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'Publish or perish': Family life and academic research productivity

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Research purpose: The influence of work-to-family and family-to-work spillovers is well documented in the human resources literature. However, little is known of the relationships between the pressures faced by academics to publish and the potential family life consequences of being a highly productive academic.

Research design, approach and method: This research sought to investigate these relationships within the context of a large South African university by testing associations between family life variables such as marriage and dependent children against measures of the following specific types of research publication: (1) South African Department of Higher Education and Training–accredited journal publications; (2) Thompson Reuters Institute for Scientific Information (ISI) and ProQuest's International Bibliography of the Social Sciences (IBSS)–indexed journal article publications; (3) conference proceedings publications; (4) conference paper presentations; (5) book chapter publications; (6) book publications; and (7) gross research productivity, reflecting a volume or quantity measure of research publication.

Main findings: ISI and/or IBSS journal article publication is found to be negatively associated with dependent children, but only for male academics, and to be negatively associated with female gender over and above the effect of family life variables in testing.

Practical/managerial implications: Human resources managers in universities need to be cognisant of the specific pressures faced by staff that are required to produce ever more research publications, in order to help them achieve work–life balance.

Contribution: In a global context of increasing pressures for research publication, and for higher and higher numbers of publications, it is necessary to identify the potential costs involved for high-volume–producing academics, particularly in terms of family versus work.

Introduction

A large body of literature exists across different contexts on unequal societal role burdens experienced by the different sexes (Cornwall, Harrison & Whitehead, 2007; Faust, 2013; Jacobs, 1996; Kabeer, 2005; Powell, 2005; Rao, 2006; Rao & Kelleher, 2003; Smyth, 2007; Unterhalter & North, 2011; Wendoh & Wallace, 2005), as well as in the South African context (Geisler, 2000; Hassim, 2006; McEwan, 2000; Rogan, 2013; Seidman, 1993; Wood & Jewkes, 1997). There is agreement across the literature that differences in societal practices relating to the organising of social relations (Ridgeway & Correll, 2004) largely underlie these gender differences and that inequality exists in the burden of home-making, childcare and family roles (Dilworth, 2004; Dilworth & Kingsbury, 2005) as well as in the gender differentiation associated with certain roles, such as teaching (Hattie & Marsh, 1996) and research roles (Barbezat, 2006) in universities.

Purpose

This research sought to investigate relationships between family life and research productivity in the context of a large developing-country university. Of specific interest to this project were relationships between family life and research productivity for highly productive researchers, and potential family-related costs or consequences associated with being a top researcher in this context. Therefore, the objective of the study was to test theory that relates family life to research publications output. The aim of the study was to develop knowledge around work–life balance (WLB) effects.

It is argued that this study is important, for the following reasons. Firstly, in an increasingly competitive global context, academics are pushed to publish ever-higher numbers of publications

(see Binswanger, 2014; Colquhoun, 2011; Keen, 2007; Smith, 1990). Peer review, typically unpaid, underpins an extensive process of academic publication. Some argue that increasing pressures on academics to publish more (Keen, 2007) can reduce the quality of science and demoralise staff and can contribute to journal proliferation, including predatory journals, and to the development of a 'publication for a fee' industry (Beall, 2013; Colquhoun, 2011). As the management of universities increase these stipulated 'numbers', typically in order to meet the pressures of university ranking systems (Binswanger, 2014), the 'publish or perish' nature of academic work intensifies, often with a focus on quantity instead of quality (Colquhoun, 2011; O'Connor, 2010), in some instances also resulting in increased bias (Fanelli, 2010). There seems to be little current research in this context explicitly investigating relationships between family life and research publications in the form of different types of publications. Therefore, this study is considered important because it can provide knowledge of family life consequences in a context under increasing pressures to publish, given international trends (Beall, 2013; Colquhoun, 2011; Fanelli, 2010; Keen, 2007; O'Connor, 2010). Knowledge of the 'threshold tolerances' of publication relating to specific forms of research publications is therefore considered to be important.

Secondly, some (see Smith 1990, n.p.) have argued the 'publish or perish' dictum may generate 'useless research articles' and lead academic staff 'away from their students'. This raises the issue of conflict between teaching and research roles, a long-standing issue in university contexts (Hattie & Marsh, 1996). This study is also significant if it identifies costs associated with high research productivity, given the teaching pressures on academic staff. An analysis of teaching versus research satisfaction is therefore considered important in this context. It is argued that pressures to publish will increase over time, and these pressures need to be considered in relation to their costs and consequences.

Thirdly, given South Africa's history of endemic inequality (Hassim, 2006; Ribeiro, Bosch & Becker, 2013), this study makes a contribution through its explication of the gender dynamic associated with the tensions between high-volume publication and family life. In a society in which many are sincerely committed to reducing inequality, particularly gender inequality, research that contributes knowledge of how inequality can be reduced without imposing costs on others is considered to be particularly important. Having offered an introduction to the study and a justification for its significance, the theoretical frameworks of the study are now considered.

Literature review

Any research on the potential satisfaction and WLB of staff within a certain industry needs to recognise the relative work-related differences between the industry and others. Research has found differences in occupational stress between occupations, with teaching staff in particular reporting higher levels of occupational stress than most other professions, perhaps because of the emotional labour involved (Johnson *et al.*, 2005; Zembylas, 2004; Zhang & Zhu, 2008). Emotional labour relates to the need to display intense emotions within a job, although work overload is typically also a challenge faced by teachers (Hargreaves, 1998; Johnson *et al.*, 2005; Kokkinos, 2007). Teaching is but one dimension of lecturing work, but an important aspect of it.

Societal practices that relate to the organising of social relations are typically unequal, with different roles ascribed by gender (Ridgeway & Correl, 2004), and unequal gender roles persist, such as those relating to childcare as well as the tension between work and family roles. It is possible that gender roles are not neutral in terms of shaping the intrinsic preferences of academics for either research or teaching.

Time spent on teaching has been found to be a negative and significant predictor of research productivity, as measured by total publications ($p < 0.01$), and male academics typically report spending less time on teaching and more on research than female academics (Barbezat, 2006). Given that academics need to balance the roles of leader, teacher and researcher, the potential influence of family commitments such as marriage and dependent children might increase the potential for family–work conflict.

One aspect of the tension between work and family roles is the potential influence of spillovers, or the negative influences of work, on family life and on working outcomes. Working mothers have been found to experience higher levels of negative family-to-work spillover than fathers (Dilworth, 2004). Family-to-work spillovers have also been found to differ according to generational differences (Dilworth & Kingsbury, 2005). In terms of bidirectional inter-role conflict, family boundaries have been found to typically be more permeable in that work roles typically intrude more significantly on family roles than family roles on work roles (Eagle, Miles & Icenogle, 1997); however, research highlights the ongoing influence of unequal sex roles (Castro, 2012; Durbin & Tomlinson, 2014; Houle, Chiocchio, Favreau & Villeneuve, 2012).

Numbers of dependent children are considered an important moderator of work–family issues, and therefore WLB (Deery, 2008). Because of the negative impact of WLB issues on staff retention, some have recommended that governments legislate maximum hours of work. In certain industries, hours of work can be high, such as in hospitality (Deery, 2008), accounting (Frank & Lowe, 2003) and medicine (Landrigan *et al.*, 2004) and can be associated with higher levels of occupational injuries and illnesses (Dembe, Erickson, Delbos & Banks, 2005). Although universities might have relatively flexible working hours compared to other industries, it is possible that increasing pressures on academics can lead to academics working similar hours and taking work 'home'.

Critics argue that, on a global basis, academics have been subjected to ever-increasing workloads over time (Houston,

Meyer & Paewai, 2006; Tight, 2010). This approach has proliferated in the form of 'artificial contests' that are intensifying across the world, as higher and higher publication counts are required of academics (Binswanger, 2014). This has put academics under pressure to produce increasingly higher numbers of research publications as well as research grants, with a particular focus on volume more than quality.

To the extent that basic research is a common good, letting markets decide on research typically neglects basic research, but this has not stood in the way of the global rise of artificial markets in the form of competitive rankings, which coupled university performance to markets along a host of dimensions (Binswanger, 2014). However, over time, stakeholders in Human Resource Management (HRM) systems can shape these systems; for example, 'society may press for changes to improve family life' (Jackson, Schuler & Jiang, 2014), but academia as an industry seems to be atypical of others, and the trend towards increasing pressures on academics to publish volumes of publications (Binswanger, 2014; Colquhoun, 2011; Smith, 1990) seems to show no signs of abating. The HRM systems of universities typically include formal workload models.

However, to some extent, the impact of increasing hours of work that academics need to put in during their own time might not be reflected in typical workload models. Academic contexts might be expected to develop into less family-friendly workplaces over time if the trend towards ever-increasing productivity (Colquhoun, 2011; Smith, 1990) does not level off.

Although there has been an increasing focus on developing family-friendly workplaces over time, workplace cultures have been more difficult to change (Bond, 2004; Lewis, 2001). Another constraint to policies that seek to improve work–life facilitation is the potential for economic, social or career penalties to be related to the use of these policies, which can take the form of 'reduced employment participation of women, reduced career opportunities for flexible or part-time workers, and reduced access to preferred roles, tasks and opportunities' (Skinner & Chapman, 2013, p. 13). Participation in work and/or family programmes has been found to be more likely in the presence of supervisor support and diversity management organisations (Kim & Mullins, 2014). In terms of family–work spillover, a consideration of gender inequality is also important.

Given the historical ordering of sex roles and the disproportionate load of work associated with family life borne by women (Ridgeway & Correl, 2004), it is possible that over time a different gendered career pattern may develop. The deficit model of gender difference highlights the unequal access of women to resources and their exclusion from research networks, which tend to be male-dominated; further, childbearing, caretaking and domestic needs can interfere with research (Boshoff & Bosch, 2012). Publication success typically dictates career progression in academia, particularly in terms of publication in journals indexed in Thompson Reuters's Institute for Scientific Information (ISI) and ProQuest's International Bibliography of the Social Sciences (IBSS). Conference proceedings publications, conference presentations, book chapter publications and book publications are also important.

Research is time intensive, and time spent on teaching is a dominant predictor of research publications; a trade-off needs to be made between research, teaching and citizenship roles. Certain research suggests that top researchers typically work 'at home' and after hours in order to invest the time necessary to publish extensively (Callaghan, 2013), which may take time away from family life over the lifecycle of an academic. Absent from the literature in this context is knowledge of the specific differences in publication that might result from family–work spillover, or from gender-unequal family task workloads. Therefore, this study differentiates between seven different types of research publications and thus offers a more nuanced understanding of the potential consequences of gender role disparity associated with family life influences and of such potential inter-role conflict.

Inter-role conflict arises when sets of opposing pressures arise from participation in different roles; it is experienced when 'pressures arising in one role are incompatible with pressures arising in another role', and role pressure incompatibility exists when 'participation in one role is made more difficult by virtue of participation in another role' (Greenhaus & Beutell, 1985, p. 77). An important form of inter-role conflict is work–family conflict, 'in which the role pressures from the work and family domains are mutually incompatible in some respect' (Greenhaus & Beutell, 1985). The historical literature suggests three types of work–family conflict predominate with regard to the work or family domain, namely (1) time-based conflict, which relates to hours worked, inflexible work schedules, shiftwork and the like which typically conflict with family domain factors such as family size and other family pressures; (2) strain-based conflict, relating to role conflict, role ambiguity and boundary-spanning activities which can conflict with family pressures; and (3) behaviour-based conflict, related to work expectations which conflict with family expectations (Greenhaus & Beutell, 1985). On the basis of the above literature, the central hypotheses tested in this study are (1) hypothesis a, that 'there is a significant association between dependent children and research productivity' and (2) hypothesis b, that 'there is a significant association between marriage and research productivity'.

However, literature suggests that relationships related to research productivity, akin to those related to job performance, are complex in nature and need to be modelled through the inclusion of covariate effects. Therefore, certain covariates are included in the analysis of the hypotheses derived above. The rationale for inclusion of these factors was based on a

preliminary grounded qualitative analysis, as well as justification from the job performance literature. The literature sources of the measures of these factors are reported in the methods section. Job satisfaction (Muchinsky, 1983), self-efficacy (Bandura, 2006) and locus of control (Spector, 1988) can be primary determinants of individual performance, according to the job performance literature. These were also identified as core determinants of individual research productivity according to the preliminary qualitative study and were therefore included as covariates in the study. Other research in the South African context has found research output of non–research-active academics to be predicted by tangible management mechanism factors, yet by factors other than tangible factors for research-active academics (Bosch, 2011). Following Podsakoff, MacKenzie, Lee and Podsakoff (2003), individual endowments of positive (PA) and negative affect (NA) can cause systematic bias in survey responses, and to control for this effect, measures of these were also included. Therefore, the measures employed were derived from the literature and were considered appropriate for this study seeking to address the research problem described earlier. Having located this research within the broader literature and having derived hypotheses for testing, the methods applied in this study are now discussed.

Method

Research approach

The study applied a quantitative cross-sectional research design, drawing from the ontological and epistemological tenets of post-positivism (Cresswell, 2003). The methods applied in this research were taken to be consistent with the post-positivist paradigm as explicated in the paragraphs that follow.

Population and sampling

The study attempted to apply census sampling. The population of the study comprised approximately 1300 academic staff of a large South African higher education institution. Of these, approximately 883 were full-time staff. Staff were provided with pre-addressed envelopes that could be returned together with completed questionnaires via the internal mail system. In total, 225 usable responses were received, giving a response rate of about 17% for total staff. A sample size calculation was used to ensure the sample size was sufficient to derive inferential statistics at the 5% level of significance (where the chance of making a Type I error, or rejecting a true null hypothesis was equal to making a Type II error, or rejecting a false null hypothesis). Anonymity was guaranteed and participation was voluntary. Refusals to participate were unconditionally respected. Almost half of respondents (46%) reported not having doctorates, about a third (32%) had doctorates but were not Associate Professors or Professors, 14% reported being Associate Professors, and 8% reported having full professor status. This ratio of staff was taken to support representativeness. Further checks of representativeness found over half of academics to report English as a home language (52%), and only a quarter of staff with an African home language (25%). These results are broadly consistent with the demographics of the institution for the period of the study.

Analysis

The data were analysed with SPSS, Version 22. Univariate, bivariate and multivariate tests were performed. Pearson tests of zero-order correlations and partial correlation analysis were applied to test hypotheses and also for the purposes of further analysis. Multiple linear regressions were used to test relationships where covariates were indicated. The assumptions of all the statistical tests were checked, and in addition to this bootstrapped confidence intervals were used to verify results (Byrne, 2010). Furthermore, chi-squared tests were also used to gain further insight into tested relationships in order to support the depth of the analysis. Data were tested for reliability. Convergent and discriminant validity was also assessed. Careful attention was paid to content, construct and face validity. Each form of data, namely ratio, interval and nominal, was identified and the assumptions of each taken into consideration in data analysis.

Measures

In many studies, the underlying rationale for the selection of variables as covariates can be problematic, resulting in bias from omitted variables (Heckman & Navarro-Lozano, 2003). In order to increase the validity of the process of covariate inclusion, the covariate structure was matched with the 'grounded context' through the preliminary use of a grounded theory application based on Glaser's (1992) method. In this way, a rationale was used that supported the inclusion of the covariate factors in multivariate testing.

It is acknowledged that it was not possible to use instrumental variables to ensure without a doubt that omitted variable bias was not a factor, yet theoretical rationale guided the process, nonetheless. The research therefore followed Cresswell's (2003) understanding of post-positivist research, which acknowledges the weaknesses inherent in any attempt to apply positivist methods and applies a 'theory-testing' approach in order to mitigate these limitations. In other words, evidence is used to either accept or reject hypotheses, or arguments, according to Popper's (1963) approach.

The following variables were included in the multiple linear regression analysis models: generalised job satisfaction, self-efficacy related to research, negative affectivity, positive affectivity, locus of control, gender, other countries lived in for over a year, full-time work experience, professional associations, the number of people reporting to an individual, number of masters students supervised, dependent children, a preference for quantitative methods, South African origin and English as a home language.

Job satisfaction was measured using seven-point Likert-type scales, broadly derived from the precedent of the Minnesota Satisfaction Questionnaire scales (Arvey, Bouchard, Segal & Abraham, 1989; Muchinsky, 1983). Three items were used to

measure job satisfaction. The Cronbach Alpha obtained for these items was 0.859.

The self-efficacy items were derived from the scales developed by Bandura (2006). These items were designed to reflect perceived capability, using the word 'can' rather than 'will', following Bandura's (2006, p. 308) prescriptions. Bandura (2006, p. 309) differentiates locus of control from self-efficacy, where locus of control 'is concerned, not with perceived capability, but with belief about outcome contingencies – whether outcomes are determined by one's own actions or by forces outside one's control' and that high locus of control 'does not necessarily signify a sense of enablement and well-being' (Bandura, 2006, p. 309).

The scales used in this study to measure NA and PA were derived from Watson, Clark, and Tellegen's (1988) affect scales. Watson *et al*. (1988) developed two 10-item mood scales, the Positive and Negative Affect Schedule, which have, in previous studies, been found to have high internal consistency, to be largely uncorrelated, and to be relatively stable over 2-month time periods. These factors have emerged from rotated factor analysis as orthogonal dimensions of affect (Watson & Tellegen, 1985). PA 'reflects the extent to which a person feels enthusiastic, active and alert' and high PA 'is a state of high energy, full concentration, and pleasurable engagement, whereas low PA is characterised by sadness and lethargy' (Watson *et al*., 1988, p. 1063). NA is a:

> general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear and nervousness, with low NA being a state of calmness and serenity. (Watson *et al*., 1988, p. 1063)

This study used the 16-measure work locus of control scales developed by Spector (1988). The scale has demonstrated validity and reliability in different contexts (Spector, 1988) and has been found to correlate with a range of factors that support criterion-related validity as well as being used extensively in locus of control studies across the globe. The items of this scale are in the form of Likert-type scales that give respondents a statement and responses that include 'Disagree very much', 'Disagree moderately', 'Disagree slightly', 'Agree slightly', 'Agree moderately', and 'Agree very much'.

The other demographic variables were sampled using questions that were phrased simply and clearly in the questionnaire. Seven measures of research productivity were used (a composite measure of research publication – termed gross research productivity – and six subordinate measures). Respondents were asked to indicate how many of these they had been published or presented, including those accepted for publication or presentation. These seven measures were (1) South African Department of Higher Education and Training–accredited journal publications; (2) ISI and IBSS-indexed journal article publications, representing 'internationally indexed' journal article publication; (3) conference proceedings publications; (4) conference paper presentations; (5) book chapter publications; (6) book publications and (7) gross research productivity, which, as indicated, is a composite variable, comprising (1), (2), (4) and (5), a composite of 'same-size' publications that specifically reflected the quantity of research publication.

Scales and questionnaire items were tested during piloting. In all methodological processes, precedent was strictly followed and a sampling protocol was adhered to so as to not allow extraneous variance to enter the process.

Results and discussion

The descriptive statistics that relate to these variables are reported in Table 1. The univariate, bivariate and multivariate results are reported and discussed in the sections that follow.

Univariate analysis results

According to the univariate analysis (Table 1), women were in the majority in the sample, with 53% representation versus 47% for men. Over half of the sample were of South African origin (56%) and had English as a home language (52%). The majority (56.9%) of staff reported being married. Respondents reported on average having one child (1.094), with a range of up to a maximum of seven children. The mean age of female respondents was 40.8 years, with a median of 40 and a mode of 35 (58% married with an age range from 22 to 66). The mean age of male respondents was 40.52, with a median and mode age of 40 (with 56% married and an age range from 22 to 72 years).

Bivariate and multivariate results

The results of the bivariate and multivariate testing are reported and discussed as follows. In each case, the tested hypothesis is used as the heading of each section:

- **Hypothesis 1:** *There is a significant association between dependent children and research productivity.*

According to the zero-order bivariate Pearson tests of association, the dependent children variable was found to be positively significantly associated with conference proceedings publication (0.164; $p < 0.014$). Neither were ISI and/or IBSS journal publications found to be significantly associated with dependent children nor were these relationships significant when age was controlled. However, when age together with gender were controlled, the association between ISI and/or IBSS journal publication and dependent children was found to be negative and significant (-0.179; $p < 0.008$), a result supported by the bootstrapped confidence intervals (lower = -0.304; upper = -0.04).

When included together with covariate factors in the multiple linear regression analyses, the dependent children variable was also found to be significantly and negatively associated with ISI and/or IBSS journal article publication ($p < 0.035$). This might indicate the presence of heterogeneity in the data

TABLE 1: Descriptive Statistics: Mean, Standard Deviation, Variance, Skewness and Kurtosis.

Variable	Mean	Standard deviation	Variance	Skewness	Kurtosis
Job satisfaction	15.07	4.03	16.2	-0.836	0.854
Self-efficacy research	425.25	106.36	11311.9	-0.586	-0.013
Negative affectivity	17.75	6.63	43.9	1.33	1.85
Positive affectivity	38.13	6.87	47.2	0.954	11.22
Locus of control	69.56	10.6	112.8	-0.398	0.649
Gender 1 = male†	47%	-	-	-	-
Other countries lived in	1.21	1.45	2.11	1.66	3.19
Full-time work experience	14.6	10.69	114.3	0.769	-0.086
Membership of professional associations†	81%	-	-	-	-
People reporting (span of control)	2.7	6.4	41.54	4.623	26.31
Masters supervised	6.19	9.55	91.27	2.561	8.11
Dependent children	1.09	1.28	1.64	1.33	0.324
Preference for quantitative methods = 1†	45.6%	-	-	-	-
South African origin (by birth)†	56%	-	-	-	-
English home language†	52%	-	-	-	-
Accredited Department of Higher Education and Training journal articles	4.27	10.1	102.8	5.83.4	43.36
Accredited ISI and/or IBSS journal articles	7.19	14.69	215.8	3.4	13.33
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**

ISI, Thompson Reuters Institute for Scientific Information; IBSS, ProQuest International Bibliography of the Social Sciences.
†, Means of binary variables are instead reported as percentages.

as a methodological artefact (Heckman & Navarro-Lozano, 2003), which cannot be addressed using bivariate methods, but which can be controlled for using partial correlation and multiple linear regression analysis methods.

As a further check, when backward elimination with a statistical (atheoretical) rationale was applied, the dependent children variable was still found to be significantly and negatively associated ISI and/or IBSS journal article publication. The other variables remaining in the backward elimination model (within the 10% significance level required for inclusion) were self-efficacy relating to ISI and/or IBSS publications, total work experience and gender (R^2 = 0.268; Adjusted R^2 = 0.258; Standard Error = 12.650; F = 27.016; p < 0.0001). All the bootstrapped confidence intervals were found to support the significance of the variables in the model. The female gender variable (a dummy measure) was significant and negatively associated with ISI and/or IBSS journal article publication in both these models, indicating that this effect was significant over and above the associations between dependent children and the other covariates. On the basis of these results, the alternative hypothesis a, that 'there is a significant association between dependent children and research productivity' was supported.

Therefore, the result is taken to suggest that dependent children have a negative association with ISI and/or IBSS journal article publication over and above the influence of gender. This result may suggest that family-to-work spillovers (Dilworth, 2004; Dilworth & Kingsbury, 2005) might be present in terms of international journal article publications. If there is a cost in terms of a family life versus ISI and/or IBSS publication trade-off, then such a result would be expected. It is possible that in a context of ever-increasing pressures for publication (Binswanger, 2014; Colquhoun, 2011; Smith, 1990), there may be a threshold above which there is a conflict between family life and research publications. Although it is not possible to claim causality on the basis of the tests used, it is nevertheless argued that further research should investigate the possibility that as pressures to publish continue to increase there might be the chance of increasing family life role conflict.

The negative association between female gender and ISI and/or IBSS journal article publication is taken to suggest that female career progression may be constrained in this context. Further Chi-Squared tests were performed on the relationships between gender and membership of different levels of the organisational hierarchy or designation differences. The Mr or Ms Designation (Chi-square = 3.140; p < 0.208), doctoral designation (Chi-square = 0.495; p < 0.482) and associate professor designations (Chi-square = 1.731; p < 0.188) revealed no gender difference, but at a professorial level (Chi-squared = 4.951; p < 0.026), men were more prevalent. This result would be expected to reflect a context in which men have an advantage in ISI and/or IBSS journal publications because promotion to 'full' professor typically requires international publications. Little evidence here suggests that gender inequality is not present in this context.

Although an investigation of the cause of this inequality was beyond the scope of this work, it is argued here this cause is no different from that proposed by a relatively large body of international literature (Cornwall *et al*., 2007; Faust, 2013; Jacobs, 1996; Kabeer, 2005; Powell, 2005; Rao, 2006; Rao & Kelleher, 2003; Smyth, 2007; Unterhalter & North, 2011; Wendoh & Wallace, 2005), as well as South African literature (Geisler, 2000; Hassim, 2006; McEwan, 2000; Rogan, 2013;

Seidman, 1993; Wood & Jewkes, 1997) which points to unequal societal role burdens; in other words, societal practices that relate to the unequal organising of social relations (Ridgeway & Correl, 2004). The burden of home-making and childcare and family roles (Dilworth, 2004; Dilworth & Kingsbury, 2005) is but one dimension of this role differentiation (the gender variable is significant over and above [independent of] the effect of dependent children in the tested equations), and as suggested by Hattie and Marsh (1996), it is argued here that another role burden in this context is possibly the different gender role ascriptions that relate to teaching roles.

In order to further investigate these relationships within the gender samples itself, and thereby to control for the manifest heterogeneity (Heckman & Navarro-Lozano, 2003) discovered in the testing process, a split was applied to the data by gender. For the female sample, none of the measures of research productivity were significantly associated with the dependent children variable. This was taken to suggest that inequality around gender roles may run deeper than reasons associated only with childcare.

However, for the male sample, according to zero-order tests, only dependent children were found to be associated with conference proceedings publication, and positively so (r = 0.202; $p < 0.039$). Partial correlation analysis was then applied, but this relationship was not found to be significant when controlled for age. Age being controlled for in case this finding was an artefact of age effects, and tests were performed with all the research publication variables. With age controlled, ISI and/or IBSS journal article publication was found to be negatively and significantly associated with dependent children for male academics (r = -0.195; $p < 0.048$), 'yet not for female academics'.

Whether this reflects an engagement with childcare time constraints by male academics in the form of family–work spillovers is unclear. It is possible, perhaps, that female academics are in fact better in adapting to the pressures of raising children. The notion that male academics with families might be constrained in their career progression (ISI and/or IBSS journal article publication is typically a requirement for promotion to full professor) is also problematic. It is possible that publication of higher numbers of ISI and/or IBSS publications requires more time than is available in typical working days; other research suggests that to be top in an academic field might require very large time investments (Bosch, 2011; Callaghan, 2013). If high levels of ISI and/or IBSS publication require hours of work or time investments that are in excess of typical working conditions, then further research should perhaps investigate the costs to individuals (and to family life) that might be associated with this.

For the female sample, dependent children are found to be associated negatively and significantly with conference presentations (r = -0.217; $p < 0.018$). For men, this relationship is not significant. It is possible travelling involved in conference presentations has a different gender effect; women may be less likely to sleep over at conferences if they have dependent children. What might be important here is the fact that conference presentations are typically the first step in the development of a research portfolio, as this is a developmental stage in a ladder of research development (Callaghan, 2013). These results suggest family-to-work spillover, which has been found to potentially have a negative influence on work productivity (Dilworth, 2004; Dilworth & Kingsbury, 2005) that might be present in this context and that its effects may differ by gender. If family life does constrain the development of female academics through its influence on conference presentations, which is a first, and perhaps necessary, step in academic development, then institutional support and incentives might need to address this. Institutional support and incentives might play an important role in addressing gendered constraints to development in this context (Boshoff & Bosch, 2012):

- **Hypothesis 2:** *There is a significant association between marriage and research productivity.*

Married academics were found to report publishing significantly more Department of Higher Education and Training (DOHET) articles, (0.194; $p < 0.003$) but when age was controlled for using partial correlation analysis, this association was no longer found to be significant (0.105; $p < 0.118$), although the bootstrapped confidence intervals suggested a significant association (lower = 0.023; upper = 0.196). Marriage was not found to be significantly associated with ISI and/or IBSS journal article publication nor conference presentations; neither as zero-order associations nor with age controlled, but was for conference proceedings (zero-order: 0.154; $p < 0.021$), although not when age was controlled (0.077; $p < 0.250$). Similarly, marriage was not found to be associated with book, book chapter publication, or with gross research publication, in all cases with and without controlling for age.

Although family-to-work spillover effects might typically have less of an influence than work-to-family effects (Eagle *et al*., 1997), the presence of a negative association between international journal article publication and the number of dependent children of male academics requires further research into what potential 'family' costs are associated with highly productive researchers. It is concluded that family-to-work spillovers (which are proxied by the dependent children variable) may not be gender homogenous in this context. The influence of societal culture can manifest strongly in the different family roles that it prescribes in different ways to men and women (Emrich, Denmark & Den Hartog, 2004). It is recommended that universities proactively engage with these challenges by providing day-care facilities and other support to parents, as gender role differences might still place a gender-unequal burden on parents (of either sex) who are academics. On the basis of these results, it is recommended

that the influences of family-to-work spillovers on male academics are also not neglected.

Conclusion and recommendations for further research

The objective of this study was to test the potential influence of family life spillovers on academic research publication. The findings of this study suggest that male academics with more dependent children publish significantly fewer ISI and/or IBSS journal articles. Little evidence was found to refute predictions in the literature that ever-increasing pressures to publish will be associated with WLB consequences for academic staff (Binswanger, 2014; Colquhoun, 2011; Smith, 1990), and in this instance, it was argued that academics publishing higher numbers of ISI and/or IBSS journal articles might face a higher chance of family–work role conflict. Further research is suggested to build on these findings, preferably using causal methods as well as qualitative research in order to develop causal models of these relationships.

Female academics, with relatively lower ISI and/or IBSS publications, might also be constrained in their career progression in this context, but these constraints might exist over and above the influence of family life. Although it was not possible to ascribe causality using statistical testing, it was argued that unlike men, who seem to be less productive the more dependent children they have, women seem to have a preference for teaching over research, which might explain certain of these differences. Further research should seek to investigate these relationships further and offer a more authoritative perspective on this.

To the extent that career progression is a function of international article publication, it was argued that a glass ceiling effect, or unseen barrier to gender career progression unrelated to skills or abilities (Cotter, Hermsen, Ovadia & Vanneman, 2001), prevails in this context, termed here a 'paper ceiling', relating specifically to the academic context. This notion was supported by further analysis – no significant difference was found between the genders for all the hierarchical levels of designation except for full professors, who were found to be significantly more likely to be men. Further, women with dependent children were found to be significantly less likely to make conference presentations, which may have an important developmental role as it is the first step of the research 'ladder'. It is acknowledged this might be because of unequal sex roles, as women with dependent children might be less likely to sleep over at conferences.

On the basis of these findings, it is concluded that it is possible that family–work spillovers may constrain career progression in this context. Although the use of causal methods was not possible, further research is recommended in order to replicate this study in other contexts as well as to perhaps apply qualitative methods in order to explore the causal paths that underlie these findings.

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