

Global competitiveness in research: Does a doctorate abroad matter for faculty in Sub Saharan Africa?

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Abstract

The paper reports results of a study that examined the degree to which foreign doctoral experience facilitates on research competitiveness following graduate return to the country of origin. Underpinned by the global engagement model, the study compared rates of global engagement in research for foreign and domestic doctorates across six research specific forms of engagement; publications, collaborations, projects, conferences, funding and affiliations. A sample of 170 curriculum vitae were drawn from the archives of the National Council for Higher Education of Uganda. An innovative longitudinal curriculum vitae analysis method was used to determine levels of global engagements in research by higher education faculty. Foreign and domestic doctorate engagement rates were compared using the Generalized Estimating Equation (GEE) method. The analysis across the six research forms proves helpful in providing a wider picture. Results suggest that foreign doctorates only had significant access to international funding and made little progress in other forms of research engagement. Further analysis reflects differences in specific demographic categories. The implication was that study abroad produces globally competitive graduates, but outcomes could be improved both at administrative and policy levels.

Keywords: Study abroad, research competitiveness, global engagement, higher education, Sub-Sahara Africa

Table of Contents

Abstract.....	1
1.0 Introduction.....	3
1.1 Global Imbalances amidst competition	3
1.2 The Uganda higher education context.....	5
1.3 Factors affecting research engagements in higher education	6
2.0 The Analytical Model	7
3.0 Methodology.....	8
4.0 Results	10
4.1 Sample characteristics	10
4.2 Descriptive statistics	11
4.3 GEE baseline analysis results.....	12
4.4 Analysis across education levels	12
4.5 Analysis across academic disciplines	13
4.6 Analysis across gender categories.....	14
5.0 Discussion	14
5.1 Access to international funding	15
5.2 International collaboration.....	16
5.3 International affiliations to professional bodies.....	16
5.4 Participation in international projects	17
5.5 Presentations at international conferences	18
5.6 International publications	18
6.0 Implications	19
References	20
Table 1 Inequality in research funding for best fifteen countries in three regions .	4
Table 2 Number of CVs by faculty characteristics and degree award	11
Table 3 Descriptive outcomes of foreign and domestic doctorates.....	11
Table 4 GEE table for global engagements across research dimensions	23
Table 5 GEE table for global engagements across education levels.....	24
Table 6 GEE table for global engagements across disciplines	25
Table 7 GEE table for global engagements across gender categories	26
Figure 1. The global engagement in research model	8

1.0 Introduction

This study examined global competitiveness in research by higher education academics in Sub-Saharan Africa years following the experience abroad on doctoral study. It is grounded on the understanding that higher education today is increasingly becoming competitive among countries, universities and even among faculty (Marginson & van der Wende 2007). This quest for world class status in higher education revolves much around research (Shin & Kehm 2012). Countries and universities seeking competitive research faculty to boost rankings employ two main approaches. The first involves offering incentives such as scholarships and resettlement packages to attract faculty irrespective of institution or country of origin. This is common with the developed countries of the West and the emerging nations of East Asian (Shin, Jung, Postiglione, & Azman 2014). The alternative approach mainly adopted by low income countries in Sub-Saharan Africa, such as Uganda involves sending faculty for doctoral training abroad with the hope that they equally become competitive and able to sustain it on return. While returns on the former approach are conditioned, the outcomes in the latter approach are little known. There is hardly evidence that connects global research engagement and foreign doctoral training. Aware of the many challenges particularly faced by African students in study abroad (Maringe & Carter 2007), it is imperative for student sending institutions and countries to better understand the benefits of the experience.

The paper assesses progress on global competitiveness in research by foreign doctoral graduate returnees and compares research engagements of foreign and domestic doctorates while focusing on activities of a global nature. By research engagement, the study draws from measures of research outputs in literature and comes up with six research specific forms of engagement that include; publishing, collaboration, affiliations to professional societies, participation in research projects, access to research funding, and presenting at academic conferences (Brandenburg. & Federkeil, 2008; Kyvik & Larsen 1994; Wendt, Slipersæter & Aksnes, 2003). Although common research practice is to examine research outputs for each form of engagement independent the others, the current study considers them related and a concurrent analysis and comparative assessments were considered necessary across the six forms of research engagement.

1.1 Global Imbalances amidst competition

Competition in science is not a new phenomenon among nations especially reflecting on the cold war space exploration programs of the former USSR and the USA. What perhaps is new is the entry of universities following commercialization of education services and which tends to bring all nations and universities on board. The global research system is increasingly competitive and characterized

by inequality. The imbalances are so diverse and cover many aspects. For the current purpose, two key aspects relevant to the study are worth mentioning.

Consider for example the distribution of the world's top 500 universities. None is located in Africa. Recent data from the Organisation for Economic Cooperation and Development (OECD 2017) indicates that Europe had the largest number totaling 207 universities, followed by North America with 166 universities. East Asia and Pacific have 100, the Middle East and North Africa have 13, and Latin-America and Caribbean have 10 universities. South Asia only have 01 university based in India. The distribution of the world's best universities has also implications on research performance by higher education faculty as it provides a stronger support system needed for research.

Research funding could be another important aspect for comparison. Recent OECD data suggests that countries in Sub Saharan Africa have the lowest research funding rates compared to other regions. The table below comparing the top fifteen countries across the three global regions; Europe, East Asia and the Pacific and Sub Saharan Africa. It is clearly evident that even the best funded country in Sub Saharan Africa; South Africa spends far less than the lowest spender among the top fifteen in the European region; the Czech Republic. It also falls below the top six high spenders in R&D in East Asia and the Pacific. It is clear that researchers from Africa are likely to be less competitive considering the meagre research funding. These inequalities and many others make it absolutely important for disadvantaged research systems to be attached to mainstream research centers and hopefully develop their competitive edge.

Table 1 Global funding inequality in research among the best fifteen countries in three regions

No.	Europe	East Asia and Pacific	Sub Saharan Africa
1	Czech Rep. 6933	Macao China 41.4	Mauritius 38.6
2	Denmark 8242.9	Mongolia 74	Burkina Faso 39.7
3	Poland 10248.1	Myanmar 94.5	Botswana 76.7
4	Belgium 12634.8	Philippines 477.9	Mozambique 92.4
5	Austria 13481	Vietnam 789.1	Gabon 131.9
6	Switzerland 13669.9	New Zealand 1857.3	Senegal 149.7
7	Sweden 15299	Indonesia 2135.8	Mali 151.2
8	Turkey 15337.7	Hong Kong 2668.1	Uganda 259.3
9	Netherlands 16923.4	Thailand 3304	Ghana 276.5
10	Spain 19750.5	Malaysia 7334.3	Sudan 300.4
11	Italy 30126.5	Singapore 10066.7	Tanzania 348.7
12	Russia 40522.1	Australia 23133.6	Ethiopia 784.4
13	UK 46297.2	Korea 74217.7	Kenya 788.2
14	France 60867.9	Japan 170081.8	Nigeria 855.5
15	Germany 112808.8	China 408829	South Africa 4975

Notes: Million USD (PPPs) by country across three global regions. Countries are listed from the lowest to the highest funded for each region

Source: Data: OECD (2017) Science Technology and Innovation.

1.2 The Uganda higher education context

With such inequalities at a global level, Africa is hardly in a position to compete with the rest of the world but would rather focus on building competitive talent. Fortunately, the study is more concerned about the study abroad approach being used to build such talent and not the competitiveness of African countries. For Uganda, much of the research is conducted by higher education faculty. Like many Sub-Saharan African countries with the exception of perhaps South Africa, it still face inequalities even within its own higher education system. In terms of funding, it could be considered a moderate performer in Sub-Saharan Africa and with one of the best Universities in Africa. Therefore, it could be considered an ideal case for the current study. Although it appears to be doing well in the African context, it does not imply that it has a level ground for universities and individual faculty.

Uganda as an emerging nation faces a dynamic situation in higher education likely have a significant impact on faculty research. By 2011, the total number of public universities was 09 and private universities had increased to 29 and more are still emerging. The number of doctoral graduates is growing but at a low pace. For instance, in 2011, the number of Ph.D. holders had grown from 858 in 2010 to 914, Master's Degree holders were 3657, and the remainder had lower qualifications. The population of eligible faculty with a doctorate would be considered still low compared to the number of institutions. However, there also other immediate challenges to research.

Funding for faculty study and research is either on a private basis, government or often largely by donor agencies. It is therefore bound to introduce inequalities among faculty. In the case of Uganda; Ph.D. and postdoc research funding for both domestic and study abroad are being provided by various organizations. For instance, the Swedish International Development Agency (SIDA) sponsoring Ph.D. Similarly, collaborations like the CAPREx (Cambridge-Africa Partnership for Research Excellence) initiative provides postdoc fellowships for Makerere University faculty to study in Cambridge. Other sources of research support go to specific disciplines. The Swedish International Development Cooperation Agency/Swedish Agency for Research Cooperation with Developing Countries (SIDA/SAREC) provides funding for Research in the faculties of Sciences and humanities. Unbalanced support from such sources can have effects on mobility for academic conferences, publications in international journals, and even membership in professional societies.

The funding imbalance could aggravate already existing inequalities within institutions. While most academics in public institutions enjoy a tenure and earn monthly salaries, most faculty in private institutions and even some in public universities have no tenure and are paid per hour. Remunerations may vary according to faculty rank, qualifications, experience, and sometimes according to the individual. Universities also vary in research capacity built overtime. As a result most faculty end up in consultancy to supplement incomes. In addition, well

established public universities can hardly be compared to recently established universities in the 1990s. Moreover, the majority are private institutions with potentially diverse levels of infrastructure development. Comparing researchers from different institutions on research performance might therefore be unfair without paying attention to university effects. Research outcomes could be affected by many other factors.

1.3 Factors affecting research engagements in higher education

Literature on the impact of study abroad has examined several aspects and among them; intercultural competence development (Bender 2009; Deardoff 2006; Doyle 2009; Fuller 2007; Rexeisen, Anderson, Lawton, & Hubbard, 2008, Salisbury, et al. 2013), language development (Kang 2014; Llanes 2011; Savicki 2011; Shaftel, Shaftel & Ahluwalia 2007), and impact on career choice (Mahajeri & Gillespie 2008; Orahood, Kruze & Pearson 2004; Wiers-Jenssen 2007). Although recent studies made attempts to examine global engagement (Murphy, Sahakyan & Yong-Yi, 2014), links with global engagements in research are among aspects that remain to be examined.

Despite the shortcoming in literature, studies on research output highlight the role of demographics and contextual factors. Research on the role of demographics suggests that productivity is a function of age, a percentage increase in age, academic position and gender for all disciplinary fields (Rosterd & Arknes 2014). Lee & Bozeman 2005 also linked the presence of moderating variables; age, rank, grant, gender, marital status, family relations, citizenship, job satisfaction, perceived discrimination, and collaboration strategy to research productivity. The findings echo well with findings regarding; academic rank (Beckmann & Schneider 2013), the role of age in publications and the importance of gender (Bird 2011) and relationship between affiliation to international professional bodies and productivity (Diamond & Haurin 1994)

Contextual factors equally have a central role in research engagements. A couple of studies have examined and attest to the positive impact that the incentive and reward system in terms of promotion on faculty productivity (Olsen, Kyvik & Hovdhaugen 2005), and that the cosmopolitan nature of sciences compared to the humanities and social sciences makes scientists more globally engaged (Kyvik 1990). Likewise, cosmopolitan researchers with values of international scholarly community were often likely to participate or be invited to present papers in international conferences compared to non-cosmopolitans (Kyvik & Larsen 1994). The implication for the study is that foreign doctorates would be expected to have attained a cosmopolitan outlook and therefore have greater participation in international conferences. It is also suggested that researchers from small countries were more likely to seek collaborations abroad than those in large countries due to scarcity of local talent in some disciplines (Luukkonen, Tijssen et

al. 1993). Furthermore, academic staff who linked to industry funding, are more productive and increase in funding could result in increased publications (Kyvik & Aksnes 2015, Chudnovsky, López, Rossi & Ubfal 2008) and others indicate that it enhances research collaboration (Ubfal & Maffiolib 2011, Gulbrandsen & Smeby 2005). Moreover, collaboration has the potential to increase productivity among authors of different sex especially in the experimental fields (Mauleo'n, Hilla'n, Moreno, Go'mez & Bordons 2013). Given the circumstances in a specific country, contextual factors could determine levels of research competitiveness for individual faculty.

Beyond demographics and contextual factual factors, research specific forms of engagement are known to correlate and could compound impact on research engagement. For example, it has been shown that the number of peer-reviewed journal papers significantly correlates with the number of collaborators (Lee & Bozeman 2005). Popular arguments in the literature suggest that collaborations increase opportunities for publication. Reason being that multi-authored papers bring diverse competencies of the authors and therefore the opportunity for pre-submission 'internal refereeing' (Good 2005). Similarly, Pravdic and Oluic-Vukovic (1986) suggest that scientific output as measured by publications closely corresponds to the rate of collaboration among authors. Moreover, collaboration with more productive scientists increases personal productivity and collaboration with less productive researchers diminishes productivity. More productive tend to collaborate with the more prolific counterparts and most of the researchers tend to seek collaboration with the most prolific authors. However, some studies point out that collaboration has no direct association with either local or foreign publication productivity (Ynalvez & Shrum 2009). Instead, network size and proportion of contacts in the developed countries could determine engagement in collaborative research.

2.0 The Analytical Model

To determine levels of global competitiveness, the study compares rates of global engagement in research by foreign doctorates and domestic doctorates. A theoretical model was used to illustrate the interactions between study experience and research specific forms of global engagement. Faculty demographics, and contextual factors were considered as covariates. The global engagement model (Paige et al. 2010) was adapted and modified to illustrate conceptual framework (Figure 1). It was theorized that study abroad experience would positively impact on the specific forms of research engagement. The envisaged relationship however, would depend on faculty demographics and contextual factors linked to history. In addition, the outcomes on each dimension would also depend on faculty performance other research dimensions because they are correlated due to all being measures of research engagement. It was also possible that in some cases,

the context and demographics would matter less and study abroad could still impact on engagement rates.

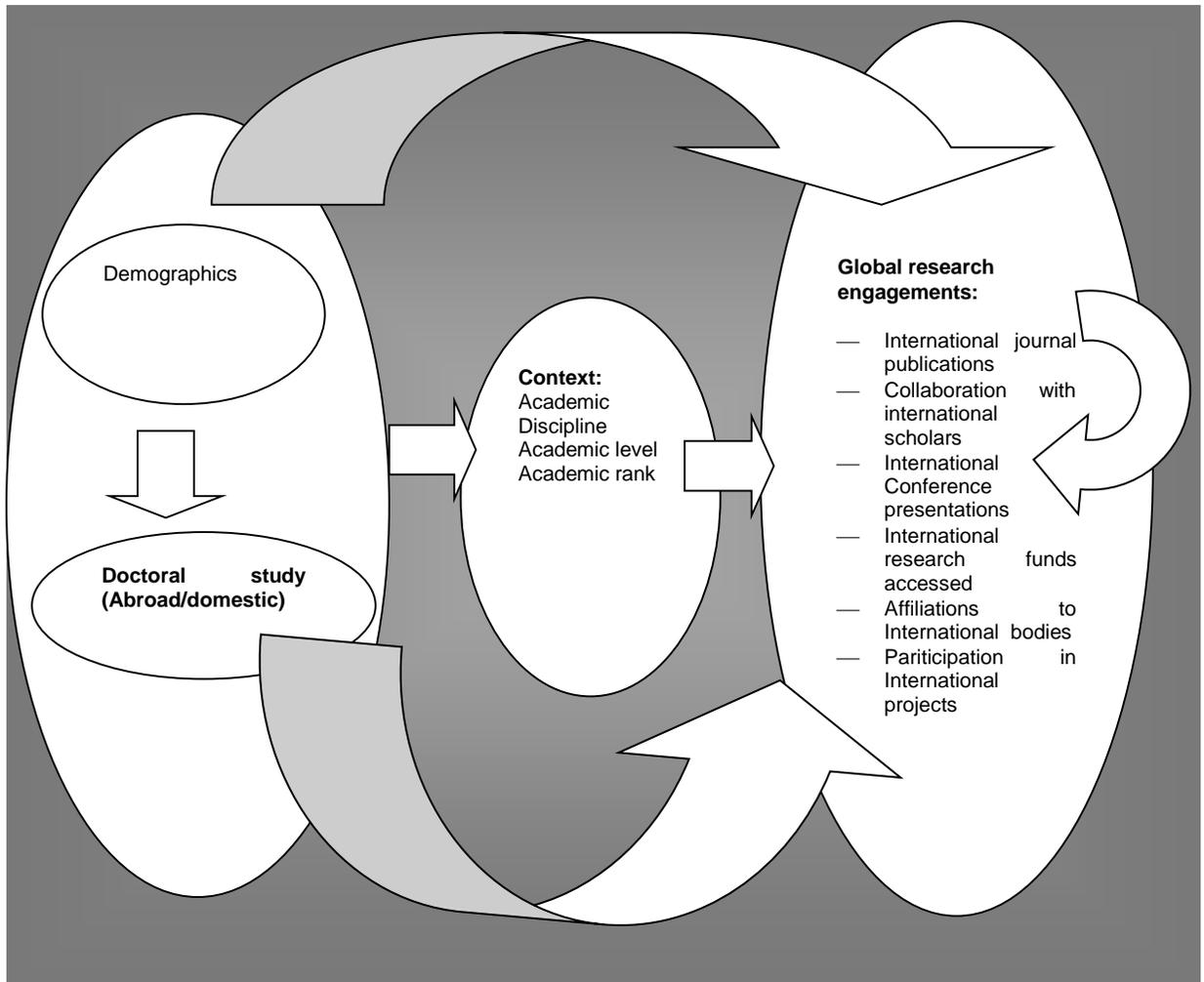


Figure 1. The global engagement in research model

3.0 Methodology

The theoretical assumptions that foreign doctorates than domestic doctorates would be more globally engaged in research across all the forms of research engagement were tested among Uganda higher education faculty as a case for Sub-Saharan Africa. A sample of 170 curriculum vitae was drawn from the archives of Uganda National Council for Higher Education following a filtering process that selected relevant documents from the archive. The CVs were for academics serving as faculty in higher education for the period 2009-2014. CV data contains individual characteristics of academics, study backgrounds, and qualifications. It also contains key career accomplishments that include publications, professional

affiliations, conference presentations, participation in projects, research funding and evidence of collaboration through co-publication.

Data was extracted following the LCVA method which involves coding of variables by annual scores for each outcome variable on the basis of numeric counts per year for each of the six years under study. Therefore, the number of international publications, collaborations, projects, affiliations, international funds accessed, and presentations at conferences were measured by counts per year. Data for covariates such as demographics factors; age, gender, and experience were coded. Contextual factors including; academic rank, academic discipline, and education were also obtained from the CVs and coded as potential covariates.

CVs were considered authentic and valid documents submitted by institutions of higher education. No additional effort was needed to verify the CVs. The validity of the study would be affected by various factors including; history, and maturation as manifested by appointments, qualifications, academic discipline and differences in years of research experience (Cohen, Manion & Morrison 2009). To obtain valid results about study abroad outcomes requires control of the influence of covariates. On the other hand, coding reliability was ensured by conducting the test-retest reliability method. A minimum correlation was set at 0.5 to test the reliability of coding for each variable as a minimum recommendations by Cohen, Manion & Morrison.

Following a descriptive analysis, the data was analyzed using descriptive statistics and subsequently, the generalized estimating equation (GEE) method for inferential purposes. The GEE method developed by Liang & Zeger (1986) was selected and applied to examine the global engagements of foreign doctorates in research and comparing with a reference group comprised of domestic doctoral graduates. The reason was that the method is useful for count data analysis and overcomes the random effects problem through its averaging procedure (Gibbons, Hedeker, & DuToit, 2010). Therefore results only depend on covariates of interest. Demographic characteristics factors and outcome measures of research engagement were entered into the analysis as covariates so as to determine outcomes on each specific dimension of research. In the current analysis, the dependent variables included the six dimensions of global engagement; international publications, collaborations, funding, affiliations, projects and conferences. The predictor variable of interest is the award type (foreign/domestic). The control covariates are involved; age, experience, gender, academic discipline, academic rank, and education level. Also, during estimation for each outcome, the remaining forms of engagement were included as covariates for control to isolate the engagement results for each of the forms.

A quasi-likelihood under the independence model criterion (qic) proposed by Pan (Cui 2007) and available in STATA 14 was used to identify a parsimonious

model for each outcome measure. The GEE is robust to misspecification of the correlation matrix. Following model selection process using 'qic' command for the baseline model, the 'xtgee' command with robust standard errors and time as the exposure variable was applied. To further explore the results, three additional models were examined by splitting data to assess study abroad outcomes across education levels, academic disciplines, and academic ranks. The secondary analyses were done while maintaining all variables. In the subsequent sections the results are presented followed by discussions and implications of the study.

4.0 Results

The results were structured so that all the six forms of engagement are reported at once. The baseline results consist of models for the six forms of research engagement. This is followed by results of the split analysis of data according to education, academic rank, academic discipline and gender. These follow up analyses results are also presented by category and includes all the dimensions of research engagement. The presentation format was adopted to allow instant comparison of results across forms of engagement to gain a clearer picture of overall engagement. Coefficients were converted into incident rate ratios for ease of interpretation. Results are presented after the sample characteristics and descriptive statistics.

4.1 Sample characteristics

The sample characteristics were examined through and across award categories; foreign and domestic (Table 2). There were more foreign doctorate holders compared to domestic doctorate holders in each category of the sampled CVs. The female were few in both categories. Out of 39 CVs, the domestic category was only 09 CVs and the foreign category had 30 CVs. Similarly, the postdoc category was equally low with only 31 CVs in total. The domestic category had only 06 CVs and the foreign category had 15 CVs. The low CV counts further affect the professor category when all academic rank categories are examined. Professor CVs were only 04 for the domestic faculty and 20 in the foreign doctorate category. Fortunately, GEE method is efficient and makes use of every available data even for few observations. Faculty numbers are as reflected in the CVs are shown below.

Table 2 Number of CVs by faculty characteristics and degree award (n=170)

Variable	Faculty Category	Domestic	Foreign	Total
Gender	Male	32	99	139
	Female	09	30	39
	Total	41	129	170
Education level	PhD	35	114	149
	Postdoc	06	15	31
	Total	41	129	170
Academic discipline	Soft	27	65	92
	Hard	14	64	78
	Total	41	129	170
Ranks (Merged)	Lecturer	26	87	113
	Professor	15	42	57
	Total	41	129	170
All ranks	Lecturer	18	49	67
	Senior lecturer	08	37	45
	Associate Professor	11	23	34
	Professor	04	20	24
	Total	41	129	170

4.2 Descriptive statistics

Descriptive statistics for foreign and domestic graduates were examined using mean outcomes and standard deviations on each dimension (Table 3). The summary statistics suggest that on average, foreign doctorates compared to domestic graduates had higher levels of global engagement across dimensions except in international projects. The overall total outcomes, however, reveals that foreign doctorates performed better than domestic across all forms of research engagement. The dispersion of data as indicated by their standard deviations were nearly the same for both groups and can, therefore, be assumed to have the same amount of deviation.

Table 3 Descriptive outcomes of foreign and domestic doctorates (N=795)

Variables	Foreign Doctorate		Domestic Doctorate		Total	
	Mean	SD	Mean	SD	Mean	SD
Affiliation	2.02	2.62	1.64	2.78	1.92	2.66
Collaborations	0.64	2.22	0.27	0.79	0.55	1.97
Funding	0.53	1.18	0.18	0.54	0.45	1.07
Projects	0.32	0.95	0.42	1.79	0.35	1.21
Publications	1.48	2.75	1.33	2.47	1.44	2.68
Conferences	0.81	2.07	0.65	1.69	0.77	1.99

Notes: SD = standard deviation

4.3 GEE baseline analysis results

The baseline results indicate that foreign doctorates were only more competitive in international funding. Results revealed that foreign trained doctorates were 3.82 times per year more likely to access international funding than the domestic-trained doctorates (Table 4). The implication being foreign doctorates could potentially improve the global competitiveness of higher education institutions. Most forms of engagement had substantively great outcomes but had no statistical significance. On the other hand, foreign doctorates compared to domestic doctorates had lesser international publications (IRR=0.977, SE=0.219, $p>0.05$) and international projects (IRR=.0.522, SE=0.390, $p>0.05$). Although the results were substantively large and positive for foreign graduates on four dimensions, the differences were not significantly different except for international funding dimension. The analysis for specific dimensions reflects a significant influence of demographic characteristics and correlations with other forms of research engagement. It emerged that demographics and contextual factors play a major role in determining outcomes. More especially, being an associate professor or professor increases rates of global engagement in most of the outcome variables. Age also affected outcomes while gender had little influence on the results except in international projects. Similarly, faculty who were involved in most or all of the global engagement dimensions were more likely to increase their overall rates of global engagement in across dimensions. Meanwhile a postdoc experience sometimes improved global engagement rates. Considering that significant differences occurred between postdoc experience and a Ph.D., additional analysis is needed to take into account differences due to postdoc experience. The comparison would provide a better picture how each group; foreign and domestic doctorates would perform given a postdoc experience when controlling covariates.

4.4 Analysis across education levels

The analysis was done to determine whether there is a difference in outcomes for faculty with a postdoc experience compared to those without a postdoc (Table 5). Data was split so that Ph.D. and Postdocs were separated. The results of the GEE analysis showed more positive outcomes for foreign graduates in international funding. The Ph.D. holders sourced 2.42 times more international funding per year than their domestic counterparts in the respective category. The indication is that foreign-trained faculty on average accessed more consultancy and grants compared to domestic faculty. A foreign doctorate, however, appeared to have significant drawbacks in access to international projects and international conferences among the postdoc category. No significant differences were observed between foreign and domestic graduates in their global publications, collaborations, and affiliations. Overall, the analysis reveals that postdoc graduates with foreign PhDs were more globally engaged compared to postdocs with domestic PhDs especially in the international publishing and affiliation to international bodies. Meanwhile, a postdoc is an outstanding experience for faculty

with a foreign doctorate with respect to international affiliations. However, when domestic doctorates also attain a postdoc they perform well and sometimes significantly exceeded, foreign doctorates who had also attained a postdoc experience. This was evident in international projects and conferences. Overall, increased engagement in some dimensions of research suggests that study abroad might be a reliable mechanism of improving overall global engagement rates in research for both foreign and domestic doctoral graduates.

4.5 Analysis across academic disciplines

To further examine outcomes of a foreign doctorate on global engagement rates in research, an additional secondary analysis across disciplines was conducted (Table 6). For want of an adequate sample, disciplines were merged. Two general disciplinary categories were created; hard and soft disciplines as done by (Shin, Jung & Azman 2014). The assumption was that foreign doctorates would become more globally engaged compared to domestic doctorates across the disciplinary categories; soft and hard. Results of GEE analysis across the hard and soft disciplines revealed foreign doctorates on average had no significant differences with domestic doctorates for most of the dimensions of global engagement except in access to international funding within the soft disciplines. Foreign doctorates had an advantage in the soft disciplines for international affiliations than a domestic doctorate. A foreign doctorate in the soft disciplines had 2.92 times more access to international funding than the domestic graduate. It implies that foreign doctorates had a greater share of consultancy and grants. Furthermore, foreign doctorates also had 1.96 times more international affiliations than domestic doctorates in the hard disciplines. Foreign doctorates, however, had no significant differences with domestic doctorates in international collaborations, publications, projects and conferences within both the hard and soft disciplines. Also, no significant differences were found between foreign and domestic doctorates within the hard disciplines in international funding and soft disciplines in international affiliations.

In summary, foreign compared to domestic doctorates have no difference on access to international funding in the hard disciplines and still no difference in international affiliations for the hard disciplines. It would be of interest to probe further to identify categories of foreign doctorates having greater access to international funds within the soft disciplines. Furthermore, the analysis could examine variations within faculty ranks. In the meantime, many covariates were associated with outcomes. For international publications across disciplines, therefore, it might be argued that age, rank, and collaboration are key predictors of international publications. Affiliation to international organizations matters for soft disciplines as affiliations is to the hard disciplines. Conferences and publications might be useful covariates to explain collaboration but age, and international projects were discipline specific predictors. Academic rank, projects, publications, and conferences were helpful in understanding affiliation rates across

disciplines. Conversely, affiliation in hard disciplines and funding in the soft disciplines might be more viable ways of assessing projects rates across disciplines. Academic rank, projects, and publications were associated with conferences rates, but there was no significant difference in international conference participations between foreign and domestic Ph.D. in both the hard or soft disciplines.

4.6 Analysis across gender categories

The aim of the analysis was to determine the gender categories of study abroad outcomes for the various dimensions of global engagement. The assumption was that foreign doctorates would be more globally engaged across both among male and female categories for each dimension of research. The results showed differences within the gender categories were mainly in funding and affiliations (Table 6). Even then, the differences were only significant among males and not among the female faculty. Compared to the domestic doctorates, the foreign-trained male faculty on average accessed 4.39 times more international funding. It suggests that study abroad appears to be more rewarding for the men than the women especially in access to international funds. Foreign doctorates had no gender differences in international publications, collaboration, affiliations, conferences, and projects. In conclusion, a foreign doctorate would be associated with differences in access to funding and affiliation. Most especially, the correlations were significant for the male than the female category. For the women, non-significant differences for foreign doctorates were noted in all dimensions except collaboration and conferences. The foreign doctorates in the male faculty were less engaged than the domestic category in international projects. Although study abroad impact could be associated with changes in levels of global engagement in research, it is far more pronounced among the males than females.

5.0 Discussion

The study aimed at examining whether study abroad experience enabled doctoral graduates make competitive progress on global engagement in research for higher education faculty. Higher education faculty with a doctorate abroad and a doctorate at home were compared across six research specific forms of engagement involving; international publications, projects, collaborations, conferences, affiliation, and funding. The results showed that study abroad had a positive correlations with access to international funding. Other forms of engagement had positive substantive values in favor of foreign doctorates despite being non-significant. The only exception in favour of domestic graduates was in international publications. Despite being non-significant, some of the outcomes were substantively large enough to be of interest. Further analysis showed that differences existed at the education level, academic discipline, and academic ranks, especially in the project dimension. Although the research interest was different, the correlation among the dimensions of research engagement was an

interesting aspect. Details of the results are discussed by dimension of research engagement.

5.1 Access to international funding

Theoretically, faculty with a doctorate abroad would be expected to have greater access to international research funding compared to domestic doctorates. The assumption sits well with current findings of studies suggesting that those who studied abroad are more likely to have contacts abroad than those who studied at home (Kyvik & Larsen 1994). Their findings also suggested that study abroad per se has little relevance, but rather it is the number of contacts made that will matter in international production. Related studies on overall academic productivity also maintain that study abroad has no correlation with productivity (Shin, Jung & Azman 2014), but such studies often refer to international publication. Although some scholars have argued that researchers who collaborate with industry tend to publish more (Chudnovsky, et al. 2008; Kyvik & Aksnes 2015), it does not seem to be the case in the current analysis. Perhaps this could be due to different contexts and the nature of collaboration and considering that it is the soft disciplines and not sciences who are significantly engaged in consultancy. On the other hand it might be argued that industrial players in some countries prefer researchers who have published more as evidence of competence. It is also common practice that outputs of consultancy are intended for specific audience and not for publication. Nevertheless the large and significant differences between foreign and domestic doctorates in access to international funding demonstrates that the foreign doctorates are eager to maintain their links with the global community. More important however is that there is still need to demonstrate further in a significant way the importance of the experience of a doctorate abroad across all the dimensions of international research engagement.

The analysis also found differences in international funding outcomes in international publication, affiliation, and project dimensions across educational qualifications. Changes in outcomes occasioned by a postdoc experience would be understandable, but it becomes more interesting when postdoc graduates with a domestic doctorate overtake postdocs with a foreign doctorate in the project and conference dimensions. This could mean that domestic doctorates have the opportunity to attain global competitiveness when given a postdoc opportunity. Obviously, the postdoc experience for tenured faculty is usually short and may not be sufficient for establishing research contacts for future engagements. Whatever reason, results of the analysis suggest a postdoc experience is valuable for improved international participation for domestic doctorates. Prior to the postdoc the performance on average remains below the foreign doctorates and which is more significant in access to international funding. Differences in access to international funding were tracked within academic disciplines and found to be in both the soft disciplines. The competitive nature of grant writing might explain the favor that studies abroad find. Grant agencies might prefer contracting those whom

they trust and find culturally competent to work with international partners. The approach echoed in Norwegian studies that study abroad graduates were more likely to find employment that could be described as international (Wiers-Jenssen 2011). Within the hard disciplines, the universal and codified nature of the hard disciplines creates opportunities for universal competitiveness of faculty (Kyvik & Larsen 1994). Additionally, the high specialization within the sciences and the need for a specific specialization gives possibilities for all faculty irrespective of the study backgrounds.

5.2 International collaboration

The foreign doctorates were on average more engaged in international collaborations than national graduates. This outcome was also evident in the hard disciplines, among doctorates and postdocs, and also among professors and lecturers. Such patterns of collaborations could arise due to many factors. Foreign doctorates including the postdocs both collaborated more internationally than their domestic counterparts. Collaboration at an international level requires contacts abroad. It would be natural that those who studied abroad are expected and have more contacts than domestic graduates (Kyvik & Larsen 1994). This pattern appears to be evident particularly in the hard discipline. Considering that its collaboration was more in the hard disciplines again appeals to the standardization in the hard disciplines which allows for greater collaboration with the international community. Furthermore, the need to share research equipment and access to research sites increases chances for collaboration (Melin and Persson 1996). Small countries such as Uganda with inadequate resources to fund all kinds of research and acquire the specialized equipment needed in all disciplines especially in the hard sciences that require such equipment. Therefore more collaboration would be expected in such disciplines than in the soft disciplines. Across education levels, faculty with postdoc training collaborated more than in the Ph.D. category. The outcomes not only reinforce the importance of a doctorate abroad but also the importance of a postdoc experience in increasing levels of global collaboration. Within the academic ranks, the objective result was that both the professors and lecturers who studied abroad collaborated globally more than those who did not study abroad. The high rate of outcomes for study abroad suggests the importance of the overseas study. Although, professors might appear as a select group of faculty who happen to benefit from a reward system for the more productive, a generational analysis could illuminate this issue further. A positive reward system for productivity indirectly motivates international collaboration.

5.3 International affiliations to professional bodies

Affiliations provide an academic with many engagement opportunities. The results showed substantive differences in favour of a doctorate abroad. Regarding education level, academic discipline, and academic rank, the differences across

categories were strong and with differences among the postdocs and lecturers being significant. The implication is that studying abroad increases opportunities of gaining membership in international professional societies. While studying abroad, students are exposed to international societies during the time for paper presentations or attend conferences relevant to expertise. Domestic students rarely have much exposure to such associations. Following course completion abroad, it is likely that study abroad graduates continue renewing membership to international societies. However, the domestic graduates would remain with limited international memberships (if any). The low membership rates are compounded by the possible lack of awareness about the importance of affiliations to professional advancement (see Pan and Zhang 2013). Moreover, the importance of international affiliation corroborates the current study findings that affiliation rates positively correlate with all the other dimensions of global research engagement. The implication is that both domestic and foreign graduates might have to acknowledge the importance of international affiliations as one useful way to gain international linkages for global engagement. Study abroad experience and graduate employing institutions could have a role in providing ground for affiliation. Affiliations for doctoral students improve opportunities for successful global engagement in later career. Besides it might be useful for faculty to make deliberate efforts in support of internationalisation through professional societies.

5.4 Participation in international projects

Results showed no significant differences between domestic graduates in both the hard and soft disciplines. Therefore, decisions about what disciplines to send for study abroad would be non-effective as a mechanism to improve participation in global projects. However, it may only add value in the soft disciplines than hard disciplines. Getting postdoc experience for a foreign doctorate would surprisingly mean lesser involvement in global projects. Within the academic disciplines, low project rates were more pronounced in the hard disciplines than soft disciplines. The same argument of standardization in the hard disciplines might shade light on the lack of significant difference in international projects (Kyvik & Larsen 1994). Also, specialization in the hard disciplines means that each academic could be considered for projects that are discipline specific and therefore everyone could have a chance. Moreover foreign doctorates are drawn to consultancy and hence spare little effort on international projects. Soft disciplines have a more diverse methodology and often tend to be more localized than in the hard disciplines. Therefore, postdoc training needs to identify specific disciplines where it makes a difference in international projects. A more detailed disciplinary analysis is required to determine specific disciplines that advance global engagement in projects. Following a return to the country of origin, there is a need to create enabling environment for graduates to sustain focus on the development of academic career rather than focusing on private consultancy alone. This could be achieved through creation and funding of research centers or institutes for research and linking them to international projects so as to maintain the research agenda.

5.5 Presentations at international conferences

Foreign doctorates compared to domestic doctorates had no significant outcomes linked to study abroad, but the objective differences were large. The fact that foreign doctorates on average presented more at international conferences than domestic graduates is an important outcome. The explanation for the trend could be found in faculty affiliations. Foreign trained lecturers had a significantly higher rate of international affiliation than the domestic graduates. Moreover, the correlation between affiliation and conference participation was positive and highly significant. This positive correlation was found objectively high among Ph.D. holders (non-postdoc) especially in the soft disciplines, but significantly negative among postdocs. In models where affiliations significantly correlated with conferences, there would be a strong performance in conferences participation for that category. Affiliation to professional associations provides information on upcoming conferences and at times provide moderate fees for members. Therefore, affiliation could partly explain increased conference participations by foreign graduates. However when domestic doctorates attain postdoc level they overtake foreign doctorates as they also become more affiliated. Conferences being forums for knowledge sharing (Kyvik & Larsen 1994) attract those doing research other than consultancies. In keeping with the argument by Kyvik and Larsen, it is reasonable to suggest that those more committed to consultancy than basic research may be less 'attractive' to merit invitations by conference organizers despite even being affiliated members of many international societies. Aware that foreign doctorates have greater access to international funding, it is possibly for that reason that postdocs with domestic Ph.D. overtake foreign doctorates in conferences. Age and research dimensions including; funding, affiliation, projects, and collaborations have a greater impact on outcomes than the study abroad experience. Although study abroad has no significant relation with conference participation, the difference between study abroad and domestic doctorates at baseline is large. Besides, changes in conference participation correlate with changes in other dimensions of research and therefore the importance of balancing participation in the research dimensions.

5.6 International publications

Foreign doctoral graduates from abroad made no significant difference with domestic doctorates in international publications. However, following a postdoc experience, they turn out to publish more than domestic doctorates. There could be more than one explanation for this outcome. Foreign trained graduates have greater access to international funding and increased access might reduce time for basic research and publication. The argument gains credence in findings that the research talent in East Africa and especially in Uganda is on hire and spend more time in consultancies (Wight, Ahikire, & Kwesiga 2014). Publishing in the context of consultancy could face restrictions on publication by the funders and therefore could potentially impact on publication rates for faculty engaged in

consultancies. Involvement in consultancy might account for lower publication rates among foreign doctorates. Even within the academic disciplines, foreign doctorates published internationally more than domestic doctorates in the soft disciplines but were weaker in the hard disciplines. Kyvik & Larsen, argue that publications in the hard disciplines by their very nature are international. Therefore, scientists could have little choice about where to publish. The outcome that foreign doctorates in the hard disciplines are more involved with consultancies could partly explain the lead by domestic graduates in publications. Soft disciplines on the hand often have a national character and in that respect may appeal more to the national than international audiences. Therefore they are more likely to be published in forms accessible to an appropriate audience. Such forms might include local institutional or professional journals and in some cases, an indigenous national or regional language. It might, therefore, be argued domestic doctorates in soft disciplines could be publishing more for the local audience. Besides, research in the soft disciplines is not as standardized as in the hard disciplines, and little exposure to the international publication dynamics could complicate possibilities for publication in a highly competitive environment. The results, however, suggest the importance of postdoc training and could, therefore, be one way to develop and strengthen global engagement in the soft disciplines.

6.0 Implications

The concurrent analysis of the six forms of research engagement reveals much when outputs are compared than assessing each form in isolation. It also casts doubt on the conception that doctoral graduates from abroad are less productive. This is because the results allow the possibility of comparing impact across dimensions of research engagement. Arguably, study abroad has close links to global engagement in research. The impact is however mainly visible in access to international funding. It is clear that in circumstances where only a few forms of research engagements are evaluated as outcomes of study abroad, could lead to a potential loss of information on the overall picture. Foreign doctorates appear to play a significant role in consultancies and to the extent of posting low levels of engagement in research publication. Given the nature of outcomes, institutions expecting to increase global rankings might benefit less from foreign doctoral graduates. For Uganda and perhaps Sub-Sahara Africa countries, a doctorate abroad is still a rewarding experience following graduate return. It might be argued that proper management of research field in institutions of higher learning might contribute to more publications that and training contribute to high ranking for an institution. For instance compelling academics to have a specific minimum of engagements per year would reduce time spent on consultancy and thereby more time for other research activity. On the policy side, the approach goes along with improving funding for research and welfare for academics to encourage academics to spread their efforts on the diverse aspects of research other than consultancy. Research centers could be well facilitated to achieve economy of effort and maintain the agenda. Such efforts could become more efficacious when support

by more doctoral training abroad. Even faculty who had their Ph.D. in national institutions could benefit more when given opportunity for longer postdoc experience abroad.

Much of the influence on global engagement could be attributed to the research context. Academics active in all dimensions of research would probably improve overall levels of global engagement and make even institutions more competitive. Concentrating on a few dimensions appears to undermine other dimensions because they are correlated. Meanwhile, the role of demographics needs to be acknowledged. Aging has a negative influence on publication and conferences but not on other dimensions. The association between study abroad and global engagement is better reflected when seen across different dimensions and across contextual factors. A focus of one aspect of production may give little about the impact of a study abroad experience.

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Table 4 GEE table for global engagements across research dimensions (N=795)

Notes	Variables	Publications	Collaborations	Affiliations	Funding	Projects	Conferences	
Exponentiated coefficients. Standard errors in parentheses. Starred = * p<0.05; ** p<0.01; *** p<0.001. a = Category for a dummy variable award with domestic as the reference category. b = Category for a dummy variable gender with female as the reference category. c = Category for a dummy variable education with Ph.D. as the reference category. d = Category for a dummy variable Academic rank with lecturer as the reference category. e = Category for a dummy variable discipline with hard discipline as the reference category.	foreign ^a	0.977 (0.219)	1.564 (0.560)	1.497 (0.382)	3.816** (1.646)	0.497 (0.370)	1.176 (0.301)	
	age	1.485*** (0.160)	0.963* (0.018)		0.949** (0.018)		0.996 (0.013)	
	age*age ^b	0.996*** (0.0011)						
	gender (male) ^c					3.170* (1.491)		
	Postdoc ^d				2.257** (0.713)		1.931** (0.475)	
	professor ^d	1.178 (0.267)		1.078 (0.317)	0.498 (0.262)		0.278** (0.423)	
	lecturer	0.415*** (0.105)		0.387** (0.123)	0.427* (0.161)		0.633 (0.193)	
	senior Lecturer	0.585* (0.136)		0.677 (0.191)	0.309** (0.138)		0.737 (0.227)	
	affiliations	1.065* (0.029)			1.084 (0.052)	1.185** (0.068)	1.158*** (0.037)	
	collaborations	1.266*** (0.034)		0.924* (0.029)		1.172** (0.062)	1.122** (0.040)	
	funding	1.105 (0.084)		1.128* (0.0662)		1.509*** (0.144)	1.196** (0.078)	
	projects		1.208*** (0.068)	1.083* (0.0410)	1.202* (0.097)		1.193** (0.074)	
	publications		1.376*** (0.034)	1.080** (0.028)	1.059 (0.040)		1.067 (0.036)	
	conferences		1.117** (0.038)	1.126*** (0.033)	1.069* (0.031)			
	_cons	0.000** (0.001)	0.383 (0.328)	1.287 (0.758)	0.225 (0.335)	0.053* (0.070)	0.200 (0.184)	
	Wald X ²		146.4***	382***	27.21***	87.43***	98.74***	323.83***
	Observations (N)		798	798	798	799	800	798

Table 5 GEE table for global engagements across education levels (N=795)

Variables	Publications		Collaborations		Funding		Affiliation		Projects		Conferences	
	PhD	Postdoc	PhD	Postdoc	PhD	Postdoc	PhD	Postdoc	PhD	Postdoc	PhD	Postdoc
Foreign ^a	0.999 (0.268)	1.428 (0.330)	1.197 (0.476)	0.566 (0.470)	4.355** (2.420)	1.322 (1.116)	1.435 (0.409)	3.178 (2.023)	0.735 (0.579)	0.0283** (0.0329)	1.264 (0.413)	0.243* (0.170)
Age	1.548*** (0.197)	1.474** (0.220)	0.908 (0.156)	1.145 (0.267)	1.495 (0.347)	1.042 (0.334)	0.834 (0.124)	1.204 (0.237)	1.329 (0.520)	0.286** (0.135)	1.256 (0.178)	1.239 (0.419)
Age*Age	0.995*** (0.001)	0.996** (0.002)	1.001 (0.002)	0.998 (0.002)	0.995* (0.002)	0.999 (0.003)	1.001 (0.002)	0.998 (0.002)	0.996 (0.004)	1.013** (0.005)	0.998 (0.001)	0.997 (0.003)
Male ^b	0.872 (0.186)	0.845 (0.301)	0.941 (0.309)	1.228 (0.532)	0.819 (0.396)	1.188 (0.858)	0.650 (0.186)	2.047 (1.239)	1.842 (0.987)	0.976 (1.356)	0.790 (0.229)	1.212 (1.055)
Soft ^c	1.422 (0.312)	0.490* (0.143)	0.399** (0.120)	1.004 (0.747)	0.675 (0.233)	0.916 (0.449)	0.915 (0.242)	0.640 (0.324)	0.333 (0.214)	0.643 (0.719)	1.596 (0.431)	1.314 (0.692)
Professor ^d	1.785* (0.454)	4.923*** (1.697)	1.165 (0.364)	0.159* (0.131)	2.953** (1.146)	0.772 (0.575)	3.260*** (0.968)	2.826* (1.458)	5.077** (2.898)	0.0373* (0.054)	1.323 (0.433)	0.138* (0.122)
Affiliation	1.068* (0.031)	0.974 (0.052)	0.955 (0.061)	1.424*** (0.120)	1.059 (0.065)	1.111 (0.168)			1.105 (0.071)	1.886*** (0.262)	1.137*** (0.040)	1.770*** (0.254)
Collaboration	1.301*** (0.048)	1.578*** (0.211)			1.013 (0.057)	1.197 (0.219)	0.941 (0.036)	1.025 (0.090)	1.118 (0.089)	0.937 (0.133)	1.183*** (0.056)	0.773 (0.165)
Funding	1.108 (0.070)	0.881 (0.076)	1.155 (0.090)	1.314* (0.175)			1.079 (0.094)	0.961 (0.094)	1.300 (0.186)	1.161 (0.206)	1.241** (0.092)	1.087 (0.098)
Projects	1.048 (0.036)	1.091 (0.125)	1.134* (0.073)	1.242 (0.229)	1.071 (0.093)	1.267 (0.170)	1.054 (0.047)	1.385* (0.194)			1.154* (0.082)	0.952 (0.131)
Conferences	1.026 (0.031)	1.140* (0.070)	1.105** (0.041)	0.888 (0.081)	1.115*** (0.034)	1.086 (0.067)	1.115** (0.038)	1.142** (0.052)	1.130** (0.053)	0.861 (0.115)		
Publications			1.362*** (0.033)	1.432*** (0.147)	1.066 (0.051)	0.968 (0.089)	1.084** (0.027)	0.954 (0.060)	1.001 (0.069)	1.128 (0.157)	1.023 (0.045)	1.201 (0.152)
Observations	705	93	705	93	705	93	705	93	705	93	705	93

Notes: Exponentiated coefficients; Standard errors in parentheses; Starred = * p<0.05; ** p<0.01 *** p<0.001; Education: Grouping variable composed of Ph.D. and Postdoc categories; a = Category for a dummy variable award with domestic as the reference category; b = Category for a dummy variable gender with female as the reference category; c = . Category for a dummy variable discipline with hard discipline as the reference category; d = Category for a dummy variable Academic rank with lecturer as the reference category.

Table 6 GEE table for global engagements across disciplines (N=795)

Variables	Publications		Collaborations		Funding		Affiliations		Projects		Conferences		
Discipline	hard	soft	hard	soft	hard	soft	hard	soft	hard	soft	hard	soft	
Foreign ^a	0.832 (0.257)	1.297 (0.342)	1.421 (0.549)	0.764 (0.451)	2.859 (2.159)	2.916* (1.475)	1.959* (0.659)	1.774 (0.636)	0.312 (0.255)	1.467 (0.725)	0.937 (0.359)	1.187 (0.400)	
Age	1.691*** (0.212)	1.432* (0.218)	0.929 (0.110)	1.125 (0.212)	1.481 (0.422)	1.063 (0.286)	1.248 (0.203)	0.780 (0.128)	0.871 (0.375)	1.648 (0.478)	1.169 (0.216)	1.396 (0.258)	
Age*Age ^b	0.994*** (0.001)	0.996** (0.002)	1.000 (0.001)	0.999 (0.002)	0.996 (0.003)	0.998 (0.003)	0.998 (0.002)	1.002 (0.002)	1.000 (0.004)	0.995 (0.003)	0.998 (0.002)	0.997 (0.002)	
Professor ^c	1.822 (0.620)	2.061* (0.599)	1.076 (0.349)	0.613 (0.376)	2.097 (1.150)	1.844 (1.115)	1.444 (0.428)	5.477*** (1.985)	4.386 (4.387)	2.679 (1.880)	0.817 (0.343)	1.639 (0.567)	
Male ^d	0.775 (0.241)	0.896 (0.222)	1.915* (0.608)	0.534 (0.268)	1.794 (1.062)	0.507 (0.240)	0.517 (0.205)	0.974 (0.313)	3.094 (2.935)	1.836 (0.859)	0.845 (0.355)	0.850 (0.312)	
Postdoc ^e	1.938** (0.433)	0.618 (0.191)	0.883 (0.230)	0.769 (0.651)	1.710 (0.738)	2.955* (1.631)	1.731* (0.478)	1.197 (0.733)	1.099 (0.740)	2.032 (1.078)	2.226* (0.701)	1.954 (1.054)	
Affiliations	0.981 (0.043)	1.096* (0.040)	0.962 (0.076)	1.066 (0.112)	1.158* (0.073)	1.051 (0.091)			1.386*** (0.121)	0.953 (0.068)	1.157* (0.068)	1.124** (0.046)	
Collaborations	1.317*** (0.044)	1.571*** (0.167)			1.004 (0.077)	1.183 (0.211)	1.022 (0.051)	1.066 (0.133)	1.138 (0.127)	1.254 (0.282)	1.223** (0.083)	1.162 (0.147)	
Funding	1.138* (0.064)	1.061 (0.150)	1.139* (0.063)	1.301 (0.303)			1.140* (0.072)	0.986 (0.120)	1.206 (0.179)	1.716*** (0.155)	1.246** (0.102)	1.149 (0.125)	
Projects	1.057 (0.037)	1.054 (0.241)	1.119 (0.075)	1.378 (0.614)	1.032 (0.102)	2.084*** (0.321)	1.147*** (0.046)	0.866 (0.168)				1.078 (0.074)	1.775*** (0.211)
Conferences	0.985 (0.031)	1.091 (0.057)	1.100* (0.042)	1.128 (0.097)	1.113** (0.043)	1.015 (0.036)	1.079* (0.033)	1.134*** (0.039)	0.972 (0.058)	1.231*** (0.074)			
Publications			1.369*** (0.044)	1.377*** (0.050)	1.022 (0.047)	1.002 (0.056)	0.993 (0.038)	1.082** (0.027)	0.969 (0.095)	0.976 (0.078)	0.967 (0.067)	1.087* (0.043)	
Observations	352	446	352	446	352	446	352	446	352	446	352	446	

Notes: Exponentiated coefficients; Standard errors in parentheses; Starred = * p<0.05; ** p<0.01; *** p<0.001; Discipline: Grouping variable for academic disciplines and is composed of hard and soft disciplines; a = Category for a binary variable award with domestic as the reference category; b = quadratic for age representing age squared; c = Category for a binary variable academic rank with lecturer as the reference category; d = Category for a binary variable gender with female as reference category; e = category for a binary variable with female as the reference

Table 7 GEE table for global engagements across gender categories (N=795)

Variable	Publications		Collaborations		Funding		Affiliations		Projects		Conferences	
	female	male	female	male	female	male	female	male	female	male	female	male
Foreign ^a	1.438 (0.364)	1.005 (0.289)	0.891 (0.522)	1.300 (0.534)	1.448 (1.181)	4.394** (2.282)	1.065 (0.420)	1.698 (0.587)	1.492 (1.437)	0.600 (0.413)	0.878 (0.481)	1.208 (0.392)
Age	1.971** (0.456)	1.526** (0.197)	1.147 (0.301)	0.805 (0.124)	1.397 (0.599)	1.527* (0.297)	1.997*** (0.382)	0.816 (0.113)	26.98** (27.39)	1.160 (0.423)	1.888 (0.707)	1.145 (0.160)
Age*Age ^b	0.993** (0.002)	0.995*** (0.001)	0.998 (0.003)	1.002 (0.002)	0.995 (0.005)	0.995* (0.002)	0.993*** (0.002)	1.002 (0.002)	0.971*** (0.008)	0.998 (0.003)	0.994 (0.004)	0.998 (0.001)
Professor ^c	2.101 (0.914)	2.083** (0.545)	0.327 (0.208)	1.131 (0.344)	7.354** (4.740)	1.706 (0.657)	11.75*** (5.103)	2.746** (0.887)	0.484 (0.631)	3.187 (1.980)	1.269 (0.654)	1.314 (0.427)
Soft discipline ^d	0.904 (0.343)	1.223 (0.274)	1.373 (0.658)	0.340** (0.132)	1.003 (0.827)	0.546 (0.171)	0.238*** (0.0983)	1.137 (0.296)	0.201 (0.177)	0.302 (0.191)	0.824 (0.451)	1.623 (0.451)
Postdoc ^e	0.741 (0.252)	1.405 (0.320)	1.668 (0.836)	0.874 (0.260)	1.574 (1.351)	1.916* (0.635)	0.484 (0.246)	1.746 (0.510)	32.93** (44.43)	0.984 (0.606)	1.639 (1.041)	2.450** (0.696)
Affiliation	1.006 (0.059)	1.080* (0.035)	1.149 (0.087)	0.944 (0.065)	0.794 (0.119)	1.158** (0.064)			1.243 (0.224)	1.177* (0.078)	1.140 (0.091)	1.125*** (0.039)
Collaboration	1.828*** (0.212)	1.281*** (0.047)			1.606 (0.564)	1.023 (0.063)	1.520* (0.266)	0.918* (0.034)	0.511 (0.349)	1.125 (0.085)	1.579 (0.390)	1.155*** (0.050)
Funding	1.179* (0.079)	1.002 (0.051)	1.132 (0.131)	1.238** (0.094)			0.718 (0.122)	1.161* (0.085)	3.279** (1.275)	1.252 (0.162)	1.090 (0.129)	1.263*** (0.087)
Projects	1.133 (0.306)	1.024 (0.034)	0.391 (0.191)	1.157** (0.065)	2.249** (0.649)	1.095 (0.093)	1.149 (0.216)	1.097 (0.053)			1.341 (0.313)	1.142* (0.077)
Conferences	1.019 (0.047)	1.040 (0.032)	1.114 (0.092)	1.075* (0.034)	1.081 (0.104)	1.120*** (0.036)	1.069 (0.047)	1.101** (0.040)	1.028 (0.115)	1.094 (0.051)		
Publications			1.365*** (0.096)	1.378*** (0.035)	1.041 (0.048)	0.989 (0.034)	0.967 (0.039)	1.108*** (0.028)	1.037 (0.103)	0.960 (0.063)	0.990 (0.059)	1.045 (0.043)
Observations	186	612	186	612	186	612	186	612	186	612	186	612

Notes: Exponentiated coefficients; Standard errors in parentheses; Starred = * p<0.05; ** p<0.01; *** p<0.001; Gender: Grouping variable consisting of female and male categories; a = Category for a dummy variable award with domestic as the reference category; b = quadratic (age squared) for the age variable; c = Category for a dummy variable Academic rank with lecturer as the reference category; d = Category for a dummy variable academic discipline with hard discipline as the reference category; e = Category for a dummy variable education with Ph.D. as the reference category.

