RESEARCH ARTICLE

Citations of Studies on the Investment Development Path: Variability and Drivers

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Abstract

We examined the citation behaviour of authors of studies on the investment development path. We searched for studies on the investment development path with the keyword ‘investment development path’ in Google Scholar and Scopus through Publish or Perish Software. One hundred and twenty-seven (127) investment development path studies, published from 1986 to 2023, were fitted the data to the negative binomial estimator. We found that open access enhances citations of IDP studies. Also, how long a publication is in circulation increases citation. Peer-reviewed publications attract more citations than non-peer-reviewed publications. The number of authors on an investment development path paper did not distinguish how many citations the paper would attract. We did not provide interaction effects but single variable effects. Generally, authors of investment development path papers seeking to increase citations must publish in peer-reviewed journals, indexed in the Web of Science and with open access status.

1. Introduction

The investment development path (IDP) is the relationship between an economy's foreign capital position and the size of the economy[1][2]. Measuring foreign direct investment as net outward foreign direct investment per capita and the size of the economy as gross domestic product per capita, the IDP allows economies to be segregated into five stages of development ordinally, as I, II, III, IV and V[1][2].

Developing economies are theorised to be in stages I and II, emerging economies in stage III and stages IV and V are reserved for developed countries. Studies have shown the designation of the economies in these stages is not static. Whilst some economies could progress from lower to higher stages, others have also retrogressed, that is, moving from higher stages to lower stages[3][4][5]. Other studies also show stagnation in the IDP stage[6][7][5]. The IDP shows the cross-border appeal of the economy and gives avenues for relevant economic approaches[8][9][1][10][11][2][4][5].

Over time several publications have emerged about IDP. These have largely focused on the entire economy. The studies

addressed single countries (Austria - Bellak, 2001; Portugal[8]; Poland[12]; Kazahkstan[13]), groups of countries such as Visegrad (Kuzel, 2014;[14]), Eastern European countries (Boudier-Benseba, 2004, 2008;[4][15][16][17][18]; Trapczynski, Gorynia, Nowak and Wolniak, 2019), Developing countries[19][9], emerging and developed countries[20], Developed countries[21][22][23], and Developed, developing and transition economies (Andreff, 2003;[24][3]). Djokoto[25][26] have related the IDP to human development. Recently, Djokoto, Agyei-Henaku and Badu-Prah[27] provided a sectoral perspective to the largely total economy concept by applying the IDP to developing countries' agriculture.

Whilst some IDP studies employed only charts to establish the stages of the IDP[28][2][12][15][16][17][22][29][30][13], others used only regression models(Andreff, 2003;[8][31][9][3][32][4]), and both charts and econometric estimations[27][17][2][33].

The references to the IDP studies have been described as citations[34][35]. That is, citations are the recognitions that one publication receives from another[36][37][38][34][39]. The citations are counted as the number of times reference is made to a journal article, book or book chapter. These citations have been composed into indicators such as the H index[40], the i10 index, and the total citations. As the published works are authored, the citation extends to the authors and the journal. The case of the former is the author's citation, and the latter is the journal or book citation[41][42]. As the published works may be indexed in a database such as Web of Science (WOS), Scopus and search engines such as Google Scholar (GS), the author and journal citations are also referenced to the databases or search engine[43][44]. These locations of indexation also connote some notional level of prestige, with WOS considered the most prestigious and GS the least among the three. The extent or the number of citations is considered an indicator of the publication’s impact. Thus, there is a notion that a higher citation in WOS is more prestigious than the same level of citation in GS. These notwithstanding, GS stores the most published works[45][46][47] and WOS is the least of the three. The extent of coverage of data or publications is, however, in the reverse order for the prestige. These citations have been used to rank journals, authors and affiliations of the authors. In some cases, the citations or research impact have been used in the promotions of academics[48][49][50].

IDP studies have accumulated citations from various databases and search engines with time. These citations do vary[36][51][52][53], and the variability must be driven by some factors[36][37][54][42][55][44]. Thus, we pose the question what are the drivers of the variability in the IDP citations?

Many citation studies have been published in economics, with at least nine since 2022[56][57][58][59][60][61][62][63][64]. None of these addressed the investment development path. Recently, Agyei-Henaku et al.[36] studied the citation of foreign direct investment studies in agribusiness. However, the study was limited to inward and outward foreign direct investment but not the interaction of the two. Moreover, agribusiness was the study’s focus. Whilst the current study is within the scope of foreign direct investment, it departs from Agyei-Henaku et al.[36] in two ways. First, the current study focuses on the investment developing path, the interaction between inward and outward foreign direct investment and their relationship with economic development indicated as the gross domestic product per capita, which has implications for the level of development of an economy[9][19][11][2]. Second, this study goes beyond agribusiness to include non-agribusiness, indeed, all sectors of the economy. In this study, we assessed 127 IDP studies published from 1986 to 2023 and we found that to increase citations of IDP studies, authors must publish in peer-reviewed journals, indexed in the Web of Science

and with open access status.

In section 2, the review of the literature is presented. The search protocol is outlined, with the model specifications and estimation procedure captured in section 3. The summary statistics and the results of the estimations with the accompanying check for consistency of the estimates are captured and explained, considering existing literature, in section 4. Section 5 contains the conclusions and some policy recommendations.

2. Literature

2.1. *Theoretical review*

In the absence of a grand theory of citations, some theories have been proposed to explain why authors cite, including rewards[65][66][67], property rights[65][68], persuasion[69][35][70] and 'success breeds success'[71]. Other citation theorists include Latour[72], Rousseau[73][74], Leydesdorff[75], and Van Raan[76].

This paper focuses on Leydesdorff[75] because it better explains the approach of this study. Leydesdorff[75] acknowledged that citation is either the *explanan* or the *explanandum*. The latter is that which needs to be explained and the former is the explanation[77][75]. Djokoto et al.[37] viewed this within econometrics as 'citations could be caused or be the causal variable'. Alternatively, 'citations could be the explained variable or the explanatory variable'. Agyei-Henaku et al.[36], page 3) note "Pieces of evidence are, on one hand, employing documents' citations in publications as pointers of the value of the publication (*explanans*). On the other hand, the *explanandum* is the result of the publications' value[37][78][79][34]. The persuasive views and the Latour theories can be considered part of the Leydesdorff theory as they form 'variables' that explain or drive the *explanandum*". Djokoto et al.[37], page 2) further note that "Empirical examples are the use of citations of publications in journals as indicators of the journal's quality (explanans). However, the publication quality leads to citations as the explanandum[78][79]".

2.2. *Empirical review*

Specific papers relating to citations of IDP are rare, but there are many publications on the drivers of citations. Thus, we review a comprehensive review of factors affecting the number of citations[55] as well as the only citation study on foreign direct investment[36].

Paper-related factors; open access, age of the paper, review papers and papers considered to be of higher quality garner substantial citations[36][55]. Agyei-Henaku et al.[36] found no distinction between review papers and non-review papers just as papers of high quality versus papers in journals considered low quality. Regarding journal-related factors, peer-reviewed papers attract more citations than non-peer-reviewed papers[36][55]. Papers with more authors attract more citations than those with fewer authors[36][55]. Confirming these from Biscaro and Giupponi[80], Chakraborty, Kumar, Goyal, Ganguly and Mukherjee[81], Costas et al. (2010), Gargouri, Hajjem, Larivière, Gingras, Carr, Brody and Harnad[82]; Robson and Mousque`s[83], Tahamtan et al.[55] attributed this to knowledge diffusion[84]. That is, multi-author papers are

presented in more scientific forums such as conferences, seminars and workshops by the authors and ultimately get more cited than sole-authored papers. These positions of the studies tended to be the generality of the findings. It must, however, be noted that there are departures or exceptions to the positions of the studies especially in the case of Tahamtan et al.[55].

3. Data and Methods

3.1. *Literature search*

We searched Google Scholar and Scopus for literature on studies on the investment development path as the former is the largest academic search engine[45][46][47] and the latter is the largest database of published research and of high quality[43][44][85][86]. Using the phrases 'investment development path' and 'IDP' in the title, we harvested 197 studies from Google Scholar and 76 studies using 'investment development path' and 'IDP' as keywords in Scopus. The searches were accomplished at 10:54 GMT on December 5, 2023, using Publish or Perish software[87]. The number of records obtained from the search was 151. To be eligible, the study must be on the investment development path. This must be in the title or as a keyword. After removing duplicates, the result was 128 studies (See Appendix). The relevant data were extracted from the 128 studies to generate 128 observations for analysis. Data on the relevant variables such as accessibility of the paper, when the paper was published, whether the paper was a review paper or not, and if the paper or book chapter of the book is indexed in Web of Science. Also, if the paper is peer-reviewed and the number of authors on it. The information was then converted into variables as described in the next section.

3.2. *Models and Modelling*

Following from theory[75][55] and empirical evidence[36][37][88][89], citations are a function of some variables.

$$\text{Cites} = f(\text{paper related factors, journal related factors, author related factors}) 1$$

The operational specification of Equation 1 is:

$$\text{Cites} = \alpha_0 + \alpha_1 \text{ ACCESS}_i + \alpha_2 \text{ AGE}_i + \alpha_3 \text{ REVIEW}_i + \alpha_4 \text{ WOS}_i + \alpha_5 \text{ PEER\_R}_i + \alpha_6 \text{ AUCOUNT}_i + \varepsilon_i 2$$

Accessibility is important for citation. If a publication is not accessible, there would be less likelihood of being read and cited. Thus, we defined *ACCESS* as 1 and 0 otherwise. This refers to the availability of the full text of the publication in Google Scholar. This can be considered as open access. *AGE* is the number of years to 2023 after the date of publication of the study. This is measured in years and as an integer. It is considered that studies in circulation longer would garner more citations than those in circulation shorter. *AGE* is a paper factor. Another paper factor is document type, that is, whether a review or not. *REVIEW* is 1 if the paper is a review paper and 0 otherwise. *WOS* is a measure of the quality of the publication. That is, 1 of the publication is in a journal included in Web of Science and 0 otherwise. Djokoto et al.[37] have similarly used *WOS* as a measure of quality. *ACCESS*, *AGE*, *REVIEW* and *WOS* are paper-related factors[55].

The next category is the publication-related factors. Some modes of dissemination have been identified in the literature, books, book chapters, conference papers, theses, working or discussion papers and journal articles. Whilst published journal articles, books and book chapters must be peer-reviewed, the same cannot be the case for conference papers, theses and working or discussion papers. Although some conference papers may be peer-reviewed, all conferences in the study are considered not peer-reviewed as these are not expected to be the final deposition of research articles. Peer-reviewed publications are defined as 1 and 0 otherwise. The reference is a non-peer-reviewed publication. *AUCOUNT*, an author factor, is the number of authors of a publication. Generally, more authors would have a wider network than fewer or one author. Thus, studies with higher author citation counts are expected to attract more citations than those with fewer authors or solo authors.

The α_k are parameters to be estimated whilst the ε is the error term. The$i$ denotes the number of observations.

3.3. *Estimation strategy*

The dependent variable, *CITES*, is an integer. Thus, count data models would be appropriate[90]. Poisson models are basic count data estimators[90]. However, the variances of error terms can exceed the mean[91], thus creating overdispersion. In that case, the standard errors are biased downwards thereby unnecessarily validating the hypothesis test. In the literature, other estimators such as negative binomial (NBER), zero-inflated binomial (ZINB) and two-part estimators have been used[36][92][93][94][95]. All the estimators were applied to the data except the two-part estimator as the inspection of the data did not show substantial zeros in the *CITES*. Some statistical packages perform the estimation and provide a loglikelihood ratio test to assess the veracity of the over-dispersion. ZINB are relevant in the cases where large numbers of zeros are present in the data. Whilst we performed these estimations to resolve the anticipated issues, the results of these estimations are used as robustness checks on parameter estimates.

4. Results and Discussions

4.1. *Results*

The most recent IDP papers were published in 2023 hence, have 0 age[36][96][97][98]. The oldest publication of 37 years suggests these were published in 1986[19][11]. Only two IDP studies are review papers whilst more than 50% of the 127 studies are available as full text (open access). The mean *WOS* of 0.2205 suggests that 22% of the 127 publications in the data are in journals indexed in the Web of Science (Table 1). About 78% of the publications are peer-reviewed, journal articles, books and book chapters. The least number of authors is one with a maximum of four.

The mean *CITES* is 35.72. This is influenced by the maximum value of 882 and a minimum of 0. A look at Figure 1 suggests that the 882 cites must be an outlier. Indeed, the 882 cites relate to the most widely cited paper, Dunning and Narula[2]. Following this observation, the outlier was dropped leaving 126 observations (Figure 2). The resulting descriptive statistics are presented in the second panel of Table 1. A close inspection shows that most of the means are

lower for the 126-observation data set than for the 127-observations data set. This is not unexpected as outliers pull the mean in their direction. This is an example of a disadvantage of the use of mean as a measure of central tendency. It is worth noting that the standard deviations for *CITES* are 91.5781 and 51.7563 for 127-observations and 126-observations data sets, respectively. As the standard deviations are already larger than the respective means 37.7244 and 29.0079, the variances which are the square of the standard deviations are larger than the respective means. This shows that the *CITES* for the 127-observations and 126-observations data sets are over-dispersed.

Table 1. Descriptive statistics

Variable	Mean	Standard deviation	Minimum	Maximum
127 observations				
CITES	35.7244	91.5781	0	882
Paper related factors				
ACCESS	0.5197	0.5016	0	1
AGE	13.6063	8.8749	0	37
REVIEW	0.0157	0.1250	0	1
WOS	0.2205	0.4162	0	1
Journal related factors				
PEER_R	0.7795	0.4162	0	1
Author related factors				
AUCOUNT	1.8583	0.9061	1	4
126 observations				
CITES	29.0079	51.7563	0	227
Paper related factors				
ACCESS	0.5238	0.5014	0	1
AGE	13.5000	8.8288	0	37
REVIEW	0.0159	0.1255	0	1
WOS	0.2222	0.4174	0	1
Journal related factors				
PEER_R	0.7778	0.4174	0	1
Author related factors				
AUCOUNT	1.8571	0.9096	1	4

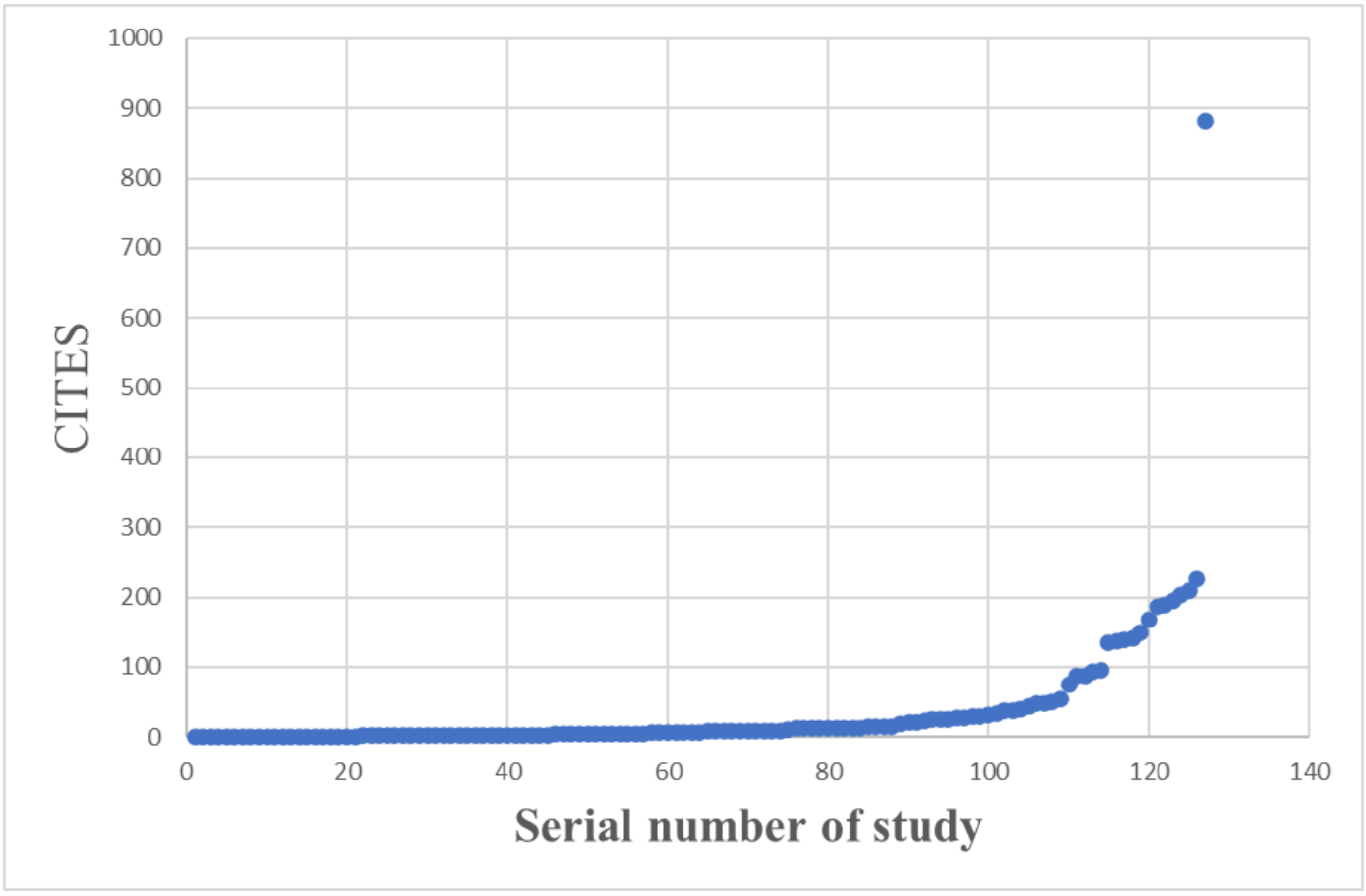

Figure 1. Scatter plot of CITES and serial number of studies with outlier.

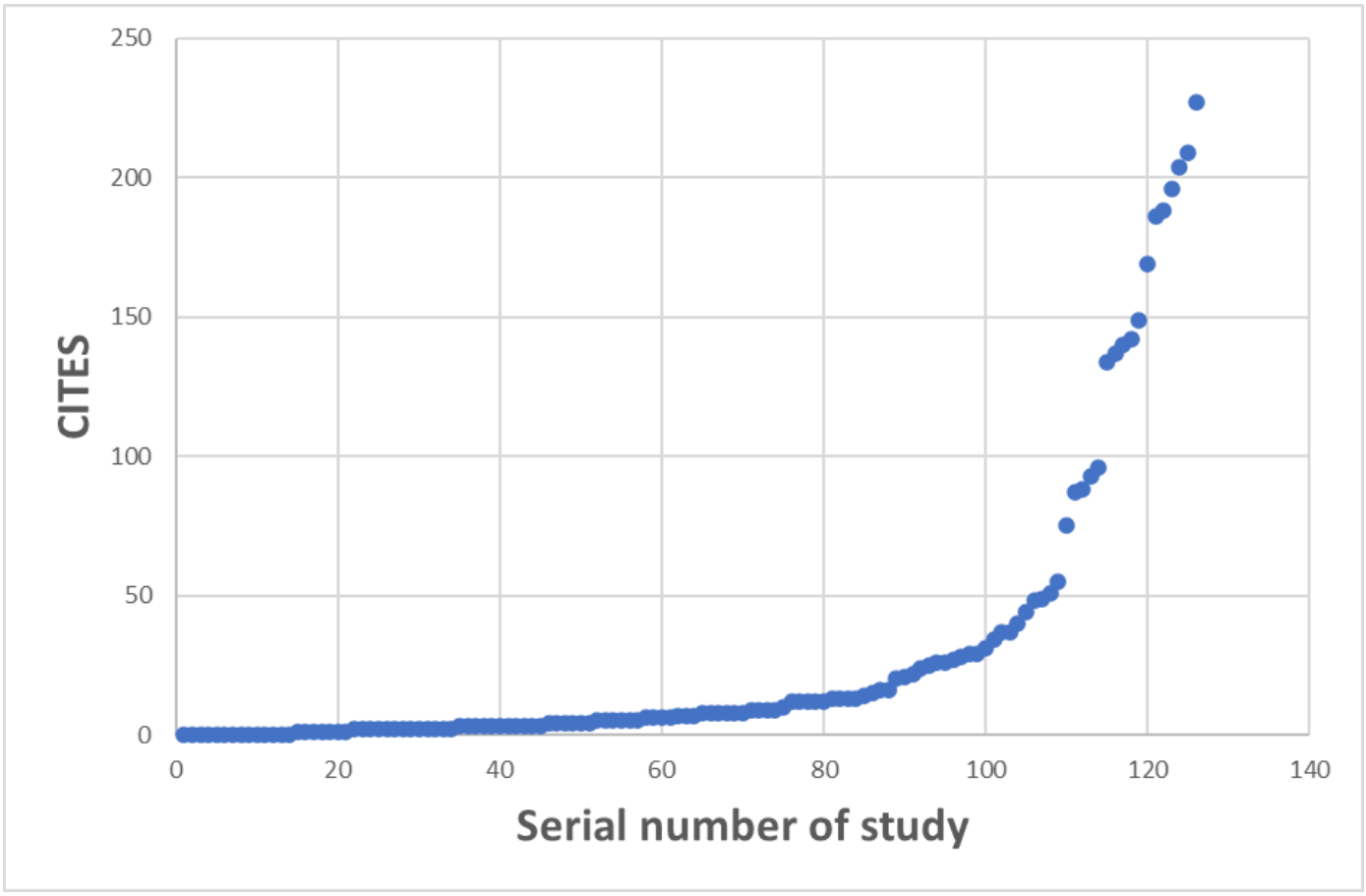

Figure 2. Scatter plot of CITES and serial number of studies without outlier.

Table 2 presents the estimations. The LR test of the models is statistically significant at 1%. This suggests the explanatory variables jointly explain the citations, the dependent variable. Models 1 and 4 were estimated using Poisson estimator, models 2 and 5 by negative binomial estimator whilst models 3 and 6 were estimated by zero-inflate binomial estimator. The Poisson estimator was not adequate because the standard errors are biased downwards when the data is over-dispersed. This can be seen in models 1 and 4, where all six coefficients are statistically significant but only four are statistically significant in the case of models 2 and 5. Essentially, the estimator of the negative binomial corrects for the downward bias of the standard errors. In addition, another LR test tests that overdispersion does not exist. The LR test of alpha=0 is reported. The null hypothesis is rejected in models 2 and 5. Models 3 and 6 account for the likelihood of increased zeros.

Table 3. Model selection estimates.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*CITES*	*CITES*	*CITES*	*CITES*	*CITES*	*CITES*
ACCESS	0.4335***	0.5958**	0.5312*	0.5668***	0.7039***	0.6871***
	(0.0370)	(0.2505)	(0.2738)	(0.0385)	(0.2396)	(0.2386)
AGE	0.1100***	0.1300***	0.1310***	0.0880***	0.1006***	0.1019***
	(0.0022)	(0.0154)	(0.0154)	(0.0025)	(0.0160)	(0.0160)
REVIEW	-0.9245***	-0.8607	-1.4362	-0.9039***	-0.8883	-1.0265
	(0.3190)	(0.9927)	(690,786.1029)	(0.3189)	(0.9679)	(89,342.3200)
WOS	0.7380***	0.9747***	0.9926***	1.1399***	1.2149***	1.2301***
	(0.0380)	(0.2956)	(0.2950)	(0.0383)	(0.2884)	(0.2880)
PEER_R	1.3258***	1.1182***	1.0984***	1.0358***	0.6118**	0.5855**
	(0.0642)	(0.3020)	(0.3012)	(0.0627)	(0.3037)	(0.3028)
AUCOUNT	0.3436***	0.2298	0.2319	0.2220***	0.1833	0.1871
	(0.0216)	(0.1508)	(0.1507)	(0.0216)	(0.1393)	(0.1476)
Information criterion	(1)	(2)	(3)	(4)	(5)	(6)
Akaike	8060.130	1011.539	1014.159	5054.240	989.397	992.086
Schwarz's Bayesian	8080.040	1034.293	1039.757	5074.097	1012.087	1017.613

Table 4. Negative binomial estimations of the drivers of IDP citations.

	(5)
VARIABLES	*CITES*
ACCESS	0.7039*** (0.2396)
AGE	0.1006*** (0.0160)
REVIEW	-0.8883 (0.9679)
WOS	1.2149*** (0.2884)
PEER_R	0.6118** (0.3037)
AUCOUNT	0.1833 (0.1393)
CONSTANT	0.0707 (0.4495)
Model diagnostics	
Observations	126
LR Chi^2	63***
LR test of alpha=0	4067***
Pseudo R^2	0.0610
Log-likelihood	-487
Estimator	Negative binomial

4.2. *Discussions*

The coefficient of *ACCESS* is positive and statistically significant. This suggests that if publications have full text available or open access, the log of the expected citations would increase by 0.7039. This implies that open-access publications drive citations by about 70% unlike those behind a paid wall. Publications with full text available unhindered are available to be read and consequently cited. This result feeds into the narrative about open-access publications or full-text availability. Agyei-Henaku et al.[36] found the same whilst a comprehensive review by Tahamtan et al.[55] also confirms

our findings.

An increase in the age of publication by one year would increase the log of the expected citations by 0.10. The statistical significance of the coefficient suggests that with time, citations of publications of IDP would increase. When a publication is first published, not many would learn about it. However, with time many would learn about it and cite it in their publications. However, how soon the citations are shown could depend on the turn-around time of the journal and the publication. This is, nevertheless, a time factor. Thus, the longer a paper is in circulation, the more it will be cited all other things held constant. Tahamtan et al.[55] have noted that how often a paper is cited could also reduce with time as the paper becomes obsolete. This has caused some to think of the relationship between citations and the age of publication to be quadratic[36]. That is, with age citations increase, reach a peak and later decline. Agyei-Henaku et al.[36] however, found the coefficient of the square of age to be positive. We consider that this may not be applicable in the case of seminal works, papers that propose theory and methods. Our finding is in line with existing literature[36][37][55].

The coefficient of *REVIEW* is negative but not statistically significant. This implies that whether a publication is a review paper or not, does not influence the citation count of IDP paper. This is not surprising as there are only two review papers on the IDP, Sawitri and Brenan (2022) and Seraffim (2011). This finding is like Agyei-Henaku et al.[36] but contrary to Tahamtan et al.[55] who found a positive effect based on the outcome of several publications. There appears to be the case that for studies in foreign direct investment, the review papers do not garner more citations than non-review papers.

Some academics see the indexation of a journal or book in the Web of Science (WOS) as a sign of quality and high recognition. Thus, many academics strive to publish in journals that are indexed in WOS and citations obtained are also marks of recognition. Our findings show that a publication in a journal or book indexed in WOS increases the log expected count of the citation of IDP studies by 1.21. This coefficient appears to be the largest statistically significant coefficient defined as a binary variable. This implies to some extent the importance of WOS as a factor in explaining the citations of IDP studies. The prestige of journals and books could encourage authors to cite publications indexed in WOS. Also, more confidence could be reposed in publications indexed in WOS. These could combine to enhance the role of WOS in driving citations in studies of IDP. Although Agyei-Henaku et al.[36] agree with our findings, Tahamtan et al.[55] disagrees.

The statistically significant coefficient of *PEER_R* of 0.6118 means that publishing an IDP study as a peer-reviewed publication results in a log expected citation count of 0.61 citations. The positive sign emphasises that the positivity is in favour of peer-reviewed journals as this is defined as 1 and 0, otherwise. This coefficient is the least of the variables defined as binary. The statistical significance shows the preference for peer-reviewed publications over non-peer-reviewed publications. Authors in IDP studies seek to increase citations of their studies in IDP by publishing their works as peer-reviewed publications. Our finding is consistent with Agyei-Henaku et al.[36] and Tahamtan et al. (20016).

The coefficient of *AUCOUNT* is 0.1833. This is, however, statistically indistinguishable from zero. Thus, the number of authors on an IDP paper does not influence the citation count of IDP studies. It was expected that due to knowledge or publication diffusion, this variable would affect citations as found in Agyei-Henaku et al.[36] and Tahamtan et al.[55]. This, however, was not the case. We observed that the maximum number of authors for the IDP studies is four and a standard deviation of 0.9096. This works to a variance of 0.8273, less than the mean of 1.8571. This is evidence of under

dispersion of the variable. Coupled with the overdispersion of the CITES (Mean-29.0079, variance-2678.7146), the underdispersion of *ACUCOUNT* was unable to explain the variability in *CITES*. This implies publications with one or fewer authors were just as cited as those with more authors.

The statistical insignificance of the constant means that the appreciable variability of *CITES* cannot be explained with the inclusion of additional variables. This also is suggestive of the adequacy of the variables included. Recalling the model estimated was informed by theory and empirics, the results obtained and presented in Table 4 are appropriate. The statistical significance of the Log-likelihood test in Table 4 suggests the joint effects of explanatory variables on citation counts. These results are interesting as all the variables, except one, the number of authors does not significantly affect citations, although the coefficient has a positive sign. The result confirms the theory that some factors explain the citations of publications[36][37][75].

5. Conclusion and Recommendation

We studied the citation behaviour of authors of 127 IDP studies published from 1986 to 2023 fitted to the negative binomial estimator. We found that open access enhances citations of IDP studies. Also, how long a publication is in circulation increases citation. Peer-reviewed publications attract more citations than non-peer-reviewed publications. The driver with the highest coefficient is indexation in Web of Science. The number of authors on an IDP paper did not distinguish how many citations the paper would attract. If only one factor should be used to increase citations in IDP studies, that is publishing in journals and books indexed in Web of Science. Generally, authors of IDP papers seeking to increase citations must publish in peer-reviewed journals, indexed in the Web of Science and with open access status.

As we explored these factors separately, subsequent studies can examine the joint effect of some of the factors such as open access journals indexed in Web of Science and review papers that are open access.

Notes

JEL: C01,23; F00, 20,23

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