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Exploring the impact of organizational characteristics on research agendas across scientific fields

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Abstract

An increasing culture of performativity has led to changes in the organizational landscape of academic institutions. While the impact of these changes on outputs is well documented, their impact on academics' strategic research agendas is still an emerging topic. This study expands upon previous research on this issue and focuses on comparing these dynamics across all fields of science using a global sample of academics. We found that most of the relationships between organizational features and research agendas were mostly consistent across disciplines, with variations mainly in the strength rather than the direction of effects. The perceived access to resources, autonomy, and collegiality was the key driver in promoting ambitious, collaborative, discovery-driven, and multidisciplinary agendas. Furthermore, our findings suggest a concerning trend in research institutions: academics that are more willing to stay in their institutions and are more aligned with its demands are less inclined to pursue trailblazing agendas. Although most of these effects were universal, some field-specific dynamics are also discussed, notably in what concerns the so-called "hard" sciences. This study highlights the importance of promoting a collegial environment with a high degree of autonomy to foster discovery-driven research and underscores the potential risks of the "publish or perish" culture prevalent in academia.

Keywords Autonomy · Research organizations · Science studies · Research agendas · Collegiality

Introduction

Over the past few years, shifting dynamics have been observed within academic institutions as a response to the growing culture of performativity (Hammarfelt & Rushforth, 2017). Increased competition between institutions has led to strategies aiming toward maximization of indicators, typically publication throughput (Hicks, 2012; Martin, 2011), even though these policies have the potential to curtail novelty and breakthrough science (Young, 2015), especially given that funding agencies tend to foster safer and

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more conservative research (Siler et al., 2015). As this corporative approach tends to favor quantity over novelty, academics tend to lose part of their agency and autonomy as they are faced with an ever-growing amount of metrics which need to be met (Oleksiyenko & Tierney, 2018). In such a competitive environment, it is therefore no surprise that collegiality begins to erode as professional survival becomes a priority (Giroux, 2015; Yokoyama, 2006).

This has resulted in a shift of organizational dynamics, and it is known that academics tend to conform to this kind of changes due to the largely uncertain and sometimes precarious nature of their careers (Long & McGinnis, 1981). The widespread adoption of managerialist practices and performativity is, by definition, at odds with the intrinsic nature of academic freedom, as the choice of a research topic should be a highly personal one (Polanyi, 2000); indeed, these practices have been shown to undermine work which is, essentially, creativity-driven by nature (Kallio & Kallio, 2014) — thus, creating a work environment where autonomy is limited, and achievement is reduced to metrics (Edgar & Geare, 2013). This has been shown to decrease the revolutionary nature of work that is produced, despite the fact that work is indeed produced in larger quantities (Young, 2015). The reduction in autonomy, coupled with increased difficulties in securing funding due to the emergence of evaluation schemes which are more focused on the practical impact of research — and in some cases, monetization potential (Smit & Hessels, 2021) — leads to reduced individual agency and, eventually, compliance (Leathwood & Read, 2013).

These changing dynamics also lead to a shift in researchers' agendas (Horta & Santos, 2019). Strategic Research Agendas (SRA) lie at the beginning of any research process and reflect an academic's strategies and preferences toward how to pursue their research (Santos & Horta, 2018). They are a part of the academic process that is both personal (Polanyi, 2000) but also shaped by environmental factors (Bazeley, 2010); even though an academic might be interested in pursuing a topic of interest, his or her agenda is likely to shift to one which is more aligned with institutional demands even when the outcome is more conservative (Leisyte, 2007; Rzhetsky et al., 2015). This might occur, for example, if continuance in the institution is contingent on securing external research funding and resources (Leisyte & Dee, 2012). In particular, this is especially damaging to early-stage careers who have yet to secure tenure and have little choice but adapt to a changing environment in order to maintain professional security (Leisyte, 2007).

Despite what is known about the relationship between organizational features and SRA (Horta & Santos, 2019), there is a gap in understanding the potential field-specific nuances of these dynamics. The influences exerted by these features, such as resources, autonomy, and social satisfaction, may vary significantly across different scientific fields due to their unique cultural, epistemological, and structural characteristics (Becher & Trowler, 2001). For instance, what fuels scientific ambition in the natural sciences may not hold the same impact in the social sciences. Thus, these field-specific influences represent an important yet under-explored aspect of research agenda-setting in academia. Understanding these field-specific dynamics carries significant implications for the development of effective management strategies in academic institutions. Two scenarios are possible regarding the impact of organizational features on research agendas:

The first possible scenario is that these relations vary by field; the one-size-fits-all approach often adopted in academia overlooks the potential variations in how different fields respond to institutional pressures and opportunities (Leisyte & Dee, 2012; Teichler et al., 2013). Hence, under this scenario, a deeper understanding of field-specific dynamics could enable the development of targeted strategies that foster more ambitious and break-through research while considering the unique cultural and structural contexts of different scientific fields. This approach could ultimately contribute to a more productive and conducive research environment across the diverse spectrum of academic disciplines.

The second possible scenario is that previous findings in the social sciences — notably that autonomy and collegiality are crucial in fostering multidisciplinary, collaborative, and discover-driven agendas, while high levels of organizational commitment lead to more conservative and risk-averse agendas (Horta & Santos, 2019) — are consistent across all fields of science. This second scenario is substantially more troubling, as it would indicate that the "fall in line" effect — where researchers comply with institutional demands and deliberately produce conservative research for the sake of metrics alone (Rzhetsky et al., 2015) — has permeated all disciplines of science, which is likely to represent a substantial threat to scientific progress in the near future.

The goal of this study is to investigate which of these two scenarios is occurring, and thus answer the following question: how does the impact of organizational features on research agendas vary by field of science? To accomplish this, we expand on the findings of a previous study which focused precisely on the effect of organizational features on research agendas (Horta & Santos, 2019). Although in the current exercise we also investigate the impact of organizational features on Strategic Research Agendas, two distinguishing novelties are introduced. First, the original study was restricted to the social sciences; in this exercise, a much larger sample is employed, encompassing researchers from all fields of science. As such, the current research takes on a comparative approach, using a moderation-based approach to determine how the impact of organizational features on research agendas varies by field of science. Second, this study makes use of the revised version of the Multi-Dimensional Research Agendas Inventory (Horta & Santos, 2020), and as such introduces two new variables of interest — academia-orientation and society-orientation.

To contextualize the directionality of the relations to be explored in this study, we make use of the Ecological Systems Theory framework (Bronfenbrenner, 2000). This framework, initially created as a developmental theory, has been successfully applied to various organizational studies (e.g., Chandler et al., 2011; Musgrave & Woodward, 2016) due to its flexibility and ease of application. Indeed, in the current context, a researcher's agenda can be argued as a development that results from the individual's past experiences (Horta et al., 2021), personal characteristics (Santos et al., 2020), and work environment (Horta & Santos, 2019). The Ecological Systems Theory posits that individuals operate within nested, interacting systems. From the most proximate to the most distal, these systems are the microsystem (reflecting the personal and direct experiences of the researcher); the mesosystem (representing the interactions and affiliations of the researcher within the organization); the exosystem (denoting the broader organizational or institutional determinants that directly mold the researcher's experiences); and the macrosystem (capturing overarching, field-specific influences, encapsulated in our study as the field of science, which serves as a moderator variable). We position the researcher's Strategic Research Agendas at the endpoint of all these systems, as these are shaped by the various layers, as previously noted. Table 1 summarizes how the variables used in this exercise are positioned within the ecological systems theory:

This study is mainly focused on two specific systems and their relations to the development of a researcher's agenda — the mesosystem (in which we position the perceived organizational features) and the macrosystem (specifically the field of science, which acts as a moderator for the lower-level mesosystem). The microsystem and the exosystem's variables (as well as country from the macrosystem), although interesting on their own, are considered for control purposes and are not the focus of this study, nor will they be discussed in-depth given the stated goals of this exercise.

Table 1 Positioning of the study's variables within the context of the ecological systems theory

Microsystem	
Gender	Personal identity and potential biases encountered
Age	The researcher's life stage and experiences
Late career	Personal career trajectory and experiences at this stage
H-Index	Direct reflection of a researcher's productivity and impact
Mesosystem	
Leadership satisfaction	Perception of leadership within the organization
Social satisfaction	Perceived social environment within the organization
Autonomy	Personal freedom and control in one's work
Unconstraint	Perceived flexibility in their work environment
Belonging	Sense of fit within the organization
Resources	Perception of available organizational resources
Willingness to stay	Intention to remain in the organization
Exosystem	
Top ranked university	The broader prestige and resources of the institution
Time in current job	Indication of organizational stability or tenure
Job count	Reflects opportunities and job changes within the broader academic or research landscape
Macrosystem	
Field of science	The conventions, norms, and values of the broader scientific community
Country	Reflecting cultural and political dynamics

The following section will provide in-depth information regarding the methodology which was employed, as well as a description of all used variables. This section is followed by the results, in which the analysis is presented and interpreted. The paper concludes with a discussion of the findings and potential implications.

Method

Data collection

This analysis was conducted within the scope of a multi-study project. The data source was a survey which took place between 2017 and 2018; an invitation to participate was sent to 915,447 corresponding authors, hailing from all fields of science, who published between 2010 and 2016. Those authors were identified based on a series of searches in the Scopus database, using various sorting strategies to maximize coverage. The survey itself comprised various sections, some of which are not relevant to the present study (which, as mentioned before, is one out of a series of exercises using the dataset). The relevant sections include demographic questions, career data, and two instruments which are key to this study — the Multi-Dimensional Research Agendas Inventory — Revised (MDRAI-R; Horta & Santos, 2020) and the Multi-Dimensional University Research Workplace Inventory (MDURWI; Santos, 2018). Before being able to participate in the study, invitees were required to read and accept an informed consent form.

In total, 21,016 participants accepted the survey invitation. Of these, 301 did not proceed past the informed consent form. Moreover, there was some degree of participation attrition throughout the survey, which was quite extensive (30 min or more to complete). Additionally, professional and educational data were situated at the end of the survey, and responses to these questions were optional in order to safeguard participant privacy, which further decreased the available sample size for analyses requiring this data (which is the present case). Thus, in total, and after removal of cases where necessary data was missing, the current study makes use of a working sample of 7242 participants.

This sample is composed of 4844 males (66.9%) and 2398 females (33.1%), on average 50 years old (M = 50.175, SD = 12.041). In terms of disciplinary distribution, 1797 participants were from the natural sciences (24.8%), 1527 were from engineering and technology (21.1%), 1699 from the medical and health sciences (23.5%), 326 from the agricultural sciences (4.5%), 1685 from the social sciences (23.3%), and finally 208 from the humanities (2.9%). Regarding geographical distribution, the sample was largely global with individuals from all continents — 3475 from Europe (48%), 1754 from North America (24.2%), 968 from Asia (13.4%), 482 from South America (6.7%), 326 from Oceania (4.5%), and 237 from Africa (3.3%). The most represented countries were the USA (N = 1,345, 18.6%), Italy (N = 469, 6.5%), Spain (N = 350, 4.8%), France (N = 331, 4.6%), and Brazil (N = 343, 4.7%). The remaining participants represented a myriad of other countries which are not listed here for brevity.

Variables

This section describes the variables which are employed in the present study, and their coding. We will begin by describing the control variables, followed by the variables of interest.

Gender is a dummy variable which indicates whether the participant is male or female, using "male" as the reference category. *Age* is a continuous variable which is self-explanatory, indicating the participant's age. *H-index* aims to control for differences in scientific productivity and visibility and represents the participant's H-index at the time of data collection. *Top Ranked U.* is a dummy variable which indicates whether the participant works in one of the top 500 universities from the ARWU World University Ranking — the reference category is "ranked". *Late Career* is another dummy variable representing the participant's career stage, using "early career" as the reference category. As career stage is not necessarily well defined in the academic profession, we used Bazeley's (2003) recommendation where relative youth is considered a proxy for career stage; thus, researchers under 40 years of age were labeled as early career researchers. *Job Count* is a continuous variable which is the number of jobs that have been held by the participant and aims to control for mobility aspects; and finally, *Time in Current Job* indicates the time, in years, which the participant has stayed in their current job and aims to control for the effects of temporality. Finally, we also include *Country*, a variable which indicates the participant's country and aims to control for country-level variability. Due to the multitude of countries included in the analysis, this variable is part of the model, but deliberately omitted from the tables for ease of readability.

The first variable of interest is *field of science* (*FOS*), which indicates the participant's field of science according to the OECD classification scheme (OECD, 2002). Due to the smaller sample size in the agricultural sciences and the humanities — as well as to reduce the complexity of the analysis — we opted to merge these two fields into other categories. Agricultural sciences was merged with the natural sciences, and the humanities were merged with the social sciences. Thus, the working version of this variable contains four levels: natural and agricultural sciences (N&A), engineering and technology (E&T), medical and health sciences (M&H), and social sciences and humanities (S&H). All analyses employ social sciences and humanities as the reference category.

The second set of variables of interest, which also serve as independent variables, are the various dimensions contained in the MDURWI (Santos, 2018), representing organizational features of academic institutions. All of these are based on means computed from the respective sub-scales which are Likert scales in the 1 to 7 range. The first concept refers to *Organizational Commitment*, composed of three sub-dimensions employed in the present study: *belonging*, which is the degree of alignment between the individual's identity and his or her organization; *willingness to stay*, which is the degree of interest in staying in the current organization; and *leadership satisfaction*, which is the degree of perceived satisfaction with one's leadership. Belonging and willingness to stay reflect similar constructs in other frameworks (e.g., Meyer & Allen, 1991; Mowday et al., 1979), whereas leadership satisfaction has also been shown to be related to the concept of organizational commitment (Avolio et al., 2004). *Resources* is a variable which measures the perceived degree of access to resources within the institution, as this is known to affect several other aspects of academic work (Castro-Ceacero & Ion, 2019; Henkel, 2000). *Social satisfaction* measures the degree of satisfaction with one's colleagues, being a way of measuring the degree of collegiality of the institution (Postiglione & Jung, 2015). *Autonomy* is the perceived degree of independence and freedom the individual has in choosing his or her topics of study and how to pursue those goals, something which is required for creative environments (Hemlin et al., 2008). The last variable in the MDURWI is *unconstraint*, which measures the perceived lack of institutional constraints and obligations not necessarily related to research activities, as is the case, for example, of teaching (Henkel, 2000).

Finally, for the dependent variables, we used the various dimensions from the MDRAI-R (Horta & Santos, 2020), each representing a different strategic research agenda. These are all continuous in nature and represent the means of sets of Likert-style items in the 1–7 format. As these are numerous and each of these have a substantial body of literature behind them, Table 2 provides a summary of what they represent and how to interpret their scores.

Procedure

First, we began by demonstrating the psychometric properties of both the MDRAI-R and the MDURWI, as well as evaluating their measurement invariance across continents due to the global nature of the sample. As these analyses are quite extensive and not the focus of the manuscript, they are made available as Supplementary Information (SI1). All psychometric properties were fully demonstrated, as well as full metric, construct, and partial scalar invariance across continents. For the primary analysis itself, as the dependent variables are all continuous in nature, a multivariate ordinary least squares model was employed (Hair et al., 2014). As the goal of this study is to compare dynamics across fields of science, we employ a moderation-based approach (Hair et al., 2014; Hayes, 2017; Kline, 2016), by treating the field of science as a moderator between the organizational features and research agendas, thus allowing us to determine how these dynamics vary by field. In statistical terms, this means that interaction terms were specified between the FOS variable and the independent variables of interest. As the initial study (Horta & Santos, 2019) was focused on the social sciences, we used this level as the reference category. Due to the

Table 2 Dimensions of the MDRAI-R

Dimension	*Definition*
Scientific ambition	The desire to acquire recognition and academic prestige in a given field (Bourdieu, 1999); being motivated and driven by the publication of scientific articles (Allison et al., 1982)
Divergence	The desire to expand into other fields of study or topics (Horlings & Gurney, 2013) and preference for working in multidisciplinary research ventures (Horlings & Gurney, 2013)
Discovery	Preference for working in fields or topics with the potential to lead to scientific discovery (Merton, 1957; Popper, 2005)
Tolerance to low funding (TTLF)	Willingness to work on fields or topics for which research funding is scarce (Ebadi & Schiffauerova, 2015)
Collaboration	Desire to engage in collaborative scientific ventures (Katz & Martin, 1997; Uddin et al., 2013), and also have the opportunity and receive invitations to participate in collaborative scientific ventures (Katz & Martin, 1997; Uddin et al., 2013)
Mentor influence	Indicates whether the researcher's mentor (Ph.D. or otherwise) holds a degree of influence over his or her work (Pinheiro et al., 2014)
Academia driven	The extent to which the research agenda is influenced by scientific priorities that the field community determines by consensus (Becher & Trowler, 2001; Collins, 1994) and the researchers' propensity to align their research agenda with the research strategic targets of their institution
Society driven	Measures the incidence of society related challenges in the research agenda and the influence and participation of laymen and non-experts in the design of the research agenda

Adapted from Horta et al. (2021)

complex nature of multi-level interaction terms, we have provided visualizations for all the significant interactions. These were produced using the *interactions* and *ggplot2* libraries in R. All statistical analyses were conducted using IBM SPSS 29.0.

Results

To facilitate the organization of this section, the results are presented by model, where each represents a different dependent variable. For each one, we begin by describing the main effects and, following this, highlight the significant interaction terms which indicate differences in effects across disciplines. The model tables are split into two due to their size, but represent the same analysis. Table 3 shows the main effects for the models:

Table 4 shows the interaction terms for the models.

Ambition

First, let us begin with the main effects. With the exception of leadership satisfaction, belonging, and willingness to stay, all organizational variables have some degree of effect on scientific ambition. Unconstraint exhibits a negative effect on ambition ($B = -0.066$, $p < 0.001$). This suggests that researchers who take on more non-research duties might be less inclined to pursue ambitious scientific endeavors. In contrast, having access to resources ($B = 0.077$, $p < 0.001$), more autonomy ($B = 0.121$, $p < 0.001$), and having more

Table 3 Main effects of the predictor variables on the various SRA dimensions

Variable	Ambition	Divergen	Collab	Mentor	TTLF	Discovery	Academia	Society
Natural and agricultural	−0.117 (0.212)	−0.194 (0.211)	−0.004 (0.165)	1.106*** (0.304)	−0.839** (0.285)	0.251 (0.209)	0.666*** (0.207)	0.290 (0.240)
Engineering and technology	0.162 (0.238)	0.042 (0.236)	0.414* (0.185)	0.117 (0.340)	−0.102 (0.319)	−0.052 (0.233)	0.306 (0.232)	−0.366 (0.269)
Medical and health sciences	0.042 (0.224)	−0.598** (0.223)	0.425* (0.175)	−0.027 (0.321)	−0.121 (0.301)	−0.261 (0.220)	−0.138 (0.219)	−0.589* (0.254)
Gender (female)	−0.095*** (0.024)	0.032 (0.023)	0.006 (0.018)	−0.067* (0.034)	−0.136*** (0.032)	−0.059* (0.023)	0.142*** (0.023)	0.149*** (0.027)
Late career	−0.107** (0.035)	0.079* (0.035)	0.103*** (0.027)	−0.371*** (0.050)	0.124** (0.047)	0.060 (0.034)	−0.006 (0.034)	0.040 (0.040)
Top ranked U. (unranked)	0.032 (0.030)	0.000 (0.030)	0.031 (0.024)	0.037 (0.044)	0.016 (0.041)	−0.040 (0.030)	0.144*** (0.030)	0.147*** (0.034)
Leadership satisfaction	−0.020 (0.021)	0.024 (0.020)	−0.033* (0.016)	0.047 (0.030)	−0.012 (0.028)	0.006 (0.020)	0.024 (0.020)	0.014 (0.023)
Belonging	0.019 (0.027)	−0.051 (0.027)	−0.001 (0.021)	−0.017 (0.038)	−0.016 (0.036)	−0.057* (0.026)	0.153*** (0.026)	0.045 (0.030)
Willingness to stay	−0.028 (0.019)	−0.062*** (0.019)	−0.042** (0.015)	0.032 (0.027)	−0.031 (0.025)	−0.079*** (0.018)	−0.024 (0.018)	−0.094*** (0.021)
Resources	0.077*** (0.016)	0.021 (0.016)	0.072*** (0.013)	0.067** (0.023)	0.253*** (0.022)	0.043** (0.016)	0.091*** (0.016)	0.063*** (0.019)
Autonomy	0.121*** (0.024)	0.002 (0.024)	0.037* (0.019)	−0.241*** (0.035)	0.243*** (0.032)	0.167*** (0.024)	−0.258*** (0.024)	−0.038 (0.027)
Unconstraint	−0.066*** (0.017)	−0.039* (0.017)	−0.036** (0.013)	−0.075** (0.024)	0.106*** (0.022)	0.023 (0.016)	−0.199*** (0.016)	−0.083*** (0.019)
Social satisfaction	0.176*** (0.030)	0.211*** (0.030)	0.533*** (0.024)	0.149*** (0.043)	−0.055 (0.041)	0.185*** (0.030)	0.222*** (0.030)	0.206*** (0.034)
Age	−0.009*** (0.001)	−0.006*** (0.001)	−0.003* (0.001)	−0.008*** (0.002)	0.013*** (0.002)	0.004** (0.001)	−0.004** (0.001)	0.007*** (0.002)
Job count	−0.003 (0.007)	0.019** (0.007)	0.011* (0.006)	−0.058*** (0.011)	0.010 (0.010)	0.022** (0.007)	−0.021** (0.007)	−0.008 (0.008)

Table 3 (continued)

Variable	Ambition	Divergen	Collab	Mentor	TTLF	Discovery	Academia	Society
Time in current job	−0.002* (0.001)	−0.003*** (0.001)	0.000 (0.001)	−0.002 (0.002)	0.001 (0.001)	−0.002* (0.001)	−0.001 (0.001)	−0.003** (0.001)
H − index	0.011*** (0.001)	0.001 (0.001)	0.011*** (0.001)	−0.005*** (0.001)	−0.013*** (0.001)	0.003*** (0.001)	−0.004*** (0.001)	−0.008*** (0.001)

Standard errors in parenthesis. Country is included in the model but omitted from the table. The full table including country controls can be made available upon request to the corresponding author

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Table 4 Interaction terms between FOS and the predictor variables and their effects on the various SRA dimensions

Variable	Ambition	Divergen	Collab	Mentor	TTLF	Discovery	Academia	Society
N&A * leader. satisfaction	−0.012 (0.029)	−0.043 (0.029)	0.002 (0.023)	0.035 (0.042)	−0.043 (0.039)	0.010 (0.029)	0.015 (0.028)	−0.002 (0.033)
E&T * leader. satisfaction	−0.037 (0.032)	−0.087** (0.032)	−0.040 (0.025)	0.099* (0.046)	−0.043 (0.044)	−0.086** (0.032)	0.079* (0.032)	−0.075* (0.037)
M&H * leader. satisfaction	−0.002 (0.031)	−0.017 (0.031)	−0.016 (0.024)	0.124** (0.044)	−0.012 (0.041)	−0.051 (0.030)	0.088** (0.030)	0.024 (0.035)
N&A * belonging	−0.003 (0.037)	0.103** (0.037)	0.013 (0.029)	−0.037 (0.053)	−0.006 (0.049)	0.038 (0.036)	−0.091* (0.036)	0.035 (0.042)
E&T * belonging	0.103* (0.041)	0.122** (0.041)	0.051 (0.032)	−0.073 (0.058)	−0.001 (0.055)	0.102* (0.040)	−0.029 (0.040)	0.034 (0.046)
M&H * belonging	0.010 (0.040)	0.059 (0.040)	0.036 (0.031)	−0.068 (0.058)	−0.009 (0.054)	0.039 (0.040)	−0.096* (0.039)	−0.068 (0.046)
N&A * will. to stay	0.021 (0.027)	−0.061* (0.027)	−0.009 (0.021)	0.018 (0.039)	0.049 (0.036)	−0.037 (0.027)	0.063* (0.026)	0.092** (0.031)
E&T * will. to stay	0.016 (0.029)	−0.014 (0.029)	0.004 (0.023)	−0.004 (0.042)	0.025 (0.039)	0.037 (0.029)	0.040 (0.028)	0.075* (0.033)
M&H * will. to stay	0.032 (0.029)	−0.049 (0.028)	0.011 (0.022)	0.023 (0.041)	0.073 (0.038)	−0.008 (0.028)	0.018 (0.028)	0.055 (0.032)
N&A * resources	−0.060** (0.023)	−0.017 (0.023)	−0.008 (0.018)	−0.011 (0.033)	0.131*** (0.031)	0.011 (0.023)	−0.041 (0.022)	0.014 (0.026)
E&T * resources	−0.063* (0.025)	0.005 (0.025)	0.009 (0.019)	0.050 (0.036)	0.044 (0.034)	0.003 (0.025)	−0.031 (0.024)	0.076** (0.028)
M&H * resources	−0.076** (0.024)	0.008 (0.024)	−0.021 (0.019)	0.023 (0.035)	0.102** (0.033)	0.028 (0.024)	−0.022 (0.024)	0.038 (0.028)
N&A * autonomy	−0.015 (0.033)	0.024 (0.033)	0.044 (0.026)	−0.128** (0.047)	−0.055 (0.044)	0.015 (0.032)	0.050 (0.032)	−0.085* (0.037)
E&T * autonomy	−0.035 (0.036)	0.075* (0.035)	−0.009 (0.028)	−0.103* (0.051)	−0.130** (0.048)	−0.009 (0.035)	0.059 (0.035)	−0.038 (0.040)
M&H * autonomy	−0.043 (0.035)	0.049 (0.035)	−0.016 (0.027)	−0.026 (0.050)	−0.156*** (0.047)	0.007 (0.034)	0.055 (0.034)	0.008 (0.039)

Table 4 (continued)

Variable	Ambition	Divergen	Collab	Mentor	TTLF	Discovery	Academia	Society
N&A * unconstraint	−0.016 (0.024)	−0.036 (0.024)	−0.047* (0.018)	0.003 (0.034)	0.016 (0.032)	−0.061** (0.023)	−0.081*** (0.023)	−0.152*** (0.027)
E&T * unconstraint	−0.049 (0.026)	−0.018 (0.026)	−0.025 (0.020)	−0.052 (0.037)	−0.020 (0.035)	−0.055* (0.026)	−0.066** (0.025)	−0.031 (0.029)
M&H * unconstraint	−0.020 (0.025)	0.014 (0.025)	−0.004 (0.019)	−0.017 (0.036)	−0.064 (0.033)	−0.025 (0.024)	−0.016 (0.024)	−0.048 (0.028)
N&A * social satisfaction	0.058 (0.041)	0.057 (0.041)	−0.016 (0.032)	−0.079 (0.059)	0.053 (0.055)	−0.039 (0.040)	−0.039 (0.040)	−0.070 (0.046)
E&T * social satisfaction	−0.016 (0.046)	−0.060 (0.045)	−0.086* (0.035)	0.096 (0.065)	0.097 (0.061)	0.025 (0.045)	−0.082 (0.044)	0.028 (0.052)
M&H * social satisfaction	0.045 (0.045)	0.068 (0.045)	−0.069* (0.035)	0.008 (0.064)	0.059 (0.060)	0.056 (0.044)	0.049 (0.044)	0.092 (0.051)

Standard errors in parenthesis. Country is included in the model but omitted from the table. The full table including country controls can be made available upon request to the corresponding author

N&A Natural and agricultural sciences, *E&T* Engineering and Technology, *M&H* Medical and health sciences

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

social satisfaction ($B = 0.176$, $p < 0.001$) all lead to greater scientific ambition; in tandem, this represents that having the means to do ambitious research leads to such research actually being pursued.

Two significant interactions are noted. E&T exhibits a positive interaction regarding belonging ($B = 0.103$, $p < 0.05$), suggesting that researchers in this field who feel an affinity for their institution are more likely to pursue ambitious endeavors. N&A shows a significant negative interaction with resources ($B = -0.060$, $p < 0.05$), and this is also the case for M&H ($B = -0.076$, $p < 0.05$) and E&T ($B = -0.063$, $p < 0.05$). The nature of the coefficient, coupled with the coefficient of the main effect and the flat regression line shown in the regression plot, suggests that in these fields, having access to resources does not impact scientific ambition. Figure 1 illustrates the significant interaction terms.

Divergence

Several main effects are noted: willingness to stay has a negative impact on divergence ($B = -0.062$, $p < 0.001$). This might be due to institutional pressure to publish "safer" research for metrics; as such, individuals aiming to pursue a career in their current institution might fall in line with such demands. Unconstraint also leads to decreased divergence ($B = -0.039$, $p < 0.05$), a difficult effect to interpret, but one which could be related to collateral research benefits derived from non-research duties, such as exposure to more colleagues and as such more novel ideas. This is reinforced by the effect of social satisfaction, a key driver of divergence ($B = 0.211$, $p < 0.001$), highlighting the importance of collegiality in research.

A series of notable interactions are also found. In E&T, leadership satisfaction exhibits a negative term ($B = -0.087$, $p < 0.001$), which coupled with the visual inspection suggests

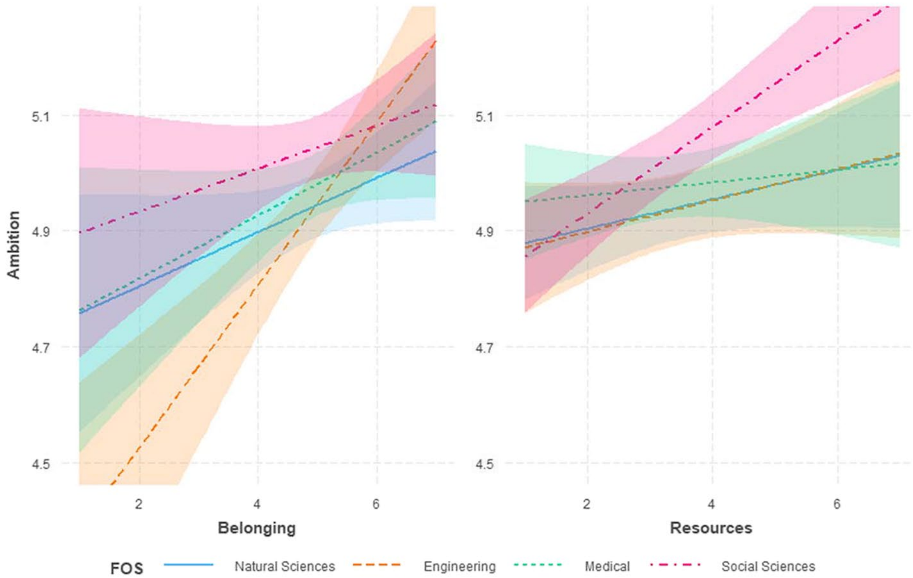

Fig. 1 Interaction plots for significant interaction terms with ambition as the dependent variable. Shaded areas indicate 95% confidence intervals

that this effect is exclusive to engineering. The effect of belonging is also exclusive to engineering ($B=0.122$, $p<0.01$) and N&A ($B=0.103$, $p<0.01$) — in both cases, it positively impacts divergence, something which does not occur in other fields. Willingness to stay has its negative effect further reinforced in N&A ($B=-0.061$, $p<0.05$). Finally, autonomy, which has no main effect, is shown to be a driver of divergence in E&T ($B=0.075$, $p<0.05$), which can also be confirmed visually. Figure 2 illustrates these significant terms.

Collaboration

All of the organizational variables except for belonging exhibit significant effects on collaboration. Willingness to stay ($B=-0.042$, $p<0.01$) and unconstraint ($B=-0.036$, $p<0.01$) both decrease the inclination to pursue collaborative ventures. On the other hand, having access to resources ($B=0.072$, $p<0.001$), more autonomy ($B=0.037$, $p<0.05$), and higher social satisfaction ($B=0.533$, $p<0.001$) lead to a higher propensity to collaborate. The first two likely relate to having both the means and the capacity to pursue collaborative ventures, while the last one is expected; a higher degree of collegiality will, naturally, encourage collaboration.

These effects are remarkably consistent across all fields of science. Only two interactions are notable; for N&A, unconstraint has an even stronger negative effect on collaboration ($B=-0.047$, $p<0.01$), whereas in M&H, the effect of social satisfaction is less pronounced ($B=-0.069$, $p<0.05$), which is also the case for E&T ($B=-0.086$, $p<0.05$). Both interactions can be observed in Fig. 3.

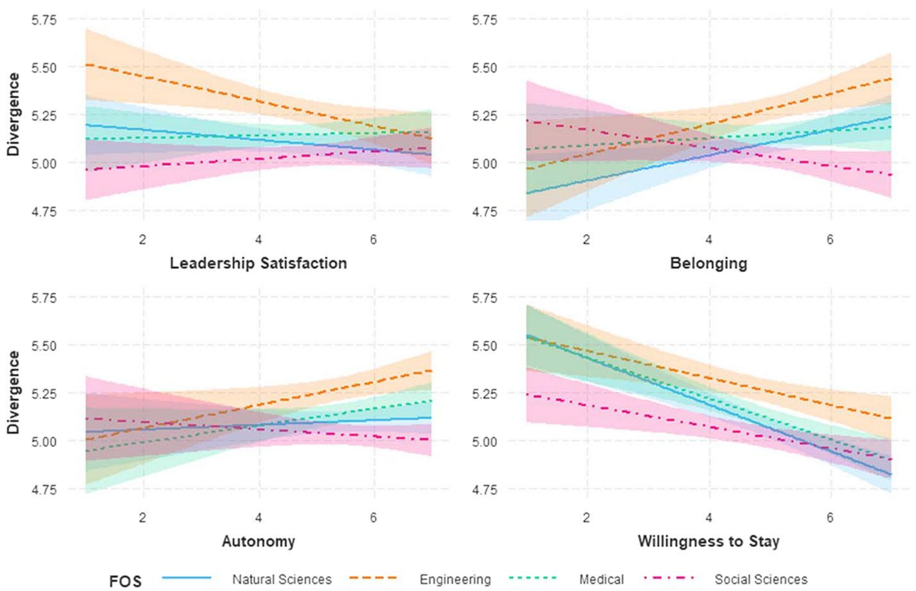

Fig. 2 Interaction plots for significant interaction terms with divergence as the dependent variable. Shaded areas indicate 95% confidence intervals

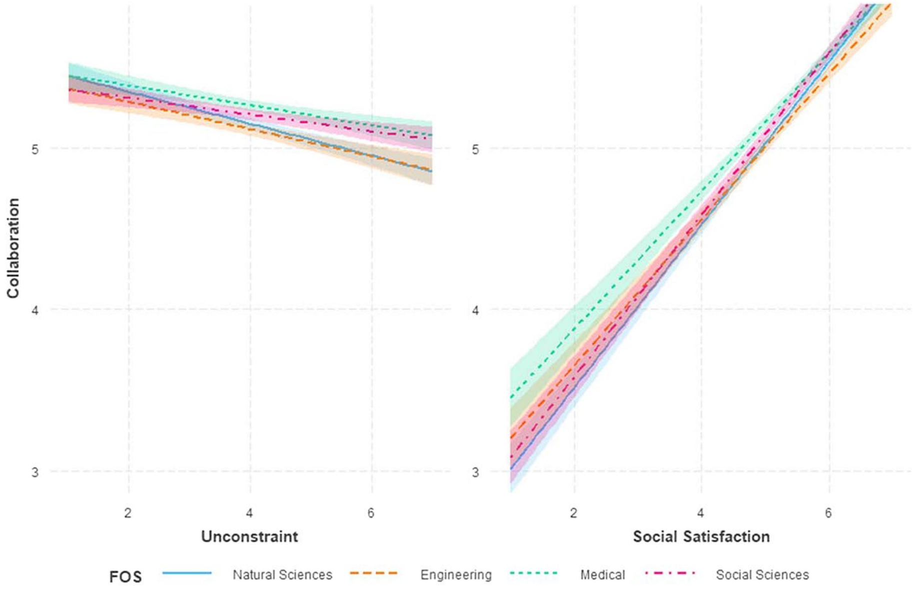

Fig. 3 Interaction plots for significant interaction terms with collaboration as the dependent variable. Shaded areas indicate 95% confidence intervals

Mentor influence

Again, all organizational factors except belonging and willingness to stay exhibit significant effects on mentor influence. Expectedly, a larger degree of autonomy ($B = -0.241$, $p < 0.001$) and unconstraint ($B = -0.075$, $p < 0.01$) are associated with lesser levels of mentor influence. On the opposite side, resources ($B = 0.067$, $p < 0.01$) and social satisfaction ($B = 0.149$, $p < 0.001$) are all associated with a higher degree of mentor influence. The association of resources and mentor influence can be due to shared resources between the two (e.g., the mentor allocating part of his or her funding to the mentee), and social satisfaction can also be explained by a higher level of collegiality, in this case relating to the mentor in particular.

There are some subtle differences across fields. The negative impact of autonomy is more pronounced for N&A ($B = -0.128$, $p < 0.01$) and E&T ($B = -0.103$, $p < 0.05$); it can be the case that in these fields, researchers "outgrow" their mentors to a higher degree than what can be observed in other disciplines. But in comparison, the effect of leadership satisfaction is intensified in E&T ($B = 0.099$, $p < 0.05$) and M&H ($B = 0.124$, $p < 0.01$) — a possible interpretation is that the relation between mentor and mentee is much closer in these fields (despite outgrowing them earlier, as suggested before). Figure 4 illustrates these dynamics.

Tolerance to low funding

Regarding tolerance to low funding, three main effects can be observed, all of which are positive. Having access to resources increases the tolerance to low funding ($B = 0.253$,

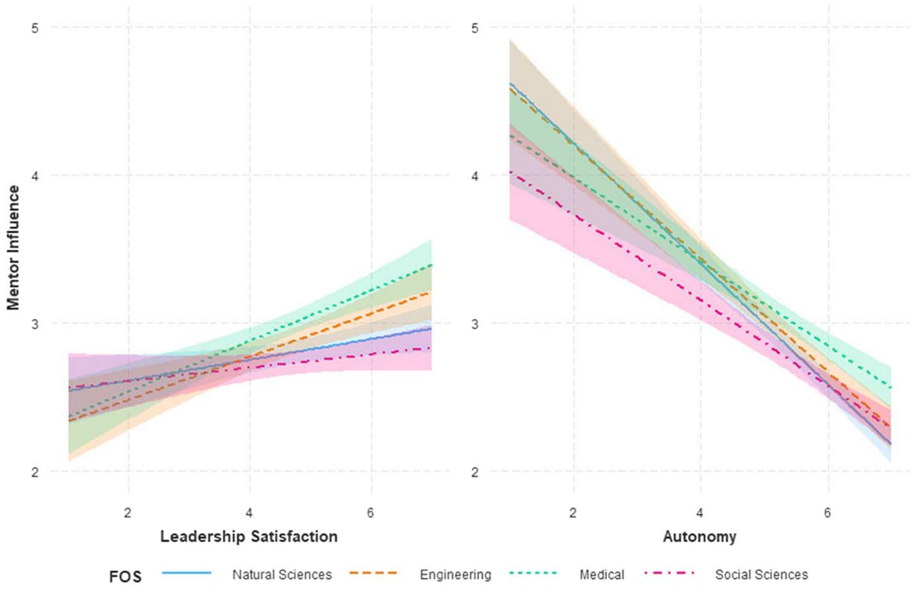

Fig. 4 Interaction plots for significant interaction terms with mentor influence as the dependent variable. Shaded areas indicate 95% confidence intervals

$p < 0.001$), a self-explaining association; researchers who already have pre-existing access to resources, or who have already secured funding, are more likely to pursue research in topics where funding is not readily available. A greater degree of autonomy ($B = 0.243$, $p < 0.001$) and unconstraint ($B = 0.106$, $p < 0.001$) also lead to a higher tolerance to low funding; a possible explanation is that, lacking institutional pressure to pursue topics where securing funding is easier, researchers might be more interested to pursue research ventures in areas aligned with their interests even if riskier. In other words, securing funding ceases being one of the key motivations for choosing topics.

However, there are some disciplinary differences. Resources play a much stronger role in N&A ($B = 0.131$, $p < 0.001$) and M&H ($B = 0.102$, $p < 0.01$). In opposition, autonomy has an attenuated influence for E&T ($B = -0.130$, $p < 0.01$) and M&H ($B = -0.156$, $p < 0.001$). All other effects seem to be consistent across fields of science. These findings are shown in Fig. 5.

Discovery

Various notable effects are observed regarding discovery. Having access to resources ($B = 0.043$, $p < 0.01$), Autonomy ($B = 0.167$, $p < 0.001$), and a higher degree of social satisfaction ($B = 0.185$, $p < 0.001$) are all associated with the pursuance of agendas driven toward novelty. This is not surprising; due to the high level of conservatism that is observed in many fields, only individuals who have the means and the autonomy to do so actually pursue discovery-driven — and also riskier — topics. The effect of social satisfaction again highlights the importance of collegiality. Willingness to stay, on the other hand, negatively affects Discovery ($B = -0.079$, $p < 0.001$), and this is also the case for belonging ($B = -0.057$, $p < 0.05$) — which we interpret as another sign of institutions

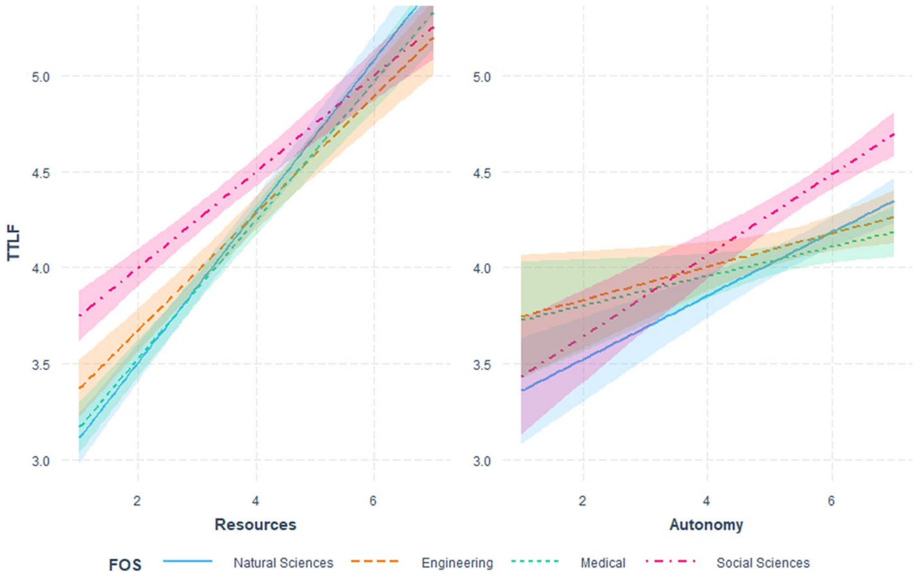

Fig. 5 Interaction plots for significant interaction terms with tolerance to low funding as the dependent variable. Shaded areas indicate 95% confidence intervals

pushing for more conservative topics, which are easier to publish, leading to researchers complying in order to secure a position at their institution.

Regarding the interaction terms, a few are notable. In E&T, there is a negative interaction term regarding leadership satisfaction ($B = -0.086$, $p < 0.01$). Visual inspection of the moderation plot suggests that this factor might be of importance in Engineering; likely, researchers in this discipline who sympathize with their institutional leadership pursue more conservative research, which is in line with the effects of willingness to stay, also noted above. A similar effect can be observed for the interaction term between E&T and belonging ($B = 0.102$, $p < 0.05$). Visual inspection suggests that for engineering, belonging has a positive impact on discovery, the only field where this occurs. On the other hand, a negative interaction term between N&A and unconstraint ($B = -0.061$, $p < 0.01$), which is also the case for E&T ($B = -0.055$, $p < 0.05$) suggests that in these disciplines, unconstraint has a negative impact on Discovery which is not present in the other fields. Figure 6 illustrates these differing dynamics.

Academia driven

Academia driven is a critical new variable in this study since it allows corroboration of our previous interpretation regarding institutional pressure. The main effects are aligned with what was expected; belonging ($B = 0.153$, $p < 0.001$) is positively associated with alignment with the academia and institution, as is also the case of having access to resources ($B = 0.091$, $p < 0.001$) and social satisfaction ($B = 0.222$, $p < 0.001$). Thus, individuals who feel like they belong in their institution and are satisfied with their colleagues, and have access to resources, are naturally more inclined to align their research with both institutional and field directives. On the other hand, researchers with a higher

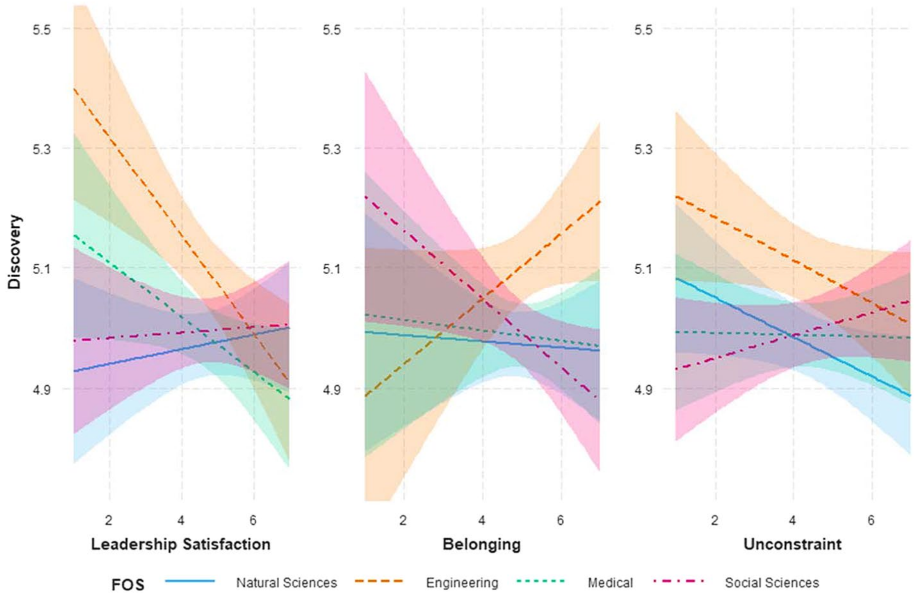

Fig. 6 Interaction plots for significant interaction terms with Discovery as the dependent variable. Shaded areas indicate 95% confidence intervals

degree of autonomy ($B = -0.258$, $p < 0.001$) and unconstraint ($B = -0.199$, $p < 0.001$) are less likely to align their research with such directives.

These effects vary according to the field, but mostly in order of magnitude. Leadership satisfaction has a positive effect in M&H ($B = 0.088$, $p < 0.05$) and E&T ($B = 0.079$, $p < 0.05$), whereas the effect of belonging is attenuated in N&A ($B = -0.091$, $p < 0.05$) and M&H ($B = -0.096$, $p < 0.05$). Willingness to stay is also enhanced for N&A ($B = 0.063$, $p < 0.05$). The negative impact of unconstraint is further reinforced in N&A ($B = -0.081$, $p < 0.001$) and E&T ($B = -0.066$, $p < 0.01$). These changes are illustrated in Fig. 7.

Society driven

Orienting one's agenda toward societal endeavors tends to be aligned with institutional directives, but to a lesser extent than raw publications. Nevertheless, the main effects tend to be similar to those reported for Academia scores; first, willingness to stay reduces Society orientation ($B = -0.094$, $p < 0.001$). Having access to more resources ($B = 0.063$, $p < 0.001$) and social satisfaction ($B = 0.206$, $p < 0.001$) increase Society orientation, likely reflecting the support that is needed to conduct this type of research. Finally, unconstraint ($B = -0.083$, $p < 0.001$) is negatively associated with agendas pursuing societal challenges.

Several differences emerge across fields of science. Willingness to stay has mitigated effects for both N&A ($B = 0.092$, $p < 0.001$) and E&T ($B = 0.075$, $p < 0.05$); in fact, visual inspection reveals a flat slope for these two fields, suggesting that this variable does not affect society-driven agendas in the hard sciences. Leadership satisfaction exhibits a negative effect on E&T ($B = -0.075$, $p < 0.05$), which can be confirmed by visual inspection. Having access to more resources has an enhanced effect in E&T

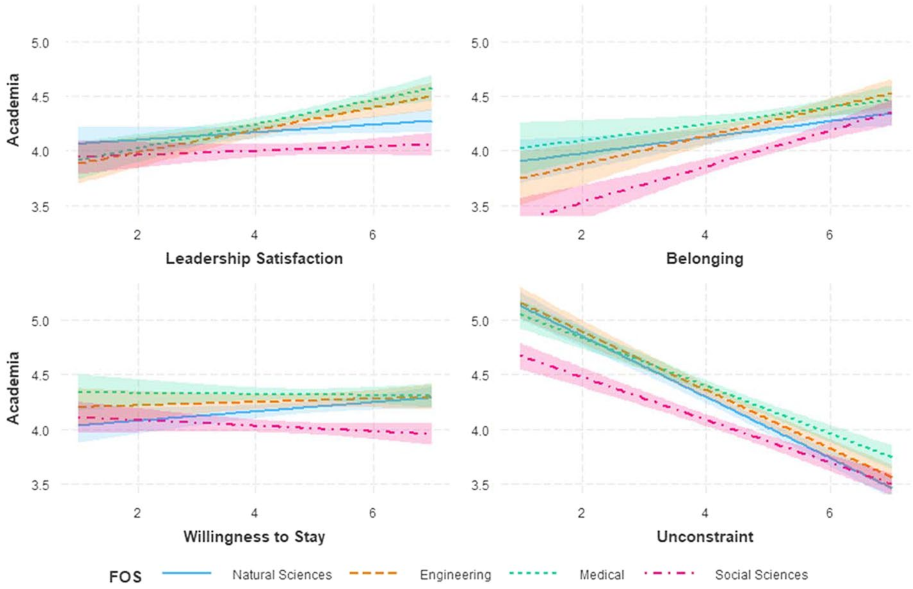

Fig. 7 Interaction plots for significant interaction terms with academia as the dependent variable. Shaded areas indicate 95% confidence intervals

($B = 0.076$, $p < 0.01$); likely, this means that in this field, such resources can be channeled into developing technology with practical applications for the society at large. In N&A, autonomy's negative impact is further reinforced ($B = -0.085$, $p < 0.05$). Also in N&A, the effect of unconstraint ($B = -0.152$, $p < 0.001$) is further compounded. Overall, it can also be observed from the graphic that the natural sciences, overall, exhibit lower intercepts — suggesting lower scores and a much lower degree of effect on society for all described variables, reflecting the typically more fundamental nature of this discipline. Figure 8 illustrates these dynamics.

Conclusion

This study aimed to explore whether the impact of organizational features on strategic research agendas varied or not across fields of science. Surprisingly, it was found that most effects are remarkably consistent across disciplines, varying more in orders of magnitude than in direction of effects per se. Consistent with previous findings, access to resources, autonomy, and social satisfaction were found to generally foster scientific ambition, divergence, and collaboration. Conversely, a greater willingness to stay and a lack of non-research obligations, as embodied by our measure of unconstraint, were found to exert negative impacts on these dimensions. This pattern is worrying, as it hints at systemic impediments to scientific advancement across disciplines. Yet, our findings also underline subtle field-specific variations, particularly for hard sciences where autonomy plays a lesser role due to their collaborative nature. Additionally, it was found that autonomy and unconstraint are associated with lower degrees of academia and societal orientation, whereas belonging and social satisfaction increases this alignment.

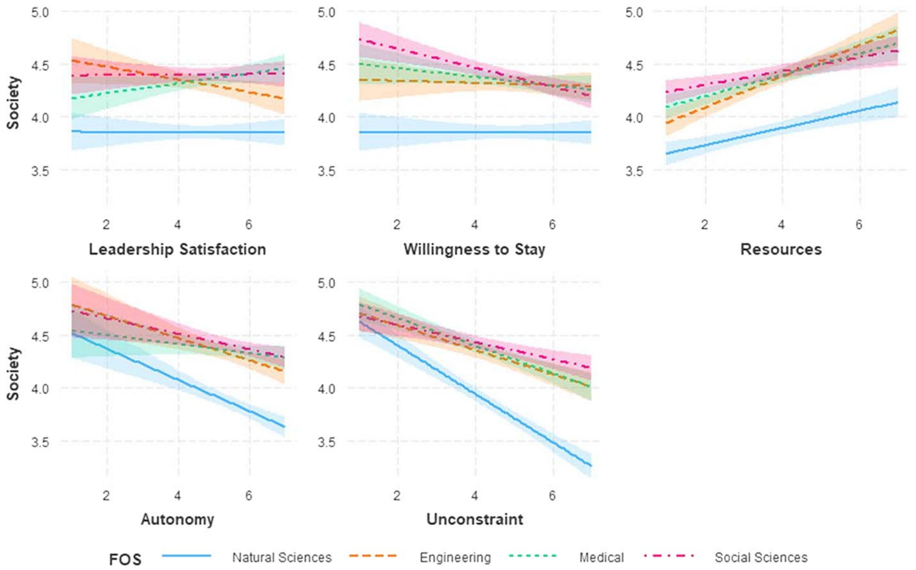

Fig. 8 Interaction plots for significant interaction terms with society as the dependent variable. Shaded areas indicate 95% confidence intervals

Autonomy remains one of the key aspects associated with discovery-driven and riskier agendas. Social satisfaction, which we interpret at a measure of institutional collegiality, also remains a strong predictor of these agendas, and one which is consistent across all the studied fields of science. This resonates with previous findings and various arguments put forth by the existing body of literature — organizations seeking to promote more discovery-driven research and risk-taking, as well as multidisciplinary approaches, should encourage a collegial environment with a high degree of autonomy, which is in line with the notion advocated by Polanyi (2000) that the choice of a research topic is a highly personal decision. However, this study provides new data which corroborates the argument that this is typically not what actually occurs in research institutions — as shown, a higher degree of autonomy is associated with lower degrees of academia orientation; in other words, autonomous researchers do not tend to align their pursuits with those that are considered desirable by their institution or by their academic community. In fact, higher levels of willingness to stay are globally associated with agendas that are less divergent, collaborative, and discovery-driven; the lack of substantial significant interactions suggests that this effect is consistent across fields of science. Leadership satisfaction, which overall does not appear to have much influence on research agendas, exhibits differentiated effects in engineering, specifically. Here, it is associated with lower levels of divergence, discovery, society orientation, and increased levels of mentor influence. This further corroborates our previous findings on the potential inhibitive effect of institutional alignment on research innovation.

This is also consistent with the literature, as it has been amply noted by various academics that institutional pressures to publish more in order to maximize performance indicators and ranking positioning (Martin, 2011) can lead to the promotion of more conservative research (Young, 2015), for which funding tends to be more easily acquired (Siler et al., 2015). In the context of our framework, this can be interpreted as the influence of the exosystem on the mesosystem and, ultimately, on the adoption of specific agendas. In uncertain environments, researchers, especially those who are still seeking tenures, are more likely to comply with institutional demands in order to secure their career (Leisyte, 2007), creating a vicious cycle of diminishment in cutting-edge research. This has been explicitly reported in some fields, where researchers state that they deliberately pursue conservative research due to career considerations (Rzhetsky et al., 2015) — and more ominously, our current findings suggest that this phenomenon is not linked to any particular discipline, but rather an issue which is omnipresent in science at as a whole.

Requiring conservative research to secure resources can lead to a paradox, as access to resources is also a key aspect in fostering discovery-driven and ambitious agendas, and this is often dependent on external entities and not something which can be directly controlled by the research institutions. A notable finding is that the effect of resources on scientific ambition does not hold in the fields of natural sciences and agriculture, medicine and health, and engineering, suggesting a field-specific attenuation of the impact of resource availability. Additionally, resources have a much stronger effect on tolerance to low funding in the natural sciences and agriculture, as well as medicine and health. As these fields usually involve cost-intensive research (for example, acquiring reagents and the running costs of operating experimental laboratories), they typically also have more funding opportunities and resources allocated to them (Huang & Huang, 2018), which can possibly cause resources to no longer be perceived as a barrier to ambitious research.

Also of note is the fact that the organizational features which have an impact on societal alignment are nearly identical to those which have an impact on academia alignment. This suggests that institutions, and the academia in general, is aligned with societal needs, which by itself is not surprising given that societal impact is now a core component of many evaluation schemes, a practice which is not without criticism (Smith et al., 2020). For example, in some frameworks "societal impact" is simply considered as the potential for monetization of the findings (Smit & Hessels, 2021) — which, of course, leaves out basic science entirely. This partly explains why the effects of organizational features on societal alignment, for the natural sciences, departed substantially from all other fields of science — this is a field which is largely fundamental in nature, and where the transition from basic to applied science can potentially take decades. Thus, it is not surprising that autonomous and unconstrained researchers disentangle themselves from societal pursuits to a much greater degree than researchers in other fields. Overall, this disconnect between scientists and societal alignment should not come as a surprise — scientists have been reported as disagreeing with how policies on societal impact are implemented, in particular regarding their narrow focus on commercial impacts (de Jong et al., 2016).

Framing these findings within the context of the ecological systems theory, it becomes apparent that the mesosystem — represented here as the perceived organizational context — plays a crucial role in the development of a researcher's agenda — lending credibility to the notion that researchers adapt to their environment, but at least in part through compliance with pressure from higher-level systems. As expected, the macrosystem, which encapsulates the lower-level systems, moderates to some degree these relations, albeit in a rather weak manner, as most of the effects are either consistent or only shift in strength across the various disciplines. Thus, this suggests that the genesis of these dynamics lies largely at the exosystem, specifically in what concerns the broader institutional landscape (i.e., the need to acquire funding and bolster rankings). Unfortunately, this layer lies outside the primary of scope of the current study, but should be considered very much of interest to future studies on the topic.

This study provides valuable information for policymakers and for institutional managers. It provides further evidence that pushing policies which are highly focused on metrics are counterproductive whenever the goal is the pursuance of discovery-driven agendas, and this holds true across all scientific disciplines. In fact, even when the end-goal is applied development, which is currently a relatively widespread focus, the current approach seems to be largely ineffective as innovation rates have been shown to be declining (Huebner, 2005) despite an ever-increasing amount of scientific papers being published with each passing year (Johnson et al., 2018) — suggesting that, rather than promoting scientific advancement, societal impact, or marketable products, current policies are instead creating perverse incentives to gamify the indicators and fostering strategies aiming to maximize them to the detriment of actual knowledge advancement (Hicks, 2012; Martin, 2011). We must remember that scientific progress does not increment in a linear manner with each paper that is written or each patent that is produced. Thus, it is not surprising that the researchers who are less aligned with their institution are the ones more likely to pursue highly ambitious and discovery-driven research.[1] It would seem, then, that "publish or perish" is causing discovery itself to perish.

While this study offers important insights, it is essential to acknowledge certain limitations of our approach and interpret the findings accordingly. First, our study predominantly utilizes quantitative methods, with interpretations grounded in existing literature and prevailing debates in the field. While this approach yields systematic and generalizable findings, complementary qualitative research is needed to offer tangible, real-world validations. Second, the present methodology does not incorporate a temporal dimension. Instead, it infers the directionality of effects based on existing literature, plausibility of arguments, and the guiding framework of the ecological systems theory. We postulate that a researcher's agendas emerge as a product of the encompassing systems' influences. However, an alternative causality direction could be posited. One might argue that a researcher's agendas shape organizational features or that researchers deliberately select institutions in line with their agendas. Addressing the former, we contend that while it is conceivable, it is less probable for an individual's research agenda to significantly alter an entire organization's features. This could occur in exceptional cases, such as when the researcher occupies a pivotal role like a Dean or Department Head, but it is not typically the case. Addressing the latter argument, we have attempted to account for the possibility of researchers gravitating towards like-minded institutions by including controls for tenure duration and past job counts, thereby introducing an element of temporality and career mobility. Finally, it is crucial to emphasize that our cross-sectional design primarily facilitates the determination of associations between variables. Though the direction of effect we have advanced is, in our estimation, the most likely, definitive causal claims necessitate longitudinal research. Such an approach represents a logical progression for future studies building on our initial findings.

With that said, our findings underscore the multifaceted and context-dependent nature of these complex relationships, shedding light on the complex interplay between researchers' institutional environment and their research agendas. However, they also reveal that despite the multitude of contexts that are specific to each field, the overall dynamics of these mechanisms differ more in magnitude than in form. Thus, more than highlighting the need for field-specific strategies for the management of research organizations, our findings present a cautionary tale on the dangers that publish or perish work cultures can pose for the scientific endeavor as a whole.

[1] An example of this can be found in Peter Higgs, who stated in an interview that prior to winning the Nobel prize, he was considered an embarrassment to his department due to a lack of publications. Source: https://www.theguardian.com/science/2013/dec/06/peter-higgs-boson-academic-system

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Declarations

Conflict of interest The author declares no competing interests.

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