E-ISSN: 3108-4176

APSSHS

Academic Publications of Social Sciences and Humanities Studies
2024, Volume 5, Page No: 226-241
Available online at: https://apsshs.com/

Annals of Organizational Culture, Leadership and External Engagement Journal

Enhancing Researchers' Scientific Performance: The Moderating Roles of Motivation and Opportunity in the Human Capital Relationship through AMO Theory

Nadine F. Laurent[1], Sophie R. Martin[2]*, Marc A. Lefevre[1]

1. Department of Management, Faculty of Economics, University of Montpellier, Montpellier, France.
2. Department of Public Administration, Solvay Brussels School of Economics and Management, Université libre de Bruxelles, Brussels, Belgium.

Abstract

This study investigates empirically how the interplay of motivation and available opportunities strengthens the link between a researcher's human capital and their personal scientific output. Drawing on recent research in strategic human capital and the abilities-motivation-opportunity (AMO) framework, we employ a combined quantitative and qualitative approach to uncover the key determinants of individual scientific performance. Regression analysis of a dataset of 471 Spanish academic researchers confirms that both motivation and opportunities act as moderators in the human capital–performance relationship. Based on the results, this paper identifies crucial drivers of scientific productivity and provides actionable insights for research management and policy development.

Keywords: Academic human capital, Researcher, AMO framework, DEA, Individual scientific output

How to cite this article: Laurent NF, Martin SR, Lefevre MA. Enhancing researchers' scientific performance: The moderating roles of motivation and opportunity in the human capital relationship through AMO Theory. Ann Organ Cult Leadersh Extern Engagem J. 2024;5:226-41. https://doi.org/10.51847/Zl2UsYRrQe

Received: 29 May 2024; **Revised:** 29 October 2024; **Accepted:** 01 November 2024
Corresponding author: Sophie R. Martin
E-mail ✉ sophie.martin@gmail.com

Introduction

Government funding has traditionally been the main source of university research. However, over the last few decades, external funding has increasingly gained importance [1]. Productivity in academia is often associated with competitive incentives tied to external funding [2]. Since scientific output affects funding allocation and career progression, understanding the factors that drive individual research performance has become a central concern. Previous research has examined variables including gender [3], age [4, 5], education [6], and membership in high-performing research groups [7], yielding inconsistent results [2].

To design effective research management policies, it is important to adopt approaches that consider the context in which academic performance occurs [8-11]. The abilities-motivation-opportunity (AMO) framework provides a valuable perspective by separating the key determinants of performance [12, 13]. According to this framework, performance is shaped not only by a researcher's skills and motivation but also by the opportunities provided through their institution and surrounding environment (e.g., sectorial technology centers, business foundations, R&D institutes). While the AMO framework is widely applied in organizational research [14-16], its application in education is limited [5, 17, 18], and studies analyzing these factors in academic research specifically are almost nonexistent. Some studies suggest that contextual influences play an important

role in these relationships [19]. Exploring AMO variables by research field may therefore provide university managers with new insights.

This study advances understanding of what drives individual scientific performance in academia by applying the AMO framework. Using a mixed-methods quantitative-qualitative design, we define and analyze a set of AMO components. The paper is organized as follows: after this introduction, we review the literature and propose a model linking individual scientific performance to the three AMO components, alongside three hypotheses. Next, the methodology used to identify determinants of scientific performance is described. Then, the data collection and analysis process is explained, based on 471 Spanish researchers, and four regression models are applied to test the hypotheses. Finally, conclusions, limitations, and directions for future research are presented.

Theoretical framework and hypotheses

Considerable research has explored the connection between individual effort and performance outcomes [20]. AMO theory posits that discretionary effort depends on the combination of ability, motivation, and the opportunity to contribute [21]. The influence of these components on performance has been examined in prior studies [22, 23], but their relevance across different organizational contexts still requires further exploration [16, 24].

In the context of academic research, we analyze how AMO components affect scientific performance and formulate hypotheses regarding their interactions. We propose that research ability directly and positively impacts performance, with this effect potentially amplified or reduced by motivation and opportunity. Research ability encompasses the knowledge, skills, and expertise required for scientific activity; researcher motivation reflects the drive to engage in scientific work; and opportunities indicate the institutional and environmental conditions that allow researchers to make decisions influencing performance. The following sections review existing findings on these three dimensions in relation to academic researchers.

Research capacities: Academic human capital lens

Studies have recognized the primary element of the AMO model as human capital, portrayed as the assortment of knowledge, competencies, and capacities (KSA) that equip a person to execute a certain role in a defined environment [12, 25]. Scholarly publications have failed to establish agreement on the exact human capital features that empower scholars to engage in investigative work [26-28].

Scholars commonly categorize knowledge into two forms: implicit and formalized [29]. Implicit knowledge pertains to structured understanding connected to processes, protocols, or notions obtained via specialized instruction in postgraduate education [30, 31]. This personally held knowledge arises from an unarticulated blend of absorbed conceptual structures, lived encounters, viewpoints, gut feelings, and related elements, empowering individuals to comprehend the core of an investigative area within a discipline. As a result, it encompasses both the foundational concepts and premises of a domain [32, 33] along with the critical specialized components of a focused investigative path [34].

Alternatively, earlier research has regarded formalized knowledge as information archived in multiple repositories, like textbooks, theses, scholarly periodicals, and data systems, readily obtainable by subsequent investigators [35-37]. In this scenario, the knowledge is accurately structured in an organized medium that permits simple sharing among scholarly peers. Publications do not provide a distinct separation between investigative competencies and investigative capacities. Various researchers have depicted investigative competencies as widespread individual qualities usable in diverse roles, including commitment to one's field [38], originality [39], or occupational integrity [40]. Under this perspective, scholarly competencies can be regarded as personal strengths associated with performing a solitary function. In comparison, investigative capacities include more targeted professional characteristics related to inquiry, such as the potential to detect promising topics [41], the potential to share findings [28], or the potential to create propositions and acquire data [39]. Thus, investigative capacities are outlined as personal strengths that enhance suitable scholarly productivity. **Figure 1** outlines this interpretation of investigative capacities.

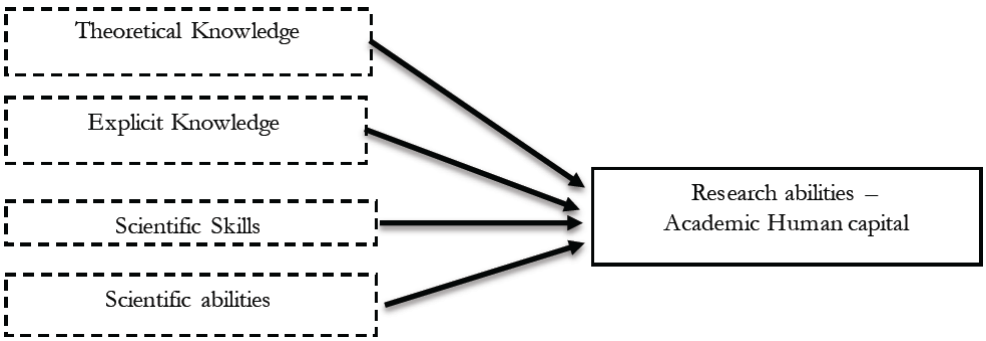

Figure 1. Theoretical research model for researcher abilities

Multiple analyses have verified the favorable effect of human capital on results [42-44]. They maintain that the pooled reserve of human capital aids in building enduring advantages [45]. From these considerations, human capital is evidently crucial for investigative pursuits. Building on this reasoning, we put forward the following proposition about human capital elements in academia:

Hypothesis 1: A researcher's capacities (in terms of academic human capital) positively and directly influence their personal scholarly output.

Hypothesis 2: Higher levels of a scholar's drive strengthen the beneficial impact of their competencies (academic human capital) on personal scholarly productivity.

Hypothesis 2a: Greater inward drive in a scholar amplifies the beneficial impact of their competencies (academic human capital) on personal scholarly productivity.

Hypothesis 2b: Greater outward drive in a scholar amplifies the beneficial impact of their competencies (academic human capital) on personal scholarly productivity.

Hypothesis 1a: Theoretical (implicit) knowledge positively and directly influences personal scholarly output.

Hypothesis 1b: Formalized (explicit) knowledge positively and directly influences personal scholarly output.

Hypothesis 1c: Investigative competencies positively and directly influence personal scholarly output.

Hypothesis 1d: Investigative capacities positively and directly influence personal scholarly output.

This primary positive linkage between human capital and personal investigative results will act as the base for assessing the roles of the other two AMO components: motivation and opportunity. These components will be examined as factors that moderate the core direct linkage. Their moderating roles will be discussed in the following part.

Moderating factors: Motivation and opportunity

A scholar's competencies form an essential prerequisite for performing investigative work. However, another critical component is needed: the drive to pursue such endeavors. Motivation serves as the catalyst that mobilizes a scholar's competencies [15]. It is characterized as the inclination and level of exertion individuals are prepared to invest in a specific pursuit [46]. Personal drive, or its lack, can restrain, boost, or offset a person's expertise and capacities [47]. In academia, this element prompts investigators to investigate, comprehend, and advance original concepts within their discipline, thus producing novel insights [48].

Research on drive distinguishes two primary categories: inward (intrinsic) drive and outward (extrinsic) drive [5, 49]. Inward drive connects to the degree of engagement and alignment a person feels toward their role. It depends on how much a scholar views their investigative tasks as meaningful, engaging, and demanding [50]. Outward drive, conversely, ties to personal goals and principles that support the creation of incentive and advancement structures related both to task progression and individual recognition [51]. For scholars, relevant mechanisms include career advancement in academia [52], pay raises, or reductions in teaching duties tied to scholarly achievements [53].

In higher education, investigations into the combined impact of inward and outward drive among scholars have yielded mixed findings [54, 55]. Certain works, including those by Shmatko and Volkova [56] or Kwiek [7], determined that inward drive offers greater benefits than outward drive due to the fulfillment derived from the investigative process itself. Fox [57] observed that strong inward drive in scholars can make up for limited outward incentives. As noted by Lovitts [33], investigators granted sufficient independence to shape and execute their projects tend to exhibit higher inward drive, stemming from the pleasure of pursuing topics that genuinely interest them [58].

Based on these insights, we anticipate that both inward and outward drive enhance scholars' fulfillment, professional standing, and rewards. Overall, we depict scholar drive in **Figure 2**.

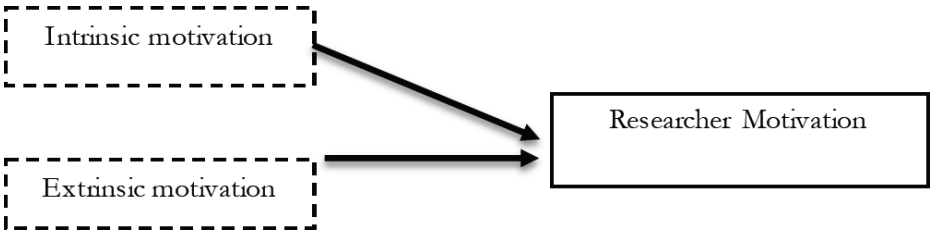

Figure 2. Theoretical research model for researcher motivation

Accordingly, we put forward the following hypotheses within this research framework:

Hypothesis 2: The beneficial impact of a researcher's abilities (academic human capital) on individual scientific performance strengthens as the researcher's motivation grows.

Hypothesis 2a: The beneficial impact of a researcher's abilities (academic human capital) on individual scientific performance strengthens as the researcher's intrinsic motivation grows.

Hypothesis 2b: The beneficial impact of a researcher's abilities (academic human capital) on individual scientific performance strengthens as the researcher's extrinsic motivation grows.

Prior studies indicate that even when employees possess both the capability and drive to carry out their tasks, performance may remain unaffected if the organization fails to supply essential resources [12, 59]. Opportunity refers to the situational factors that promote action, including the work setting and organizational support systems [60, 61]. This aspect encompasses features that either enable or hinder task completion, such as the specific arrangement of the employee's surrounding environment [62]. The literature distinguishes three primary types of resources for research: financial funding, access to skilled personnel, and physical plus digital infrastructure [63-65]. Financial funding, despite varying considerably across disciplines, has long been viewed as a core resource for research [66]. Certain investigations suggest that concentrating financial resources leads to superior research outcomes [67, 68].

The literature has additionally examined the role of qualified human resources in research settings. Several scholars argue that individual research output depends on the researcher's career stage [2]. These works indicate that scientific output tends to be heavily concentrated among a small group of experienced researchers [7]. However, given that contemporary scientific research largely involves teamwork, the availability of skilled personnel seems to hinge on achieving an appropriate balance in team structure. While senior researchers typically secure the human and material support required to advance research efforts [69, 70], junior researchers contribute by assisting in research tasks, thereby enabling seniors to enhance the team's intellectual capital and generate new knowledge and competencies that boost scientific performance [71]. Moreover, seasoned researchers play a vital role in improving the psychosocial environment for doctoral students, thereby raising the rate of successful PhD completions and overall group productivity [72-74]. Lastly, senior researchers should ensure that administrative and support staff allow academic members to concentrate on research and dedicate more time to it [74-76].

Finally, academic research depends on access to physical resources (laboratory space, facilities, and instruments) as well as digital resources (databases, scientific software, and statistical tools) [65]. Availability of specialized equipment and scholarly materials, among others, promotes scientific productivity [77]. In this regard, research such as that by Käpylä *et al.* [78] highlights the effective management and application of ICT as enhancers of research output, since they provide access to essential databases for literature searches. Nevertheless, this contrasts with findings from other works, such as Agasisti *et al.* [64], which found inconsistent effects of infrastructure on research efficiency across departments.

In summary, we outline the conceptualization of research opportunities in **Figure 3**.

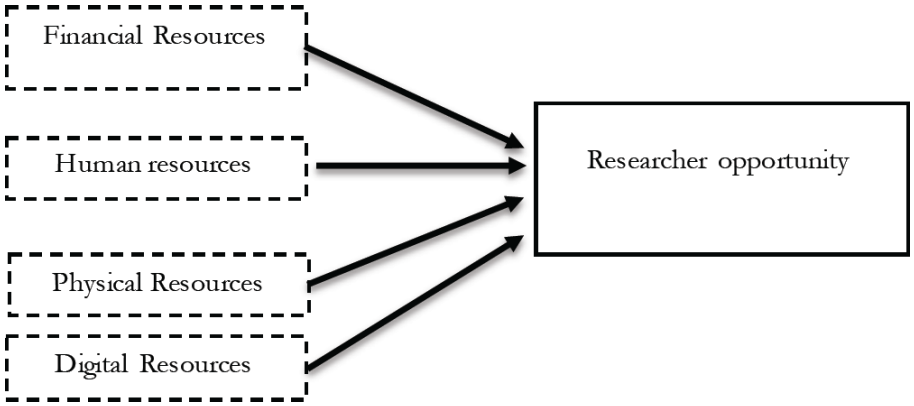

Figure 3. Theoretical research model for researcher opportunities

The review of publications implies that situational factors moderate the linkage between scholarly competencies (investigator capacities) and personal investigative output. Various established models, including the job demands-control framework, have noted interactive impacts between capacities and situational dimensions [79]. Thus, our framework posits that situational factors are essential to activate investigators' capacities and enhance scholarly output. Accordingly, we advance these propositions:

Hypothesis 3: Greater access to opportunities amplifies the beneficial impact of an investigator's capacities (scholarly human capital) on personal investigative output.

Hypothesis 3a: Increased monetary support strengthens the beneficial impact of an investigator's capacities (scholarly human capital) on personal investigative output.

Hypothesis 3b: Greater access to skilled personnel strengthens the beneficial impact of an investigator's capacities (scholarly human capital) on personal investigative output.

Hypothesis 3c: Greater access to tangible assets strengthens the beneficial impact of an investigator's capacities (scholarly human capital) on personal investigative output.

Hypothesis 3d: Greater access to virtual assets strengthens the beneficial impact of an investigator's capacities (scholarly human capital) on personal investigative output.

Figure 4 illustrates the proposed framework derived from the AMO perspective in the scholarly domain.

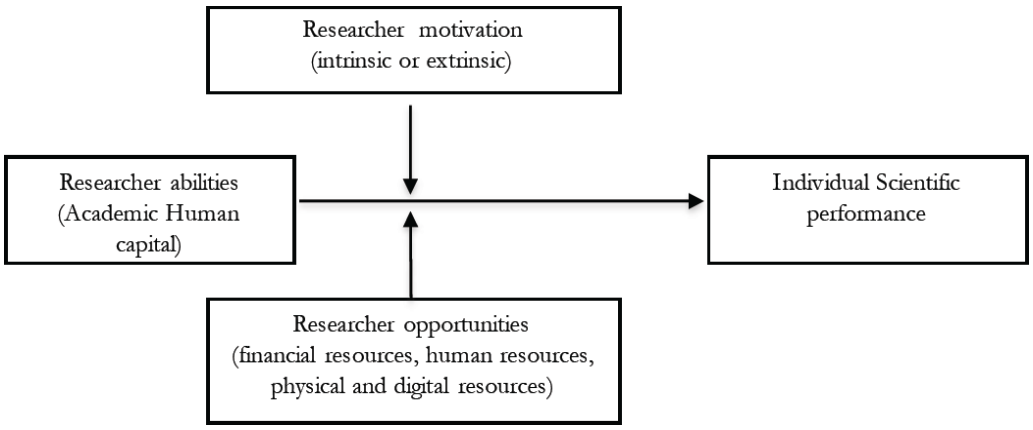

Figure 4. Conceptual framework for scholarly investigator productivity

Research approach

Questionnaire development

Given the absence of an established measurement instrument in existing publications, we opted to create and verify a customized instrument suited to investigative contexts. To achieve this, we employed a qualitative approach relying on specialist input and the Delphi technique [80]. This technique provides a structured, repeated process designed to secure agreement among specialists. Participants receive feedback on group views to facilitate convergence [80]. Our specialist group included lead investigators from the Andalusian Research Plan. Selection prioritized their extensive expertise in directing scholarly activities, overseeing projects, and leading teams. To reduce potential bias and personal influence inherent in such methods, specialists represented diverse disciplines [81]. The group ultimately comprised 62 lead investigators (20 from arts and humanities, 18 from sciences, 8 from health sciences, 6 from law and social sciences, and 10 from engineering and architecture). This disciplinary spread indicates that the examined constructs likely mirror those in other Spanish higher education institutions, as the Andalusian plan employs evaluation standards identical to those applied nationwide for research units. Thus, the chosen specialists share key traits with investigative teams across Spain.

We posed eight open-ended prompts to the group to build collective agreement. Following three iterative cycles, consensus emerged, yielding 36 indicators: 22 targeting competencies (human capital), 6 addressing drive, and 8 covering situational support. These formed the basis of a survey featuring 36 statements rated on a 5-point Likert format (1 = strongly disagree, 5 = strongly agree), plus background items on gender, age, years in academia, recognized research periods (sexenios), position level, discipline, and institution. A pilot test with a small investigator group followed to refine wording and structure. Throughout the specialist consultations and instrument creation, we actively removed unclear phrasing, ambiguous terms, and complicated expressions to limit common method variance (CMV).

Sample overview

Information was collected via a web-based questionnaire distributed to scholars at Spanish higher education institutions. Data collection occurred between January and October 2017. The instrument was forwarded to research offices at public universities for circulation, resulting in 2223 submissions. Given the study's framework and data type, we implemented rigorous checks for CMV. Following guidelines from Conway and Lance [82] and Podsakoff *et al.* [83], our assessments indicated no major CMV issue. Harman's single-factor test produced multiple components per AMO element, confirming limited impact on results [83]. Additionally, we applied partial correlation adjustments using a marker variable, comparing original and adjusted matrices per Lindell and Whitney [84]. Only one significant link lost significance post-adjustment, further supporting that CMV posed minimal threat.

For the analytic sample, we retained only participants providing a name or ORCID identifier and holding stable university posts (full professors—"catedráticos", tenured professors—"titulares de universidad", and permanent lecturers—"contratados doctores"). Identification enabled linking to publication records. To counter possible social desirability effects from self-identification, these items appeared last in the survey.

The cleaned dataset included 471 complete cases (21.19% of responses), offering robust measurement of the core constructs. **Table 1** Displays key sample characteristics.

Table 1. Descriptive statistics (n= 471)

Variable	Descriptive Statistics
Gender	Male: 65% Female: 35%

Age	>65 years: 4.8% 56-65 years: 26.5% 46-55 years: 49.1% 36-45 years: 19% <35 years: 0.8%
Length of academic career	>20 years: 67.3% 16-20 years: 17.2% 11-15 years: 10.2% 5-10 years: 4.7% <5 years: 0.6%
Number of six-year periods of research positively assessed (sexenio)	6: 3.0% 5: 10.4% 4: 20.3% 3: 22.4% 2: 20.7% 1: 15.8% 0: 7.5%
Academic rank	Full Professors (catedráticos): 31.8% Professors (titulares de universidad): 50.5% Associate Professors (contratado doctores): 17.6%
Field of study	Arts & Humanities: 15.1% Sciences: 37.7% Health Sciences: 8.1% Law & Social Sciences: 23% Engineering & Architecture: 16.2%
University	University of Oviedo: 9.6% University of Valladolid: 8.5% University Politécnica de Madrid: 7.9% University of Las Palmas de Gran Canaria: 7% University of Málaga: 6.8% University Complutense de Madrid: 5.3% University of Sevilla: 4.5% University of Alcalá: 3.8% University of Alicante: 3.8% University of León: 3.4% University of Zaragoza: 3.4% University of Cantabria: 3% University of Barcelona: 2.8% University of Granada: 2.8% University of La Laguna: 2.5% University Politécnica de Valencia: 2.5% University of Vigo: 2.3% University Autónoma de Madrid: 2.1% University of Coruña: 1.9% University of País Vasco: 1.9% University of Valencia: 1.9% University of Vic: 1.7% University Politécnica de Cataluña: 1.5% University Autónoma de Barcelona: 1.3% University of Burgos: 1.3% University of Córdoba: 1.3% University of Girona: 1.3% University of Almería: 0.6% University Politécnica de Cartagena: 0.6% University Rey Juan Carlos: 0.6% University of Salamanca: 0.6% University Carlos III: 0.4% University Pompeu Fabra: 0.4% University of Castilla La Mancha: 0.2% University IE University: 0.2% University Ramón Llull: 0.2%

Data examination

Factor exploration

We began with exploratory factor analysis to uncover underlying structures within the three core elements: competencies, drive, and situational support. Extraction used principal components, followed by varimax rotation. For each analysis, we confirmed suitability via the Kaiser-Meyer-Olkin measure and Bartlett's test of sphericity. Factor retention followed scree plot inspection [85] and eigenvalues exceeding 1 [86]. Poorly loading indicators were removed, prompting re-analysis.

Scholar Capacities (Scholarly Human Capital)

Table 2. Principal components analysis (varimax rotation) for investigator competencies (scholarly human capital) (n=471)

Survey Items	Factor 5	Factor 4	Factor 3	Factor 2	Factor 1
I am skilled at presenting and disseminating my research results					.831
I can easily build relationships with fellow researchers					.770
I am capable of coordinating research tasks (dissertations, projects, etc.)					.739
I can connect observations to experimental outcomes and draw conclusions					.703
I can conduct independent research					.675
I can adjust to shifts in my research environment					.653
I can detect potential research topics in my area					.635
I possess adequate preparation in research methods and techniques				.732	
I have sufficient theoretical background to perform research in my discipline				.723	
I am familiar with the key publications in my discipline				.716	
I have the ability to gather and handle information required for research				.677	
I am an innovative researcher			.797		
I am a proactive researcher			.718		
I am a persistent researcher in facing challenges			.626		
I possess strong observational abilities as a researcher			.522		
I am a methodical and disciplined researcher		.873			
I am a well-organized researcher		.838			
I am a determined and perseverant researcher		.687			
I am a researcher open to receiving criticism	.817				
I am capable of self-criticism in my research	.729				
I am a researcher who acts altruistically	.526				
Eigenvalues	1.091	1.338	1.370	2.251	7.042
Explained variance	5.19	6.37	6.52	10.72	33.54
Cronbach's alpha					.884

Kaiser-Meyer-Olkin Measure of Sampling Adequacy:	.896
Bartlett's Test of Sphericity:	
Approx. Chi-Square:	4010.596
gl:	210
Significance:	.000

In the primary construct (scholarly human capital), the extraction yielded five components **(Table 2)**. The statement "I am proficient in the language typically employed in journals, books, and conferences within my discipline" was dropped due to weak factor loading. The initial component comprised seven statements focused on aspects tied to executing investigative tasks, including disseminating results, collaborating with peers, and coordinating projects. These features enable scholars to advance their inquiries and careers effectively, so it was named "Investigative Capacities". The next component included four statements concerning the scholar's foundational training, methodological expertise, skill in locating and handling pertinent literature, and familiarity with key outlets in the domain; thus, it was termed "Domain Expertise". The third component grouped four statements reflecting the scholar's innovative mindset and self-initiated approach to inquiry, leading to the label "Innovative Initiative". The fourth component contained three statements addressing persistence, rigor, and systematic organization in work habits, named "Investigative Precision". The final component featured three statements evaluating the scholar's receptiveness to feedback and peer review, labeled "Receptivity to Feedback".

Investigator drive

For the drive construct, two components emerged **(Table 3)**. The statement "I conduct investigations to enhance my personal reputation" was excluded owing to inadequate loading. The leading component captured elements linked to external rewards, such as career advancement or recognition credits. The following component encompasses rewards derived from the inherent fulfillment of investigative work. Accordingly, the former was designated "Outward Drive" and the latter "Inward Drive".

Table 3. Principal components analysis (varimax rotation) for investigator drive (n= 471)

Item	Component 2	Component 1
I perform research to earn research evaluation credits		.857
I perform research to gain monetary incentives		.754
I perform research to achieve career promotions		.741
Conducting research is an integral part of my job	.871	
I perform research for my personal fulfillment	.843	
Eigenvalue	1.372	2.010
Explained variance	27.44	40.19

Cronbach's alpha	.617	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy:	.599	
Bartlett's Test of Sphericity		
Approx. Chi-Square:		417.064
gl:		10
Significance:		.000

Investigator situational support

The situational support construct retained eight statements distributed across two components **(Table 4)**. The primary component covered statements describing access to funding and personnel, whereas the secondary component addressed access to informational assets. Hence, the first received the label "Access to Funding and Personnel" and the second "Access to Informational Assets".

Table 4. Principal components analysis (varimax rotation) for investigator situational support (n= 471)

Item	Component 2	Component 1
I perform research to earn research evaluation credits		.857
I perform research to gain monetary incentives		.754
I perform research to achieve career promotions		.741
Conducting research is an integral part of my job	.871	
I perform research for my personal fulfillment	.843	
Eigenvalue	1.372	2.010
Explained variance	27.44	40.19

Cronbach's alpha	.690

Kaiser-Meyer-Olkin Measure of Sampling Adequacy:	.741	
Bartlett's Test of Sphericity		
Approx. Chi-Square:		176.433
gl:		28
Significance:		.000

To further validate the structure, we applied structural equation modeling in EQS [87] to assess nomological validity across the AMO constructs. Unidimensionality of each construct was confirmed through single-factor confirmatory analyses, evaluating model fit, parameter robustness, and significance. All indicators from the specialist phase and exploratory analysis were included, treating AMO elements as reflective higher-order constructs. **Table 5** reports fit metrics for the three constructs (investigator competencies—scholarly human capital, drive, and situational support). Values aligned with standard thresholds, supporting unidimensionality and justifying second-order modeling for each AMO element.

Table 5. Fit indices for unidimensional models of investigator competencies (scholarly human capital), drive, and situational support constructs

Construct	AGFI	GFI	RMSEA	IFI	CFI	BBNNFI
Academic human capital (Researcher abilities)	0.955	0.964	0.061	0.955	0.955	0.949
Researcher Motivation	0.991	0.998	0.065	0.976	0.975	0.918
Researcher Opportunities	0.964	0.982	0.068	0.951	0.949	0.920

Notes: Bentler-Bonnett Non-Normed Fit Index (BBNNFI); Comparative Fit Index (CFI); Incremental Fit Index (IFI); root mean square error of approximation (RMSEA); goodness of fit index (GFI); adjusted goodness of fit index (AGFI).

Regression examination

Predictors

The regression incorporated the five components of investigator competencies (scholarly human capital), the two components of drive, and the two components of situational support as predictors. **Table 6** maps the alignment between proposed hypotheses and extracted components. Drive components matched the conceptual framework, preserving outward and inward distinctions. In contrast, competencies and situational support displayed variations. Competencies, originally conceptualized under a three-part KSA structure, resolved into five distinct components, with skills separating into innovative initiative, investigative precision, and receptivity to feedback, while knowledge consolidated into one component. For situational support, funding and personnel access merged into one component, as did physical and digital asset access.

Table 6. Alignment between conceptual constructs and extracted components

Factorial Analysis Dimensions	Theoretical Dimensions
Explicit Scientific Knowledge	Theoretical Knowledge
Proactive Creativity and Research Accuracy	Scientific Skills
Skill in Accepting Criticism	
Research Abilities	Scientific Abilities
Intrinsic Motivation	Intrinsic Motivation
Extrinsic Motivation	Extrinsic Motivation
Availability of Financial and Qualified Human Resources	Availability of Financial Resources Availability of Qualified Human Resources
Availability of Physical and Digital Resources	Availability of Physical Resources Availability of Digital Resources Availability of Information Resources

Outcome measures

Scholarly output serves as the primary outcome in the framework. Using the investigator's name or ORCID identifier, we retrieved their H-index from the Scopus repository. The H-index [88] is widely applied to gauge investigative influence and excellence, as it remains robust against variations in total publication count—unlike impact factor—thus providing a stronger gauge of overall scholarly contribution [89]. Given the known limitations of the H-index, particularly skewness in its distribution [90], we employed data envelopment analysis (DEA) to establish an efficiency benchmark anchored on the H-index. DEA, a non-parametric optimization method, evaluates multiple inputs and outputs for each case relative to top-performing peers [91, 92]. Efficiency scores reflect the proportional gap from the optimal benchmark [93, 94]. The benchmark emerges from peak output levels achieved by the most productive cases [95]. Here, we derived this metric by normalizing the H-index against years of active scholarly engagement. This approach enables fair cross-comparison across career stages, outperforming raw metrics like the plain H-index or simple publication volume. Consequently, the DEA-derived score proves superior as the outcome measure.

Covariates:

Consistent with prior investigations, we included years in academia as a covariate to mitigate potential omitted variable effects in the estimations [96, 97].

Results and Discussion

To evaluate the propositions, we estimated four regression specifications using SPSS (version 21). **Table 7** displays pairwise correlations and summary statistics for all included constructs. **Table 8** reports the estimation outcomes. Specifications 1 and 2 assess the covariate and direct impact of scholarly human capital on personal investigative productivity. The direct associations in Specification 2 reveal that human capital exerts a favorable and robust influence on investigative productivity. Specifically, investigative capacities ($p < 0.01$) and domain expertise ($p < 0.05$) demonstrate positive effects. In contrast, investigative precision ($p > 0.10$) and receptivity to feedback ($p > 0.10$) show no direct influence. Notably, innovative initiative exhibits a marginally negative association ($p < 0.10$). These patterns support Hypotheses 1a, 1b, and 1d while refuting Hypothesis 1c.

Specifications 3 and 4 introduce interaction terms for the proposed moderators: drive (Specification 3) and situational support (Specification 4). Results from Specification 3 indicate that outward drive strengthens the associations of investigative capacities ($p < 0.01$) and domain expertise ($p < 0.01$) with productivity. Inward drive, however, weakens the link for investigative capacities ($p < 0.05$). Conversely, inward drive enhances ties for innovative initiative ($p < 0.01$), investigative precision ($p < 0.01$), and receptivity to feedback ($p < 0.01$). A substantial R^2 increment (0.411) upon adding interactions confirms moderation (see Specification 3). Thus, Hypotheses 2a and 2b receive partial support. Aligning with H3, situational support moderates the connection between scholarly human capital (investigator capacities) and productivity. Access to funding and personnel amplifies effects for investigative capacities ($p < 0.01$), domain expertise ($p < 0.01$), and investigative precision ($p < 0.10$). Access to informational assets strengthens links only for investigative capacities ($p < 0.01$) and receptivity to feedback ($p < 0.01$). An R^2 increase (0.108) after interactions validates moderation (see Specification 4). Overall, these patterns offer partial validation for Hypotheses 3a, 3b, 3c, and 3d.

Table 7. Summary statistics and pairwise correlations

	Variable	DT	M	11	10	9	8	7	6	5	4	3	2	1
1	Capability in conducting research	1	0											1
2	Depth of scientific expertise	1	0										1	.000
3	Initiative in creative thinking	0							1	.000	.000		1	
4	Precision in research outcomes	0						1	.000	.000	.000		1	
5	Ability to handle constructive feedback	0					1	.000	.000	.000	.000		1	
6	External motivational factors	0					1	-.006	.064	-.054	-.019	-.005	1	
7	Internal drive and motivation	1	0					1	.000	-.066	-.039	.340**	.225**	.314**
8	Access to personnel and funding resources	0			1	.090	.037	.011	-.075	.000	.040	.044	1	
9	Access to informational and data resources	0		1	.000	.027	.072	.086	.045	.120*	.036	-.025	1	
10	Data Envelopment Analysis (DEA) score	.139	.420		1	.121*	.223**	.069	-.077	-.018	.001	-.069	.101*	.299**

11	Years in academic career	.900	4.459	1	.125*	.071	-.027	.017	-.131**	.013	.082	.032	.133**	.098*

Table 8. Outcomes from linear regression estimations

Variables	Model 1	Model 2	Model 3	Model 4
Constant	.337** (.034)	.358** (.034)	.387** (.026)	.353** (.029)
Years in academic career	.015* (.007)	.011 (.007)	.004 (.006)	.011+ (.007)
Capability in conducting research		.052** (.005)	.059** (.005)	.052** (.005)
Depth of scientific expertise		.019* (.008)	.014* (.007)	.018* (.007)
Initiative in creative thinking		-.013+ (.007)	.002 (.005)	-.016* (.007)
Precision in research outcomes		.001 (.008)	.001 (.005)	.000 (.007)
Ability to handle constructive feedback		-.003 (.009)	.001 (.004)	-.007 (.009)
External motivation × Capability in conducting research			.034** (.005)	
External motivation × Depth of scientific expertise			.048** (.009)	
External motivation × Initiative in creative thinking			-.001 (.005)	
External motivation × Precision in research outcomes			-.001 (.005)	
External motivation × Ability to handle constructive feedback			.005 (.006)	
Internal drive × Capability in conducting research			-.009* (.004)	
Internal drive × Depth of scientific expertise			-.003 (.004)	
Internal drive × Initiative in creative thinking			.045** (.004)	
Internal drive × Precision in research outcomes			.037** (.004)	
Internal drive × Ability to handle constructive feedback			.043** (.004)	
Access to personnel and funding × Capability in conducting research				.048** (.007)
Access to personnel and funding × Depth of scientific expertise				.036** (.009)
Access to personnel and funding × Initiative in creative thinking				.000 (.008)
Access to personnel and funding × Precision in research outcomes				.014+ (.008)
Access to personnel and funding × Ability to handle constructive feedback				.011 (.007)
Access to informational resources × Capability in conducting research				.027** (.008)
Access to informational resources × Depth of scientific expertise				.003 (.007)
Access to informational resources × Initiative in creative thinking				-.008 (.006)
Access to informational resources × Precision in research outcomes				.010 (.006)
Access to informational resources × Ability to handle constructive feedback				.022** (.007)
Model F	4.222*	27.261**	48.202**	11.356**
Model R^2	.015	.183	.594	.291
Increase in R^2	-	.168	.411	.108

Prior publications emphasize that scholarly human capital exerts a favorable and robust impact on personal productivity. Investigations like McNie *et al.* [27] stress the need for both technical competencies and interpersonal traits to drive investigative success. Technical competencies encompass capacities for generating propositions, designing protocols, conducting studies, and disseminating findings. Interpersonal traits, meanwhile, involve behavioral and relational aspects among scholars. Accordingly, we classify investigative capacities and domain expertise as technical competencies, while categorizing innovative initiative, investigative precision, and receptivity to feedback as interpersonal traits. Indeed, our evidence highlights domain expertise and investigative capacities as core elements of scholarly human capital, aligning with insights from Bozeman *et al.* [32] and Durette *et al.* [26]. Moreover, our estimations reveal no direct influence from investigative precision or receptivity to feedback on personal investigative productivity. Surprisingly, innovative initiative displays a weakly negative linkage with productivity. These patterns deviate partly from expectations, as conceptual frameworks predict uniform positive contributions from all human capital elements. A potential interpretation is that highly original ideas may face barriers to journal acceptance, thus reducing measurable output. This linkage warrants additional scrutiny to verify its presence and strength.

Likewise, incorporating investigator drive and situational support as interaction factors markedly enhances model fit. The evidence reveals substantially stronger moderation from drive compared to situational support ($R^2 = 0.411$ versus $R^2 = 0.108$). Regarding drive, personal investigative productivity arises from the interplay between inward/outward drive and competencies (scholarly human capital), consistent with works like Janger and Nowotny [55]. Patterns suggest outward drive

bolsters technical competencies (investigative capacities and domain expertise), whereas inward drive amplifies interpersonal traits (innovative initiative, investigative precision, and receptivity to feedback). Notably, better employment terms and monetary incentives tied to outward drive heighten the influence of investigative capacities and domain expertise on productivity. In contrast, inward drive reinforces the role of interpersonal traits in driving output. Yet, inward drive dampens the connection for investigative capacities. This may stem from our focus on stably employed scholars, who already possess solid capacities and gain less from added inward drive for core tasks. Further exploration is required to substantiate this. Overall, evidence confirms that scholars exhibit drive patterns comparable to workers in other sectors.

Concerning situational support, our patterns align with contributions from Van der Weijden *et al.* [98] and Sutherland [99]. Predictably, institutional provision of funding and personnel strengthens ties between investigator competencies (scholarly human capital) and productivity. In particular, access to funding and personnel boosts technical competencies (investigative capacities and domain expertise) plus one interpersonal trait (investigative precision). Informational asset access, however, only amplifies investigative capacities (a technical competency) and receptivity to feedback (an interpersonal trait). This disparity likely relates to the tenured sample: funding and personnel enable ongoing skill development and rigor for elevated output, while informational assets prove less critical for publication among established scholars. Such assets do facilitate openness to peer critique by exposing scholars to others' work.

Conclusion

This research sought to pinpoint the elements influencing the scholarly output of individual academics. Theoretically, the investigation assessed the suitability of the AMO framework within a university setting. The model was employed to investigate the ways in which motivation and opportunities shape researchers' capabilities (referred to as academic human capital). While prior work has established AMO theory as a valid lens for understanding personal performance [15], its application to scholarly environments has been limited. Nonetheless, the components outlined in AMO theory proved effective in highlighting key drivers of personal research productivity. Accordingly, we introduce an original framework derived from AMO that elucidates how various forms of research motivation and opportunities enhance investigative competencies. Using a combined methods approach, the majority of our hypothesized relationships received empirical backing. On a theoretical level, this work expands the body of evidence concerning the aspects affecting scholars' capabilities, drives, and prospects in their discipline. We argue that emphasizing research motivation and opportunities provides insight into enhancements in an individual scholar's competencies.

In greater detail, the outcomes advance the field in multiple respects. Initially, the AMO-inspired framework comprehensively clarifies the links between its core elements and personal scholarly output. This theory enhances comprehension of the dynamics and interconnections among scholars' capabilities (academic human capital), drives, and prospects. Notably, even with obvious sectoral variances, academics appear to address challenges similarly to employees in other professional settings [100, 101]. Like employees elsewhere, university scholars cultivate competencies and drives that yield professional benefits. Similarly, institutional and environmental prospects enable progress, as demonstrated here. Furthermore, the work pinpoints context-specific indicators: five linked to academic human capital (research abilities, scientific knowledge, proactive creativity, research accuracy, and skill of accepting criticism), two tied to research motivation (extrinsic and intrinsic motivation), and two associated with research opportunities (availability of economic and human resources and availability of information resources). Such factors are vital for effective scholarly work among university-based investigators. Various entities (institutions, teams, and individuals) may leverage these traits to boost investigative efforts. For demanding roles such as scholarship, a full AMO inventory can aid in evaluating one's status and determining requirements for effective execution. Next, empirical evidence showed that scholars' capabilities (academic human capital) positively affect personal research productivity. This beneficial effect of human capital on scholarship suggests the need for investigators to build, sustain, and refine targeted skills for the proper conduct of inquiries; these findings align with established views on academic human capital [32]. Unexpectedly, proactive creativity displayed a modest inverse link with output, possibly due to constraints imposed by ongoing research agendas and group directions that reduce room for novel departures or ideas often undervalued by journals. The data reveal that extrinsic motivation bolsters hard skills (research abilities and scientific knowledge), whereas intrinsic motivation fosters soft skills (proactive creativity, research accuracy, and the skill of accepting criticism). Thus, this investigation reinforces earlier observations on ties between intrinsic and extrinsic drives among scholars [5, 55]. Prior discourse indeed posits bidirectional influences of these motivational aspects on scholarly results [51]. Moreover, prospects hold special importance for academics. Though prior efforts have addressed scholarly engagement options, this analysis advances by using statistical inference to probe ties between capabilities and output; respondents reported higher access to economic and human resources compared to information resources. Findings indicate that economic and human resources are required to bolster hard skills (research abilities and scientific knowledge) along with one soft skill aspect (research accuracy). In contrast, information resources supported solely one hard skill (research abilities) and the remaining soft skill (the skill of

accepting criticism). Overall, motivation and opportunities among scholars propel their capabilities toward superior research productivity.

Practically, the findings hold value for institutional leaders and principal investigators aiming to elevate academic human capital quality and efficiency (scholars' capabilities), nurture drives, and supply essential prospects for inquiry. The outlined framework can guide institutions in crafting integrated strategies for capability, drive, and prospect development suited to scholars' workplace demands. In particular, sound approaches to recruiting academics, professional development, performance reviews, and incentives [28, 102] may shape capability and drive growth. Hence, administrators should implement human resource strategies that elevate scholars' capabilities and drives, given their direct and mediated ties to output, thereby helping retain and sustain high productivity by targeting underlying linkages. Institutions supplying requisite assets (financial, personnel, informational) can empower scholars to raise their output levels. Given that collaborative scholarship often correlates positively with growth and results [103], partnerships involving junior scholars and assistants may aid in building new competencies while offering broader job fulfillment perspectives. Another applied use of AMO lies in its potential for external accountability. Institutions might apply the framework to optimize asset distribution and stimulate scholarly drives. Leaders can draw on these insights to formulate strategies boosting capabilities, drives, and prospects to advance personal research productivity; parallel applications appear in non-academic settings [22, 104].

Limitations and directions for future research

Several constraints in this work suggest avenues for subsequent inquiry. Primarily, disentangling the intricate interconnections among variables demands longitudinal designs to accurately capture model dynamics. Additionally, outcomes may vary by disciplinary traits, warranting deeper exploration of influential field-specific features. Next, the nationally bounded sample calls for cross-national replication to account for contextual impacts on AMO components. Lastly, stratifying data by institutional geography, discipline, or career stage could address this constraint, potentially revealing variances, especially regarding resource access.

Acknowledgments: None

Conflict of interest: None

Financial support: Authors are ordered alphabetically and have contributed equally to this paper. This study was supported by: 1- The Spanish Ministry of Economy and Competitively under Grant ECO2014-56580-R; 2- The Andalusian Government (Spain) under Grant P12-SEJ-1810; 3- The Andalusian Government (Spain) under Grant P12-SEJ-1618; and 4- Research Projects University of Cadiz under Grant PR2016-018.

Ethics statement: None

References

1. Auranen O, Nieminen M. University research funding and publication performance—An international comparison. Res Policy. 2010;39:822-34. doi:10.1016/j.respol.2010.03.003.
2. Gonzalez-Brambila C, Veloso FM. The determinants of research output and impact: A study of Mexican researchers. Res Policy. 2007;36:1035-51. doi:10.1016/j.respol.2007.03.005.
3. Turner L, Mairesse J. Individual productivity differences in scientific research: An econometric study of the publications of French physicists. Working Paper. 2003.
4. Rorstad K, Aksnes DW. Publication rate expressed by age, gender and academic position – a large-scale analysis of Norwegian academic staff. J Informetrics. 2015;9:317-33. doi:10.1016/j.joi.2015.02.003.
5. Wollersheim J, Lenz A, Welpe IM, Spörrle M. Me, myself, and my university: A multilevel analysis of individual and institutional determinants of academic performance. J Bus Econ. 2015;85(3):263-91. doi:10.1007/s11573-014-0735-3.
6. Buchmueller TC, Dominitz J, Hansen WL. Graduate training and the early career productivity of Ph. D. economists. Econ Educ Rev. 1999;18(1):65-77. doi:10.1016/S0272-7757(98)00019-3.
7. Kwiek M. The European research elite: A cross-national study of highly productive academics in 11 countries. High Educ. 2016;71(3):379-97. doi:10.1007/s10734-015-9910-x.
8. Bazeley P. Conceptualising research performance. Stud High Educ. 2010;35(8):889-903. doi:10.1080/03075070903348404.
9. Diem A, Wolter SC. The use of bibliometrics to measure research performance in education sciences. Res High Educ. 2013;54:86-114. doi:10.1007/s11162-012-9264-5.
10. Dundar H, Lewis DR. Determinants of research productivity in higher education. Res High Educ. 1998;39(6):607-31. doi:10.1023/A:1018705823763.

11. Hedjazi Y, Behravan J. Study of factors influencing research productivity of agriculture faculty members in Iran. High Educ. 2011;62(5):635-47. doi:10.1007/s10734-011-9410-6.
12. Jiang K, Lepak DP, Hu J, Baer JC. How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. Acad Manag J. 2012;55(6):1264-94. doi:10.5465/amj.2011.0088.
13. Marin-Garcia JA, Martinez-Tomas J. Deconstructing AMO framework: A systematic review. Intang Cap. 2016;12(4):1040-87. doi:10.3926/ic.838.
14. Benet-Zepf A, Marin-Garcia J, Küster I. Clustering the mediators between the sales control systems and the sales performance using the AMO model: A narrative systematic literature review. Intang Cap. 2018;14(3):387-408. doi:10.3926/ic.1222.
15. Bos-Nehles AC, Van Riemsdijk MJ, Kees-Looise J. Employee perceptions of line management performance: Applying the AMO theory to explain the effectiveness of line managers' HRM implementation. Hum Resour Manag. 2013;52(6):861-77. doi:10.1002/hrm.21578.
16. Van Waeyenber T, Decramer A. Line managers' AMO to manage employees' performance: The route to effective and satisfying performance management. Int J Hum Resour Manag. 2018;29(22):3093-3114. doi:10.1080/09585192.2018.1445656.
17. Bouwmans M, Runhaar P, Wesselink R, Mulder M. Stimulating teachers' team performance through team-oriented HR practices: the roles of affective team commitment and information processing. Int J Hum Resour Manag. 2019;30(5):856-78. doi:10.1080/09585192.2017.1322626.
18. Runhaar P. How can schools and teachers benefit from human resources management? Conceptualising HRM from content and process perspectives. Educ Manag Adm Leadersh. 2017;45(4):639-56. doi:10.1177/1741143215623786.
19. Johns G. Reflections on the 2016 decade award: Incorporating context in organisational research. Acad Manag Rev. 2017;42:577-95. doi:10.5465/amr.2017.0044.
20. Wright PM, McMahan GC. Exploring human capital: Putting 'human' back into strategic human resource management. Hum Resour Manag J. 2011;21(2):93-104. doi:10.1111/j.1748-8583.2010.00165.x.
21. Appelbaum E, Bailey TT, Berg P, Kallenberg A. Manufacturing advantage: Why high-performance work systems pay off. Ithaca, NY: Cornell University Press; 2000.
22. Beltrán-Martín I, Bou-Llusar JC. Examining the intermediate role of employee abilities, motivation and opportunities to participate in the relationship between HR bundles and employee performance. Bus Res Q. 2018;21:99-110. doi:10.1016/j.brq.2018.02.001.
23. Wang Z, Xu H. How and when service-oriented high-performance work systems foster employee service performance: A test of mediating and moderating processes. Employee Relat. 2017;39(4):523-40. doi:10.1108/ER-07-2016-0140.
24. Knies E, Leisink P. Linking people management and extra-role behaviour: Results of a longitudinal study. Hum Resour Manag J. 2014;24(1):57-76. doi:10.1111/1748-8583.12023.
25. Kim KY, Pathak S, Werner S. When do international human capital enhancing practices benefit the bottom line? An ability, motivation, and opportunity perspective. J Int Bus Stud. 2015;46(7):784-805. doi:10.1057/jibs.2015.10.
26. Durette B, Fournier M, Lafon M. The core competencies of PhDs. Stud High Educ. 2016;41(8):1355-70. doi:10.1080/03075079.2014.968540.
27. McNie EC, Parris A, Sarewitz D. Improving the public value of science: A typology to inform discussion, design and implementation of research. Res Policy. 2016;45(4):884-95. doi:10.1016/j.respol.2016.01.004.
28. Thunnissen M, Van Arensbergen P. A multi-dimensional approach to talent: An empirical analysis of the definition of talent in Dutch academia. Pers Rev. 2015;44(2):182-99. doi:10.1108/PR-10-2013-0190.
29. Nonaka I, Takeuchi H. The knowledge-creating company: How Japanese companies create the dynamics of innovation. Oxford University Press; 1995. doi:10.1016/0024-6301(96)81509-3.
30. Horta H, Santos JM. The impact of publishing during PhD studies on career research publication, visibility, and collaborations. Res High Educ. 2016;57(1):28-50. doi:10.1007/s11162-015-9380-0.
31. Su X. Postdoctoral training, departmental prestige and scientists' research productivity. J Technol Transf. 2011;36(3):275-91. doi:10.1007/s10961-009-9133-3.
32. Bozeman B, Dietz J, Gaughan M. Scientific and technical human capital: An alternative model for research evaluation. Int J Technol Manag. 2001;22(8):716-40. doi:10.1504/IJTM.2001.002988.
33. Lovitts BE. Being a good course-taker is not enough: A theoretical perspective on the transition to independent research. Stud High Educ. 2005;30(2):137-54. doi:10.1080/03075070500043093.
34. Lee HF, Miozzo M, Laredo P. Career patterns and competences of PhDs in science and engineering in the knowledge economy: The case of graduates from a UK research-based university. Res Policy. 2010;39(7):869-81. doi:10.1016/j.respol.2010.05.001.
35. Prpić K. Characteristics and determinants of eminent scientists' productivity. Scientometrics. 1996;36(2):185-206. doi:10.1007/BF02017313.

36. Rowley J. Is higher education ready for knowledge management? Int J Educ Manag. 2000;14(7):325-33. doi:10.1108/09513540010378978.
37. Tiam J, Nakamori Y, Wierzbicki AP. Knowledge management and knowledge creation in academia: A study based on surveys in a Japanese research university. J Knowl Manag. 2009;13(2):76-92. doi:10.1108/13673270910942718.
38. Bentley PJ, Kyvik S. Individual differences in faculty research time allocations across 13 countries. Res High Educ. 2013;54(3):329-48. doi:10.1007/s11162-012-9273-4.
39. Marie J. Postgraduate science research skills: The role of creativity, tacit knowledge, thought styles and language. Lond Rev Educ. 2008;6(2):149-58. doi:10.1080/14748460802185136.
40. Bell E, Bryman A. The ethics of management research: An exploratory content analysis. Br J Manag. 2007;18:63-77. doi:10.1111/j.1467-8551.2006.00487.x.
41. Ulrich W, Dash DP. Research skills for the future: Summary and critique of a comparative study in eight countries. J Res Pract. 2013;9(1):1-21.
42. Coff R, Kryscynski D. Invited editorial: Drilling for micro-foundations of human capital-based competitive advantages. J Manag. 2011;37(5):1429-43. doi:10.1177/0149206310397772.
43. Harris CM, McMahan GC, Wright PM. Talent and time together: The impact of human capital and overlapping tenure on unit performance. Pers Rev. 2012;41(4):408-27. doi:10.1108/00483481211229357.
44. Wright PM, Coff R, Moliterno TP. Strategic human capital: Crossing the great divide. J Manag. 2014;40(2):353-70. doi:10.1177/0149206313518437.
45. Ployhart RE, Moliterno TP. Emergence of the human capital resource: A multilevel model. Acad Manag Rev. 2011;36(1):127-50. doi:10.5465/amr.2009.0318.
46. Mitchell TR. Motivation: New directions for theory, research and practice. Acad Manag Rev. 1982;7(1):80-8. doi:10.5465/amr.1982.4285467.
47. MacDuffie JP. Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. Ind Lab Relat Rev. 1995;48(2):197-221. doi:10.1177/001979399504800201.
48. Bland CJ, Center BA, Finstad DA, Risbey KR, Staples JG. A theoretical, practical, predictive model of faculty and department research productivity. Acad Med. 2005;80(3):225-37. doi:10.1097/00001888-200503000-00006.
49. Deemer ED, Martens MP, Buboltz WC. Toward a tripartite model of research motivation: Development and initial validation of the research motivation scale. J Career Assess. 2010;18(3):292-309. doi:10.1177/1069072710364794.
50. Van der Weijden I, Belder R, Van Arensbergen P, Van den Besselaar P. How do young tenured professors benefit from a mentor? Effects on management, motivation and performance. High Educ. 2015;69(2):275-87. doi:10.1007/s10734-014-9774-5.
51. Peng JE, Gao X. Understanding TEFL academics' research motivation and its relations with research productivity. SAGE Open. 2019;9(3):2158244019866295. doi:10.1177/2158244019866295.
52. Tien FF. What kinds of faculty are motivated to perform research by the desire for promotion? High Educ. 2008;55:17-32. doi:10.1007/s10734-006-9033-5.
53. Lissoni F, Mairesse J, Montobbio F, Pezzoni M. Scientific productivity and academic promotion: A study on French and Italian physicists. Ind Corp Change. 2011;20:253-94. doi:10.1093/icc/dtq073.
54. Hardre PL, Kollmann SL. Motivational implications of faculty performance standards. Educ Manag Adm Leadersh. 2012;40:724-51. doi:10.1177/1741143212456913.
55. Janger J, Nowotny K. Job choice in academia. Res Policy. 2016;45:1672-83. doi:10.1016/j.respol.2016.05.001.
56. Shmatko N, Volkova G. Service or devotion? Motivation patterns of Russian researchers. Foresight STI Gov. 2017;11:54-66. doi:10.17323/2500-2597.2017.1.54.66.
57. Fox MF. Publication productivity among scientists: A critical review. Soc Stud Sci. 1983;13:285-305. doi:10.1177/030631283013002005.
58. Chen Y, Gupta A, Hoshower L. Factors that motivate business faculty to conduct research: An expectancy theory analysis. J Educ Bus. 2006;81:179-89. doi:10.3200/JOEB.81.4.179-189.
59. Lepak DP, Liao H, Chung Y, Harden E. A conceptual review of human resource management systems in strategic human resource management research. Res Pers Hum Resour Manag. 2006;25:217-71. doi:10.1016/S0742-7301(06)25006-0.
60. Boxall P, Purcell J. Strategy and Human Resource Management. Basingstoke: Palgrave Macmillan; 2003.
61. Siemsen E, Roth AV, Balasubramanian S. How motivation, opportunity, and ability drive knowledge sharing: The constraining-factor model. J Oper Manag. 2008;26:426-45. doi:10.1016/j.jom.2007.09.001.
62. Blumberg M, Pringle C. The missing opportunity in organizational research: Some implications for a theory of work performance. Acad Manag Rev. 1982;7:560-69. doi:10.5465/amr.1982.4285240.
63. Agasisti T, Catalano G, Landoni P, Verganti R. Evaluating the performance of academic departments: An analysis of research-related output efficiency. Res Eval. 2012;21:2-14. doi:10.1093/reseval/rvr001.

64. Agasisti T, Dal Bianco A, Landoni P, Sala A, Salerno M. Evaluating the efficiency of research in academic departments: an empirical analysis in an Italian region. High Educ Q. 2011;65:267-89. doi:10.1111/j.1468-2273.2011.00489.x.
65. Schuelke-Leech BA. Resources and research: An empirical study of the influence of departmental research resources on individual STEM researchers involvement with industry. Res Policy. 2013;42:1667-78. doi:10.1016/j.respol.2013.06.010.
66. Hicks D. Performance-based university research funding systems. Res Policy. 2012;41:251-61. doi:10.1016/j.respol.2011.09.007.
67. Lariviere V, Macaluso B, Archambault E, Gingras Y. Which scientific elites? On the concentration of research funds, publications and citations. Res Eval. 2010;19:45-53. doi:10.3152/095820210X492495.
68. Zucker LG, Darby MR, Furner J, Liu RC, Ma H. Minerva unbound: Knowledge stocks, knowledge flows and new knowledge production. Res Policy. 2007;36:850-63. doi:10.1016/j.respol.2007.02.007.
69. Carayol N, Matt M. Does research organization influence academic production? Laboratory level evidence from a large European university. Res Policy. 2004;33:1081-102. doi:10.1016/j.respol.2004.03.004.
70. Delamont S, Atkinson P, Parry O. Critical mass and doctoral research: Reflections on the Harris report. Stud High Educ. 1997;22:319-31. doi:10.1080/03075079712331380926.
71. White CS, James K, Burke LA, Allen RS. What makes a research star? Factors influencing the research productivity of business faculty. Int J Prod Perform Manag. 2012;61:584-602. doi:10.1108/17410401211249175.
72. Curtin N, Malley J, Stewart AJ. Mentoring the next generation of faculty: Supporting academic career aspirations among doctoral students. Res High Educ. 2016;57:714-38. doi:10.1007/s11162-015-9403-x.
73. Levecque K, Ansell F, De Beuckelaer A, Van der Heyden J, Gisle L. Work organization and mental health problems in PhD students. Res Policy. 2017;46:868-79. doi:10.1016/j.respol.2017.02.008.
74. Nguyen TLH. Building human resources management capacity for university research: The case at four leading Vietnamese universities. High Educ. 2016;71:231-51. doi:10.1007/s10734-015-9898-2.
75. Barham BL, Foltz JD, Prager D. Making time for science. Res Policy. 2014;43:21-31. doi:10.1016/j.respol.2013.08.007.
76. Mudrak J, Zabrodska K, Kveton P, Jelinek M, Blatny M, Solcova I, et al. Occupational well-being among university faculty: A job demands-resources model. Res High Educ. 2018;59:325-48. doi:10.1007/s11162-017-9467-x.
77. Wang J, Peters HP, Guan J. Factors influencing knowledge productivity in German research groups: Lessons for developing countries. J Knowl Manag. 2006;10:113-26. doi:10.1108/13673270610679408.
78. Käpylä J, Jääskeläinen A, Lönnqvist A. Identifying future challenges for productivity research: Evidence from Finland. Int J Prod Perform Manag. 2010;59:607-23. doi:10.1108/17410401011075620.
79. Karasek RA. Job demands, job decision latitude and mental strain. Implications for job redesign. Adm Sci Q. 1979;24:285-308. doi:10.2307/2392498.
80. Landeta J. El método Delphi, una técnica de previsión del futuro. Barcelona: Ariel S.A.; 1999.
81. Okoli C, Pawlowski SD. The Delphi method as a research tool: An example, design considerations and applications. Inf Manag. 2004;42:15-29. doi:10.1016/j.im.2003.11.002.
82. Conway JM, Lance CE. What reviewers should expect from authors regarding common method bias in organizational research. J Bus Psychol. 2010;25:325-34. doi:10.1007/s10869-010-9181-6.
83. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J Appl Psychol. 2003;88:879-903. doi:10.1037/0021-9010.88.5.879.
84. Lindell MK, Whitney DJ. Accounting for common method variance in cross-sectional research designs. J Appl Psychol. 2001;86:114-21. doi:10.1037/0021-9010.86.1.114.
85. Cattell RB. The scree test for the number of factors. Multivar Behav Res. 1966;1:245-76. doi:10.1207/s15327906mbr0102_10.
86. Kaiser HF. An index of factorial simplicity. Psychometrika. 1974;39:31-6. doi:10.1007/BF02291575.
87. Bentler PM. EQS Structural Equations Program Manual. Encino, CA: Multivariate Software Inc; 1995.
88. Hirsch JE. An index to quantify an individual's scientific research output. Proc Natl Acad Sci U S A. 2005;102:16569-72. doi:10.1073/pnas.0507655102.
89. Egghe L. Mathematical theory of the h- and g-index in case of fractional counting of authorship. J Am Soc Inf Sci Technol. 2008;59:1608-16. doi:10.1002/asi.20845.
90. Iglesias JE, Pecharroman C. Scaling the h-index for different scientific ISI fields. Scientometrics. 2007;73:303-20. doi:10.1007/s11192-007-1805-x.
91. Amara N, Rhaiem M, Halilem N. Assessing the research efficiency of Canadian scholars in the management field: Evidence from the DEA and fsQCA. J Bus Res. 2020;115:296-306. doi:10.1016/j.jbusres.2019.10.059.
92. Cook WD, Ramón N, Ruiz JL, Sirvent I, Zhu J. DEA-based benchmarking for performance evaluation in pay-for-performance incentive plans. Omega. 2019;84:45-54. doi:10.1016/j.omega.2018.04.004.

93. Papadimitriou M, Johnes J. Does merging improve efficiency? A study of English universities. 2018. doi:10.1080/03075079.2018.1450851.
94. Sagarra M, Molinero CM, Agasisti T. Exploring the efficiency of Mexican universities: Integrating Data Envelopment Analysis and Multidimensional Scaling. Omega. 2017;67:123-33. doi:10.1016/j.omega.2016.04.006.
95. Kumar A, Thakur RR. Objectivity in performance ranking of higher education institutions using dynamic data envelopment analysis. 2019. doi:10.1108/IJPPM-03-2018-0089.
96. Bäker A. Non-tenured post-doctoral researchers' job mobility and research output: An analysis of the role of research discipline, department size, and coauthors. Res Policy. 2015;44:634-50. doi:10.1016/j.respol.2014.12.012.
97. Leahey E, Beckman CM, Stanko TL. Prominent but less productive: the impact of interdisciplinarity on scientists' research. Adm Sci Q. 2017;62:105-39. doi:10.1177/0001839216665364.
98. VanderWeijden I, de Gilderb D, Groenewegenb P, Klasenc E. Implications of managerial control on performance of Dutch academic (bio) medical and health research groups. Res Policy. 2008;37:1616-29. doi:10.1016/j.respol.2008.06.007.
99. Sutherland KA. Constructions of success in academia: an early career perspective. Stud High Educ. 2017;42:743-59.
100. Szulc JM, Davies J, Tomczak MT, McGregor FL. AMO perspectives on the well-being of neurodivergent human capital. Employee Relat. 2021;43:858-72. doi:10.1108/ER-09-2020-0446.
101. Szulc JM, Smith R. Abilities, motivations, and opportunities of furloughed employees in the context of COVID-19: Preliminary evidence from the UK. Front Psychol. 2021;12:635144. doi:10.3389/fpsyg.2021.635144.
102. Ayaita A, Pull K, Backes-Gellner U. You get what you 'pay' for: Academic attention, career incentives and changes in publication portfolios of business and economics researchers. J Bus Econ. 2019;89:273-90. doi:10.1007/s11573-017-0880-6.
103. Lee S, Bozeman B. The impact of research collaboration on scientific productivity. Soc Stud Sci. 2005;35:673-702. doi:10.1177/0306312705052359.
104. Andreeva T, Sergeeva A. The more the better or is it? The contradictory effects of HR practices on knowledge-sharing motivation and behaviour. Hum Resour Manag J. 2016;26:151-71. doi:10.1111/1748-8583.12100.