

# The Emergence of the Open Research University Through International Research Collaboration

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Résumé de l'article

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# The Emergence of the Open Research University Through International Research Collaboration

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## Abstract

In higher education, international research collaboration functions as a visible mechanism of cooperation and competition, serving as a proxy for quality and academic excellence. Open universities use revolutionary education models but are not often associated with quality or academic excellence. To investigate the impact of international research collaboration by active researchers affiliated with open institutions, a bibliometrics analysis was conducted of three open universities and nine traditional, comparative universities between 2000 and 2022. The results indicate that research outputs that are open access, sponsored and funded, and developed with international coauthors have positive and statistically significant effects on citation counts. Moreover, international research collaboration significantly affects all universities, not just open institutions. The results conclude that researchers affiliated with open universities are only 4.3% less cited than their comparative peers, which is attributed to publication factors, research disciplines and subject areas, and journal characteristics. Findings are discussed and imply a strategic shift in the institutional functions and outputs of open universities as collaborative conduits of knowledge production and dissemination.

*Keywords:* internationalization, higher education, international research collaboration, open universities

## Introduction

Twenty-first-century higher education institutions aim to support the empowerment and development of people and nations through knowledge transfer, knowledge creation, and the application of knowledge (Altbach & Salmi, 2011; Jong et al., 2021). Traditionally, universities regard these functions and achievements as indicators of quality or the degree of excellence (Elken & Stensaker, 2018). Open and distance education universities, hereafter referred to as open universities, are often overlooked (Peters, 2008; Xiao, 2022) in their pursuit of academic excellence (Moore, 1995; Paul, 2023), despite their innovative model and relevance in twenty-first-century higher education (Daniel, 1996; Paul & Tait, 2019). Open universities use distributed education models, including single and dual modes, and incorporate flexible curriculum structures and admission processes. Additionally, open universities engage in transnational distance education and other internationalization strategies (Bruhn-Zass, 2022; Hou, 2022; Mittelmeier et al., 2021). Globalization and the rise of the knowledge economy have catalysed new opportunities and risks for higher education institutions (Knight & Liu, 2019), including open universities, which evolved quality assurance efforts to quantify internationalization. Further, Wysocka and colleagues (2022) argue that internationalization in higher education “is also an attribute of quality and an indicator” (p. 208). Building from this premise, this study examines the degree to which open universities participate in internationalization strategies through knowledge transfer, creation, and application using international research collaboration as an indicator.

It is challenging to use a universal approach to measuring quality across diverse sociocultural contexts. Esfijani (2018) and Maringe (2010) broadly identify internationalization and quality outputs as stakeholder satisfaction, learner graduation and completion rates, research publications and grants, and academic achievement. These output metrics drive a reductionist narrative in which the materialization and perception of evaluating the quality of internationalization in higher education are reduced to two paradigms: competition and cooperation (van der Wende, 2001). First, institutions and stakeholders have placed increased importance on higher education rankings to display status, competitive advantage, and international prestige in hopes of increased funding and international mobility (de Wit, 2019). As a result, academic rankings have dramatically shaped policy and practice, transforming universities into national and international strategic investments while obscuring higher education activities into comparative forms for measurement (Hazelkorn, 2015). Second, higher education embraces cooperation as a mechanism to engage in academic exchange as a bilateral communication channel to maintain relations (Altbach & de Wit, 2015). Cooperation is the pathway to participating in knowledge networks, which also enables a path to competition (Guerrero Bote et al., 2012; van der Wende, 2007).

However, there is a third paradigm: collaboration, a dynamic process that engages partners in shared creation with a common goal. In contrast, cooperation allows partners to work together to address independent goals. International collaboration in higher education has various forms (Lopez, 2015); for the purposes of this study, only international research collaboration is explored.

Accelerated by globalization, the creation and production of knowledge flow across international borders and social networks at an unprecedented pace in the form of international research collaboration (Ribeiro et al., 2018). This exchange leverages the strengths of collaborative partnerships to generate knowledge as a soft power (Knight, 2022). International research collaboration is the visible mechanism of cooperation

and competition; it is both an input and output indicator that serves as a proxy for quality and academic excellence (Knobel et al., 2013). For example, international research collaboration can be input criteria for global university rankings. As output criteria, such collaboration results from successful partnerships that can lead to increased visibility, funding, research effectiveness, scientific productivity, and opportunities (Abramo et al., 2009). The outputs of international research collaboration have the potential to demonstrate knowledge transfer, creation, and application.

Research universities generate most of the attention given to international research collaboration due to supportive governance and regulations, financial resourcing, and attracting highly qualified talent (Altbach & Salmi, 2011); these factors overshadow knowledge generated and disseminated by open universities (Tait, 2018) and universities located in the Global South (Gueye et al., 2022). Based on my extensive literature review, scholars have not yet investigated the degree of international research collaboration in open universities as an indicator of academic excellence and quality dimensions of internationalization. Therefore, this study aims to address the gap in research and examine the significance of international research collaboration to shed light on the question: How does international research collaboration affect knowledge production and dissemination in open universities compared with non-open universities?

## Literature Review

### Measuring Internationalization of Higher Education

Scholars have not agreed on a singular definition of the internationalization of higher education due to the term's complex concepts (Qiang, 2003) and because it is a phenomenon that has rapidly evolved over the past three decades (Lee & Stensaker, 2021). Additionally, internationalization is highly contextual and dependent on the cultural, political, societal, and economic priorities of countries and education systems that engage in knowledge exchange (Knight, 2008). However, internationalization is understood as the academic mobility of people, programs, providers, policies, and projects that flow physically and virtually across geographic boundaries in response to globalization (Knight & de Wit, 2018). Internationalization practices and strategies in higher education are diffuse (Yesufu, 2018), and the methods and measurement of global partnerships and their effectiveness are scarce (Gao, 2019). The practices and strategies of internationalization function across a broad spectrum of mobility models, including study-abroad programs, branch campuses, targeted recruitment of international students for financial incentives, and distance learning programmes (Youssef, 2014). One of these mobility models is international knowledge networks (Jaffe et al., 1993), which support the flow and globalization of knowledge through international research collaboration (DeLaquil et al., 2022). Unlike other internationalization strategies and practices, international research collaboration can be quantified to measure the effectiveness of international knowledge networks for self-evaluation, comparisons, and classification purposes (Gao, 2019).

### International Research Collaboration

The internationalization of research in higher education is known as international research collaboration, which is an influential indicator of the production and dissemination of knowledge from researchers affiliated with a nation who partner with researchers affiliated with another nation (Frame & Carpenter,

1979). The factors that affect international research collaboration include graduate education faculty and students and their mobility, contextual characteristics of sciences and disciplines, access to funding opportunities, communication and dissemination strategies, and regional or intranational initiatives (Woldegiyorgis et al., 2018).

According to Barnett (1990), research outputs indicate higher education's relevancy and intellectual contributions. Therefore, for some, the internationalization of research serves competitive agendas focused on increased productivity of individual researchers, institutions, nations, and their rankings (Buckner, 2022). Nevertheless, others consider the cross-pollination of ideas across geographical borders as a cooperative and collaborative process (Turner & Robson, 2007). Moreover, the mutually shared benefits of international research collaboration continue to drive researchers and policymakers to support the globalization of knowledge and knowledge diplomacy (Knight, 2022). Due to these diverse motivations and rationales, scholars aim to identify indicators to measure the internationalization of research. However, there is a dearth of knowledge on the role of knowledge production generated by open universities and their participation in the internationalization of research.

## **Open Universities**

Following the establishment of the Open University in the United Kingdom (UK) in 1969, over 60 open education universities have expanded access to higher education worldwide (Tait, 2018). Moreover, within the first 30 years of the open education model, some universities, such as Indira Gandhi National Open University, the Open University of China, Universitas Terbuka Indonesia, and Anadolu University, quickly accelerated enrolment to support learning for millions of students (Bozkurt, 2019; Daniel, 1996). The revolutionary model of open universities ushered in innovative practices and functions, including opening admissions procedures, shifting instructional paradigms, prioritizing adult learners, embracing collaborative development models, using modular curriculum structures, and adopting emerging communication technologies (Guri-Rosenblit, 2019; Perry, 1970). Built on the foundations of access and social justice (Tait, 2013), open universities have evolved to meet the needs of contemporary knowledge societies and international knowledge networks (Teixeira et al., 2020).

Open universities have significantly contributed to educational systems through policy, practice, and research (Veletsianos & Houlden, 2019); unfortunately, these efforts have come with challenges. Often shaping the narrative of open and distance education are negative perceptions regarding quality and academic excellence at national and international levels (Gaskell & Mills, 2014). However, interpreting quality practices and indicators for open and distance education universities is well documented and implemented (Ossiannilsson et al., 2015; Tait, 1993). Therefore, more research is necessary to holistically capture institutional-level quality dimensions and performance metrics on quality inputs, processes, outputs, outcomes, and impact (Esfijani, 2018; Jung, 2022). With a focus on quality outputs and the internationalization of higher education, this study focuses on knowledge production and dissemination from three open universities.

## Methodology

### Bibliometrics Analysis

Bibliometrics analysis is a quantitative approach that enables researchers to statistically analyse research indicators as performance metrics to assess publication patterns and impact (Price, 1965). Bibliometric indicators measure research results in scientific publications or other research outputs and meaningfully normalize research outputs across indicators (Tunger et al., 2020). Bibliometrics analysis was deemed the most appropriate method due to its ability to examine large datasets across sciences, disciplines, and topics (Donthu et al., 2021). This study uses the Scopus database, which some (Aksnes & Sivertsen, 2019; Mongeon & Paul-Hus, 2016) contend covers more journals and international resources than the Web of Science or Google Scholar. These databases are essential tools for collecting, processing, and extracting data for bibliometric analysis (Bauer, 2020).

### Sample

Informed by the first phase of an exploratory mixed-methods study (Heiser, 2022), this paper reports on the second phase of a more extensive investigation to test the outputs of three open universities that met inclusion criteria. Open universities were required to have doctoral programs of study, an active research centre, a publishing extension, and accessible grant and funding reports, as well as to use quality assurance standards and frameworks. Furthermore, the universities had to meet the Scopus database search criteria, including affiliation, open access, and peer-reviewed journal articles published between 2000 and 2022. Additionally, geographical and cultural considerations were made to study a more internationally diverse representation of open universities to amplify unique contexts and support generalizability. Once these criteria were applied, total publication counts were calculated to determine the top three universities for analysis: Anadolu University in Turkey, the Open University of the UK, and the University of South Africa.

Finally, nine universities were identified for a controlled comparison to understand the effects of international research collaboration. These nine universities are the three most frequently collaborated national universities with the open universities, according to the Scopus database in February 2023 (Table 1). Therefore, this study examines the international research collaboration outputs from 12 universities to examine the significance of open universities' international research collaboration.

**Table 1**

*Most Frequent National Collaboration Affiliations with an Open University*

Open university	Top three most frequent national collaboration affiliations	Total national collaboration research outputs
University of South Africa	University of Johannesburg	873
	University of Pretoria	862
	University of Witwatersrand, Johannesburg	827
Anadolu University	Eskişehir Osmangazi Üniversitesi	705
	Gazi Üniversitesi	286
	Hacettepe Üniversitesi	364
The Open University	University College London	784
	University of Cambridge	736
	University of Oxford	832

### **Descriptive Analysis**

A descriptive analysis using R (R Core Team, 2021) was performed to delineate themes and patterns within the data, which included only peer-reviewed journal outputs published between 2000 and 2022 by researchers affiliated with the 12 universities. These data (observations = 609,365) included all subject areas, sciences, open access types, and languages. The preliminary analysis presented emerging variables regarding the total number of publications and active researchers, as well as the annual average of citations, open access, sponsored funding, and international collaboration.

Since 2000, publications have steadily increased across all institutions, as presented in Figure 1. Except for the Open University, institutions in the UK publish more frequently than all other institutions examined in this study. Further, scholars affiliated with open institutions publish less often than those affiliated with comparative institutions. Therefore, additional analysis was conducted to understand the population size of active researchers.

**Figure 1**

*Total Number of Publications by Institution, 2000–2022*

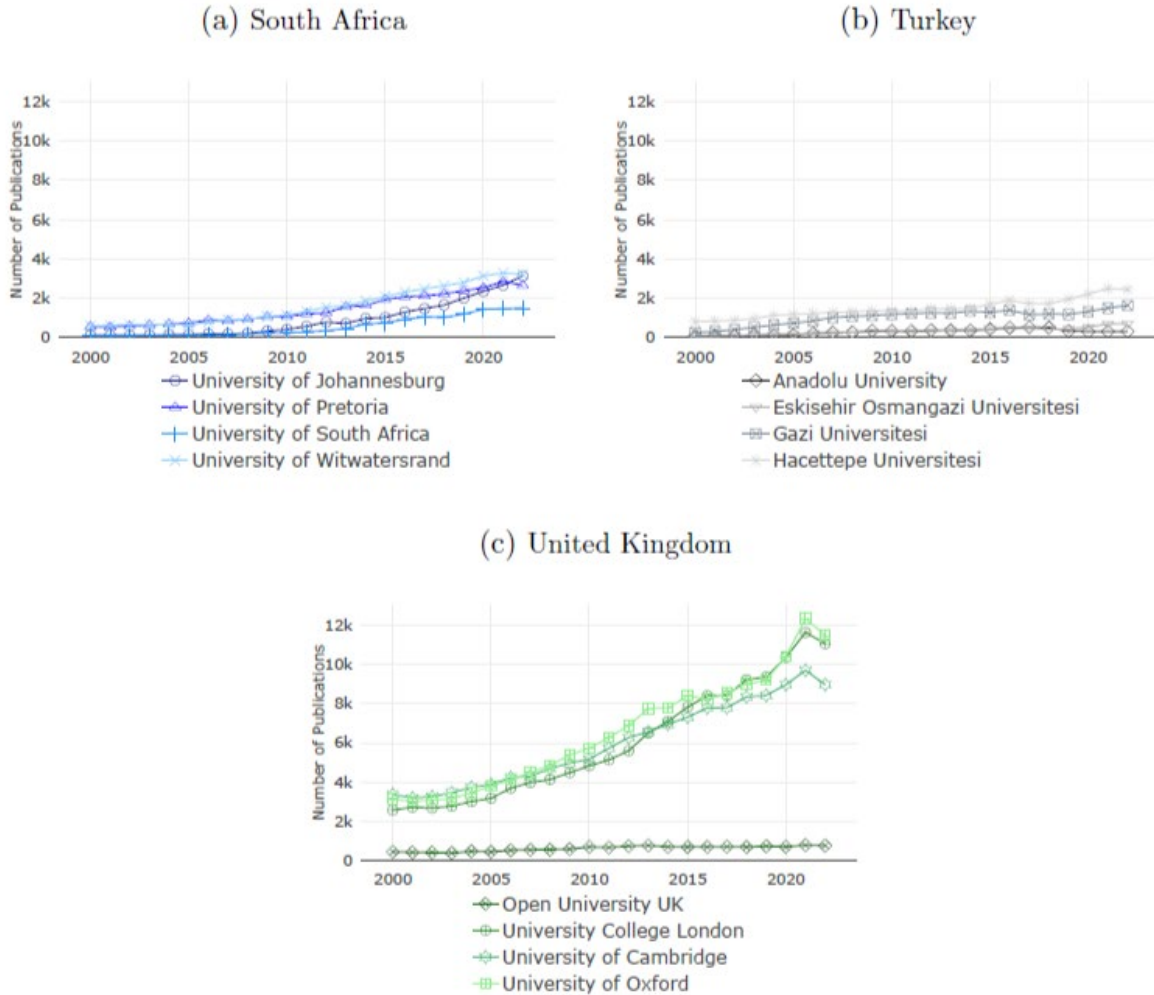


Figure 2 shows that UK institutions, except for the Open University, have increased the number of active researchers over the past 20 years upwards to 7,200 researchers. By comparison, South African and Turkish traditional institutions typically range from 1,000 to 2,000 active researchers, and the open institutions reported fewer than 1,000 active researchers with peer-reviewed publications.



**Figure 2**

*Total Number of Active Researchers by Institution, 2000–2022*

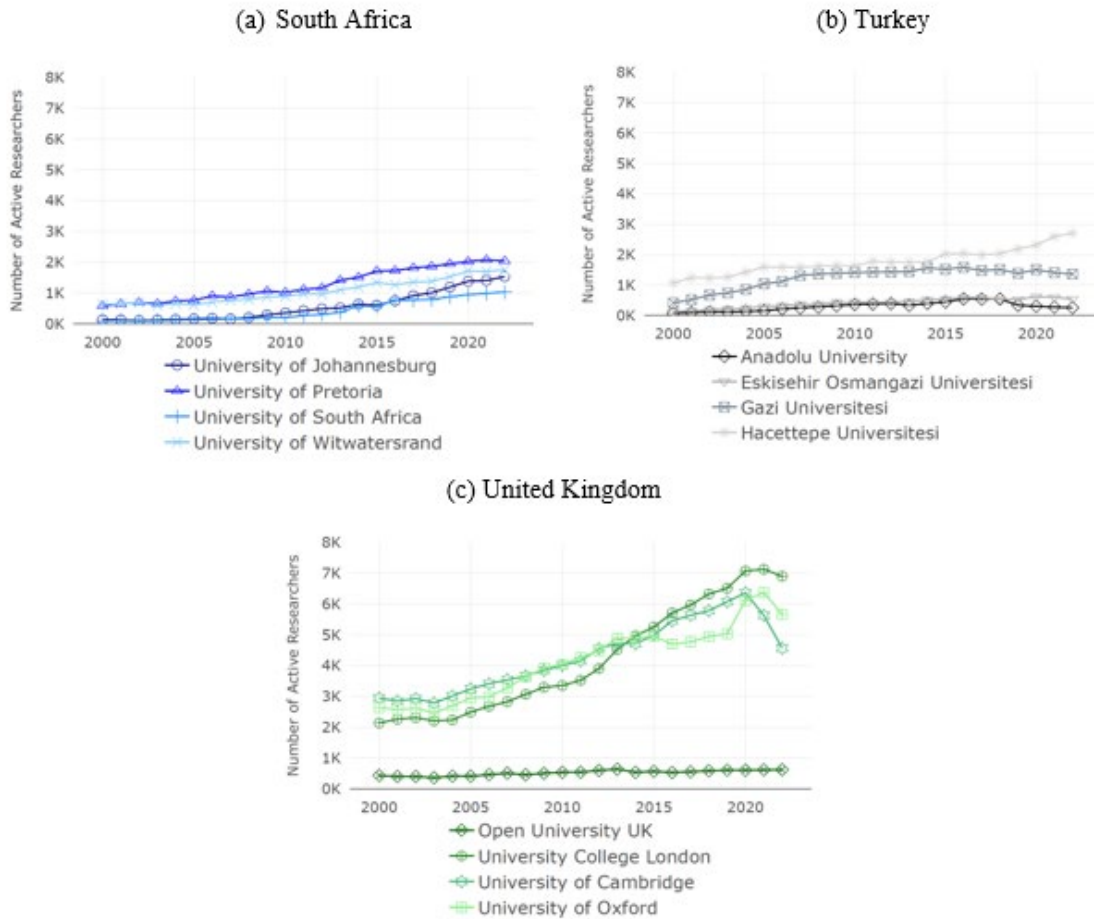
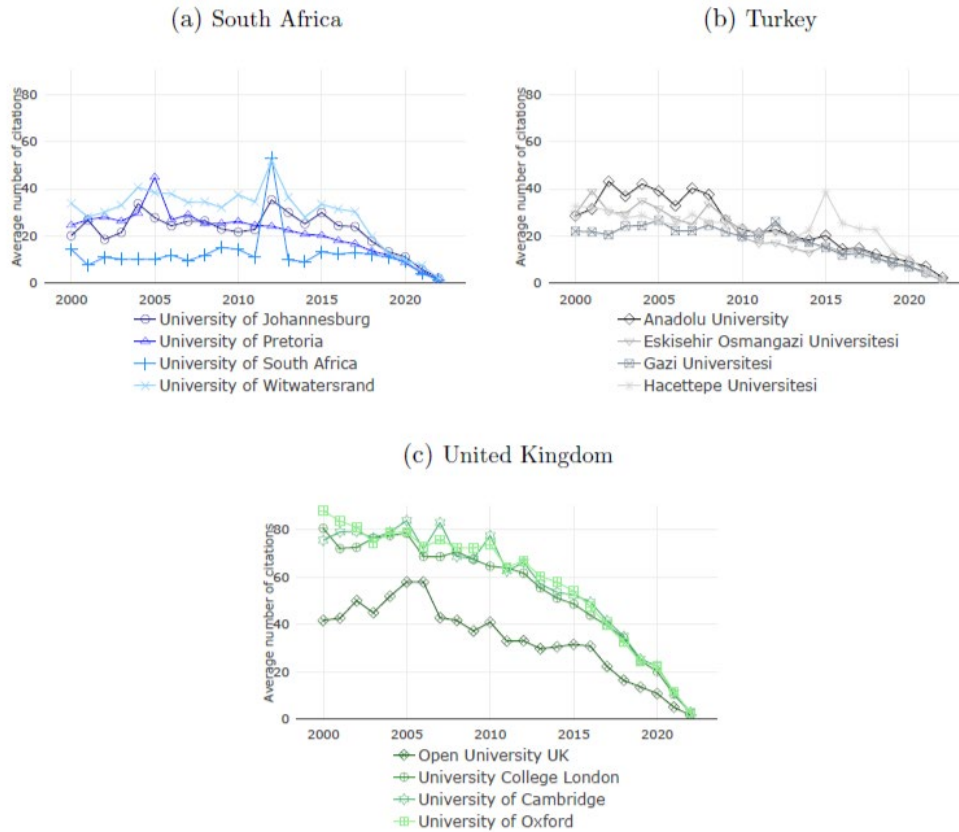


Figure 3 reports that the average number of citations declines over time, indicating that the institutions in the UK are cited more frequently than the comparative institutions in South Africa and Turkey. Unlike the other open institutions in this sample, publications affiliated with the Anadolu University are more frequently cited than their national comparative institutions.

**Figure 3**

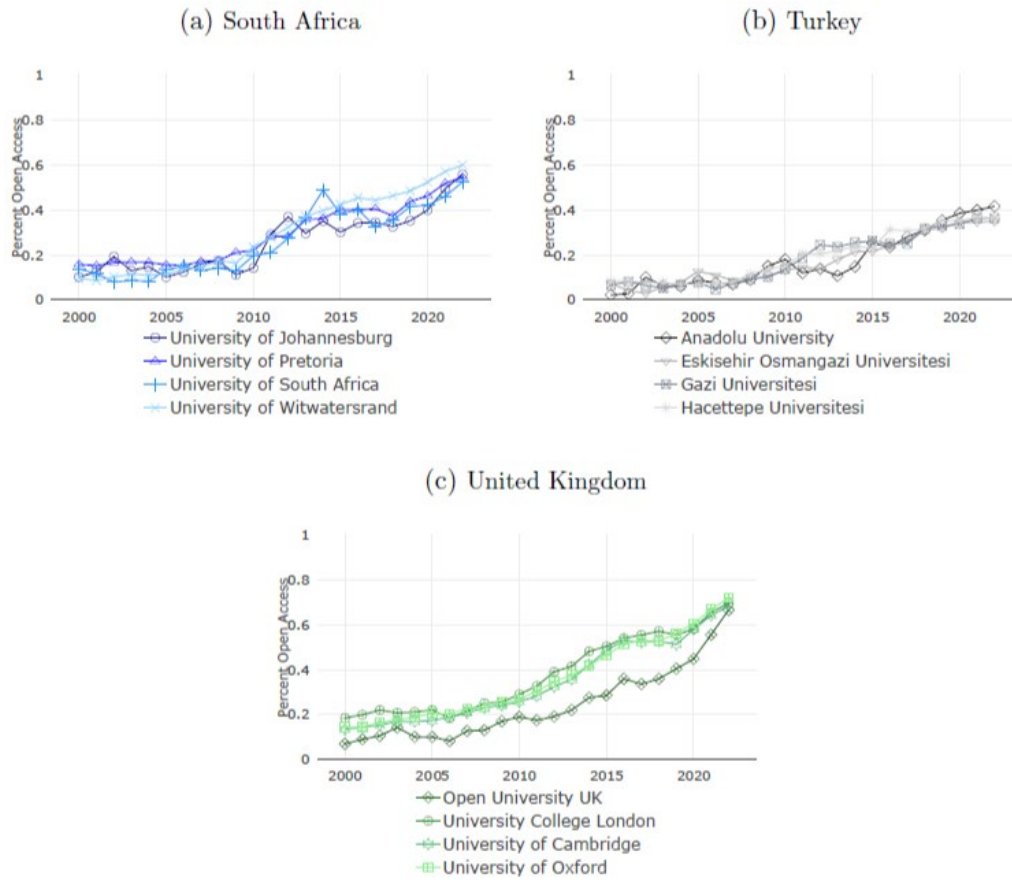
*Average Number of Citations on Published Articles by Institution, 2000–2022*



Consistent with the literature (Laakso et al., 2011), open access publications have increased across all universities, as presented in Figure 4. Institutions in the UK and South Africa frequently publish more openly than Turkish institutions in this study.

**Figure 4**

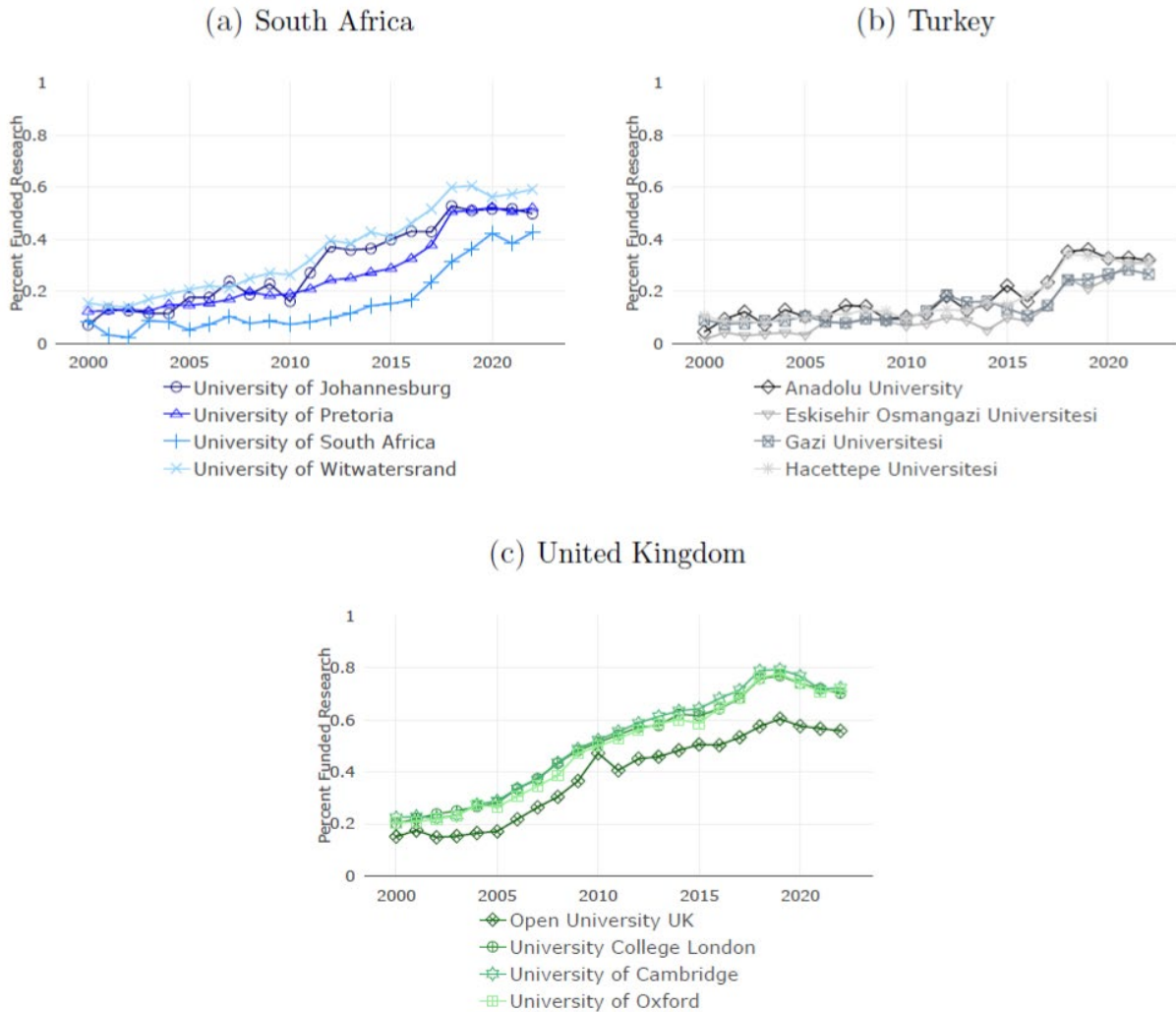
*Percentage of Open Access Articles Published by Institution, 2000–2022*



The annual percentage of funded research is reported more frequently by the comparative institutions except in Turkey, where Anadolu University strongly contends for sponsored research at the national level (Figure 5). Additionally, institutions in the UK have a higher percentage of funded research than South African and Turkish institutions.

**Figure 5**

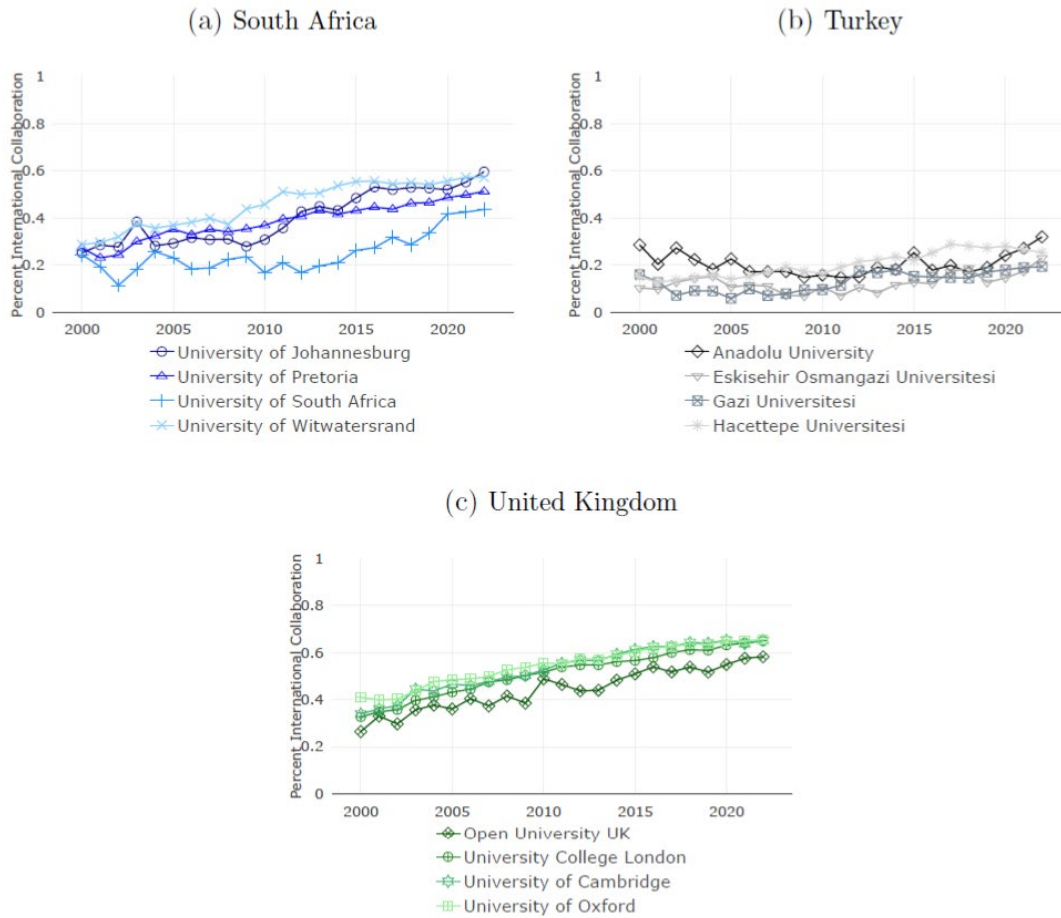
*Percentage of Funded Research Articles Published by Institution, 2000–2022*



Finally, Figure 6 shows the percentage of international research collaboration, demonstrating an increase in international research collaboration across all institutions. It is important to note that all open universities in this sample collaborate internationally to a significant degree compared with their national comparative institutions.

**Figure 6**

*Percentage of International Research Collaboration Publications by Institution, 2000–2022*



The descriptive analysis identified patterns and trends emerging in 12 institutions from three countries. Based on these findings, further statistical analysis was conducted to answer the primary research question and understand the effects of international research collaboration in open universities.

### Empirical Methodology

A linear regression model was used to examine the effect of several key research input variables on citation counts over time:

$$\log(\text{Cites}_{ijt} + 1) = \beta_1 \text{Authors}_{ijt} + \beta_2 \text{Active}_j + \beta_3 \text{Inputs}_{ijt} + \psi t + \varepsilon \quad (1)$$

The dependent variable  $\log(\text{Cites}_{ijt} + 1)$  represents the natural logarithm of the number of citations (plus one) for journal article  $i$  published in journal  $j$  at time  $t$ . The results are similar when  $\log(\text{Cites}_{ijt})$  is used as the dependent variable. In Equation 1,  $\text{Authors}_{ijt}$  is a continuous measure of the number of authors for journal article  $i$  published in journal  $j$  at time  $t$ ;  $\text{Active}_j$  is an indicator variable that equals 1 if the journal is

still actively publishing journal articles at the end of 2022 or 0 otherwise;  $\psi_t$  is a vector of year fixed effects controlling for the year when the article was published; and  $\varepsilon$  is an error term. Finally,  $\text{Inputs}_{ijt}$  is a vector of indicator variables for research inputs identifying whether the article is open access, the research was funded, and there was international collaboration. Previous studies have shown that these variables influence citation metrics (Morillo, 2020), and therefore, they were chosen for this study; however, the validity of bibliometric indicators remains ambiguous due to individual paradigms and rapid advancements in bibliometric methodologies (Aksnes et al., 2019).

After demonstrating that the research inputs significantly impact how often a journal article is cited, the variables were used as controls in a second regression, which includes an indicator variable for open universities,  $\text{Open}_{ijt}$ , that equals 1 if at least one author on the article  $i$  published in journal  $j$  at time  $t$  was affiliated with an open university or 0 otherwise. As a result, the updated specification takes the following form:

$$\log(\text{Cites}_{ijt} + 1) = \beta_1 \text{Authors}_{ijt} + \beta_2 \text{Active}_j + \beta_3 \text{Inputs}_{ijt} + \beta_4 \text{Open}_{ijt} + \psi_t + \varepsilon \quad (2)$$

After running the second regression to control for year fixed effects, additional specifications were run in R with additively separable year and subject area controls. The Scopus database assigns subject area levels to every serial publication (i.e., journal) with an International Standard Serial Number (ISSN) and the subject area controls align with the All Science Journal Classification (ASJC) code list. The subject area data by ISSN was accessed and downloaded from the Scopus Website to control for types of sciences and subjects. Scopus refers to the first subject area control as the supergroup, classifying the journal into one of three groups: life sciences, social sciences, or physical sciences. The second subject area control uses the first two digits of the ASJC code, with 27 ASJC parent codes. The third subject area control uses the complete four-digit ASJC code, of which there are 334. Finally, the subject area was controlled for with the inclusion of journal fixed effects.

## Results and Discussion

Based on the empirical methodology, results indicate positive and statistically significant indicators of research outputs that are open access, receive sponsorship funding, and participate in international collaboration. Results suggest that international research collaboration is a statistically significant variable for all universities and does not uniquely affect open universities. The findings are categorized into two themes: publication factors and the effects of international research collaboration.

### Publication Factors

The first finding concerns citation indicators with publication factors. Three research input indicators—open access, sponsored, and international coauthor—were examined due to their interrelationships to amplify the visibility and impact of research. Research has demonstrated that open access and funded research factors are often related, as scholars and their affiliations are more willing to pay publishing fees to expand to a broader audience (Pinfield et al., 2016; Solomon & Björk, 2012). Building on these two factors is international coauthorship, similarly used for funding purposes and potentially for increasing readership

globally (Abramo & D'Angelo, 2023). From this conceptual framing, Table 2 displays results examining the effect of research inputs on citation counts from Equation 1. Each column in Table 2 includes controls for the number of authors on each paper, an indicator variable identifying whether the journal is still actively publishing, and year fixed effects to control for the length of time since the article was initially published.

**Table 2**

*Effect of Research Inputs on Citations*

Variable	Open access (1)	Sponsored (2)	International coauthor (3)	All research inputs (4)
Author count	0.018* (0.001)	0.016* (0.001)	0.015* (0.001)	0.012* (0.001)
Active	0.828* (0.023)	0.740* (0.018)	0.806* (0.020)	0.721* (0.018)
Open access	0.245* (0.035)			0.154* (0.028)
Sponsored		0.641* (0.050)		0.556* (0.044)
International coauthor			0.501* (0.031)	0.400* (0.022)
Time FE	Year	Year	Year	Year
Observations	609,365	609,365	609,365	609,365
R <sup>2</sup>	0.315	0.350	0.333	0.367

Note. FE = fixed effects.

\*  $p < .01$

**Author Count and Active Journals**

The coefficient estimates on the author count and active journal variables are positive and statistically significant in every column of Table 2. Also, the coefficient estimates for the continuous author count variable indicate that the number of citations increases as the number of authors on a paper increases. This finding is intuitive because an increased author count helps increase the article's exposure and reach (Acedo et al., 2006). Moreover, authors have more opportunities to self-cite their publication in their future work (Aksnes, 2003). The coefficient estimates on the active journal indicator variable in Table 2 suggest that articles published in active journals at the end of the study period (i.e., 2022) received, on average, 72.1% to 82.8% more citations than articles published in the same year in journals that are no longer active. Again, this finding is also intuitive as active journals likely have a higher readership than inactive journals (James et al., 2018).

**Open Access**

The first column of Table 2 includes the open access indicator variable identifying whether the journal article was an open publication. The open access coefficient estimate indicates that, on average, open publications received 24.5% more citations than non-open articles published during the same year. This

result diverges from those of previous studies (Davis, 2011; Sotudeh & Estakhr, 2018) that have questioned a citation advantage to openly accessible articles and found no significant difference.

### ***Sponsored Research***

The second column of Table 2 includes the sponsored indicator variable identifying whether the journal article was funded. The analysis results indicate that, on average, studies that received funding have 64.1% more citations than non-funded articles published during the same year. This result aligns with prior research demonstrating that funded studies are cited more often (Larivière et al., 2010; Roshani et al., 2021).

### ***International Collaboration***

The third column of Table 2 includes an indicator variable identifying whether the journal article included international collaboration among authors. The international coauthor coefficient estimate indicates that, on average, articles with international collaboration have 50.1% more citations than articles without. This result is consistent with the literature (Alamah et al., 2023; Onyanha, 2021); international research collaboration yields more citations worldwide.

Finally, the fourth column of Table 2 includes all three research input variables from Equation 1 simultaneously. Again, the coefficient estimates remain positive and statistically significant. However, the magnitude of the coefficient estimates decreases.

### **International Research Collaboration**

The second finding addresses the effect of open university affiliation on citation counts using the regression framework presented in Table 3. Each column in Table 3 includes the same controls and the three research input variables explored in Table 2. The variable of interest, open university, indicates whether one of the authors is affiliated with an open university. The indicator variable equals 1 if one of the authors is affiliated with Anadolu University, the Open University in the UK, or the University of South Africa; otherwise, the indicator variable equals 0.



**Table 3**

*Open Universities and Citation Counts*

Variable	Baseline (1)	Supergroup (2)	Parent (3)	ASJC (4)	ISSN (5)	ISSN (6)
Open university	-0.307* (0.027)	-0.238* (0.018)	-0.248* (0.020)	-0.216* (0.015)	-0.049* (0.009)	-0.043* (0.008)
Author count	0.012* (0.001)	0.011* (0.001)	0.012* (0.001)	0.013* (0.001)	0.008* (0.0004)	0.008* (0.0004)
Active journals	0.715* (0.017)	0.707* (0.017)	0.705* (0.020)	0.650* (0.019)		
Open access	0.149* (0.027)	0.086* (0.018)	0.092* (0.018)	0.096* (0.019)	0.117* (0.016)	0.117* (0.016)
Sponsored	0.545* (0.043)	0.490* (0.040)	0.467* (0.038)	0.428* (0.036)	0.113* (0.015)	0.113* (0.015)
International coauthor	0.393* (0.022)	0.349* (0.018)	0.319* (0.017)	0.296* (0.016)	0.122* (0.006)	0.123* (0.007)
Open university: International coauthor						-0.022 (0.031)
Time FE	Year	Year	Year	Year	Year	Year
Observations	609,365	609,365	609,365	609,365	609,365	609,365
$R^2$	0.370	0.381	0.398	0.417	0.600	0.600
Adjusted $R^2$	0.370	0.381	0.398	0.417	0.585	0.585

Note. ASJC = All Science Journal Classification; ISSN = International Standard Serial Number; FE = fixed effects.

\* $p < .01$ .

**Open University**

The first column of Table 3 introduces the open university variable with no additional fixed effects outside of the year fixed effects included in every column of Table 2. The open university coefficient estimate in column one indicates that journal articles authored by faculty at an open university in this study received, on average, 30.7% fewer citations than journal articles published in the same year by faculty at comparison universities. These results do not control for the faculty at the comparison universities, which may differ in research disciplines, sciences, and journals in which they publish. Therefore, columns two through six attempt to control these differences using increasingly granular subject area fixed effects.

**Sciences**

The second column in Table 3 includes fixed effects for the supergroup, classifying the journal into one of three groups: life sciences, social sciences, or physical sciences. After controlling for this high-level classification, journal articles authored by faculty at an open university in this study received, on average, 23.8% fewer citations than journal articles published in the same year and supergroup by faculty at the comparison universities.

### ***Subject Area***

The third column of Table 3 includes fixed effects for the ASJC parent codes. Interestingly, the open university coefficient estimate in column three increases slightly, to 24.8%, relative to the less granular supergroup fixed effects estimates in column two.

The fourth column includes fixed effects for the ASJC codes. Including the more granular subject area controls has the expected impact in that the open university coefficient estimate in column four decreases relative to the previous three columns. The coefficient estimate suggests that journal articles authored by faculty at one of the three open universities in this study received, on average, 21.6% fewer citations than journal articles published in the same year and ASJC code by faculty at the comparison universities.

### ***Journal***

The fifth column in Table 3 reports the results, including fixed effects for the journal in which the article was published. Including journal fixed effects allows the comparison of citation counts for articles published in the same year and the same journal, thereby alleviating concerns about journal quality, distribution, and readership. However, the active journal indicator variable in column five is not included because it perfectly correlates with the journal fixed effects. The open university coefficient estimate in column five indicates that journal articles authored by faculty at an open university in this study received, on average, 4.9% fewer citations than journal articles published in the same year and journals by faculty at the comparison universities. Further, the  $R^2$  increased considerably in column five relative to the previous columns. This suggests that the journal in which an article is published is a crucial determinant of how many citations that article will receive. It also highlights the need to carefully control for differences in faculty research interests and subject areas when evaluating the effect of research inputs and university affiliations on citation counts.

### ***International Collaboration***

Finally, the sixth column in Table 3 addresses the research question: How does international research collaboration affect knowledge production and dissemination in open universities compared with non-open universities? The results suggest that international coauthorship matters, and there is little effect on the type of university. The international coauthor coefficient estimate in column six indicates that journal articles that include international coauthorship received approximately 12.3% more citations than journal articles without international coauthorship published in the same year and in the same journals. However, the coefficient estimate on the open university–international coauthor interaction term is negative; it is not statistically significant. This finding indicates that international collaboration similarly affects citation counts for faculty at open universities and their comparisons.

Although previous studies on international research collaboration have not explicitly examined the impact on open universities, scholars have found that international research collaboration positively influences academic excellence and high-quality research outcomes (Li & Yin, 2022; Velez-Estevez et al., 2022). Therefore, this study contributes to the growing body of literature suggesting the influence of international research collaboration with the inclusion of open university research outputs.

## Conclusion

Today's knowledge society is evolving, and the role of internationalization in higher education is gaining universal importance as a form of knowledge diplomacy (Knight, 2022) and as a proxy for quality and academic excellence (Knobel et al., 2013). The outputs of international research collaboration can serve as a quality indicator to measure the globalization of knowledge. This study aimed to understand the effects of international research collaboration on three open universities by examining the relationship between national comparative universities through citation metrics between 2000 and 2022.

The findings suggest that open institutions actively produce knowledge with fewer active researchers and research funding sponsors than comparative universities. Furthermore, results from the multiple regression analysis indicate that the number of authors, activeness of a journal, open publishing, international coauthors, and sponsorship support citation advantages by year across sample universities.

Unlike previous studies regarding the effects of open access on citations (Langham-Putrow et al., 2021), this examination found that open access publication offers a 24.5% citation advantage when compared with articles published in the same year that are not openly accessible. Open access publishing has increased worldwide; however, publishing openly often comes at a cost. Interestingly, this study found that comparative institutions receive more funding than open universities, and their sponsored research articles typically receive a 64.1% increase in their citation margins. Although studying the relationship between open access and funding is outside the scope of this study, more research is needed to examine the impacts of these variables on articles published by researchers affiliated with open universities, given their institutional missions for educational access.

Researchers affiliated with open universities are less often cited than their comparative peers in this sample; however, once the fixed effects were applied and compared against international research collaboration indicators, the difference in citation rates between the two groups was reduced to only 4.3%. This finding demonstrates the significance of international research collaboration and the degree to which scholars affiliated with open universities participate in globalized knowledge production and dissemination. Additionally, the results suggest a strategic shift in the functions and outputs of open universities in a relatively short period. This study indicates that open institutions have evolved from providing educational access for workforce development to institutions engaging in internationalization and demonstrating academic excellence at national and international levels through collaborative research and publication.

Finally, more research is needed to examine journal and subject-level attributes that appear to affect the number of citations that open university researchers create. This study suggests that open university researchers publish in journals or subject areas with less impact. Future studies should consider other measurable outputs, outcomes, and impact factors from international research collaboration with open universities, including the economic effects of knowledge spillover and transfer at localized levels and the international mobility of open university researchers as a result of their publications.

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