-.087)	-1.424(-.083)	-.377(-.022)	-.466(-.027)	-.396(-.023)	-.629(-.037)	-.514(-.030)

Preference Quantitative versus Qualitative Methods	1.384(.046)	1.14(.038)	.88(.029)	1.492(.049)	1.062(.035)	1.312(.043)	1.448(.048)	1.410(.047)	1.387(.046)
South African origin	-.733(-.017)	.148(.003)	-1.131(-.026)	.066(.002)	-1.914(-.043)	-1.488(-.034)	-.668(-.015)	-.041(-.001)	-.718(-.016)
English home language	4.988(.114)	3.081(.071)	2.416(.055)	2.619(.06)	1.724(.039)	4.986(.114)	4.939(.113)	4.728(.108)	4.989(.114)
The specific experience factor		.82(.396)**	.792(.387)**	1.59(.393)**	1.459(.447)*	-.574(-.038)	-4.543(-.086)^	5.101(.092)^	.011(.002)
R Squared (Adjusted R Squared)	.154(.105)	.280(.235)	.269(.223)	.452(.418)	.306(.263)	.393(.155)	.161(.109)	.161(.109)	.154(.101)
Change in R Squared		.126(.130)	.115(.118)	.298(.313)	.152(.158)	.239(.050)	.007(.004)	.007(.004)	.000(-.004)
F value	3.181**	6.241**	5.904**	13.252**	7.104**	2.944**	3.085**	3.094**	2.923**
Change in F value		3.06	2.723	10.071	3.923	-.237	-.087	-.087	-.258

^p<.10; *p<.05; **p<.01. Unless otherwise indicated, variable values in brackets are the standardised regression coefficients.