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Research across disciplines: influence of human resource management practices

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Abstract

Purpose – This study aims to examine the connection between scholars' research performance and the multidisciplinary nature of their collaborative research. Furthermore, in response to mixed results regarding the effects of multidisciplinarity on research performance, this study explores how human resource management (HRM) practices may moderate this link.

Design/methodology/approach – The authors built a model based on the theoretical arguments and empirical evidence found in the review of diversity and HRM literature. The authors also performed a quantitative study based on a sample of scholars in the field of management. Different econometric estimations were used to test the proposed model.

Findings – The results of this empirical analysis suggest that multidisciplinary research has a non-linear effect on research performance. Certain HRM practices, such as development and collaboration, moderated the curvilinear relationship between multidisciplinarity and performance, displacing the optimum to allow higher performance at higher levels of multidisciplinary research.

Originality/value – The paper provides advances on previous works studying the curvilinear relationship between multidisciplinarity and the researchers' performance, confirming that multidisciplinarity is beneficial up to a threshold beyond which these benefits are attenuated. In addition, the findings shed light on important issues related to team-oriented HRM practices associated with the outcomes of multidisciplinary research.

Keywords Diversity, Human resource management (HRM) practices, Multidisciplinary research, Research performance

Paper type Original article

1. Introduction

In recent decades, scientific research has tended towards collaboration between scientists from diverse backgrounds working in research teams and large consortia (Cummings and Kiesler, 2014; Hoekman *et al.*, 2010). Policy makers at regional, national and international levels have undertaken initiatives that have fostered collaborative multidisciplinary research to address the problems in today's societies (e.g. European Union Framework Programmes).

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Several previous studies have analysed the effects of increasing multidisciplinarity and have evaluated their results. Although some studies have shown a positive relationship with research performance (Leahey *et al.*, 2017; Lee *et al.*, 2015), previous findings have been inconclusive (Wang *et al.*, 2015). Moreover, research that explains the process through which this effect occurs and the conditions under which it can be managed and fostered remains scarce.

Several empirical studies have approached multidisciplinarity as disciplinary diversity (Abramo *et al.*, 2018; Wang *et al.*, 2015). In the literature, diversity is described as a double-edged sword (Milliken and Martins, 1996), bringing both benefits and harms. In the diversity literature, similarity-attraction/social categorisation and information-processing/decision-making perspectives have been commonly used as a theoretical framework, leading to inconclusive results. The emergence of integrative theoretical models, such as the categorisation–elaboration model (CEM) and the job demands–resources (JDR) model, has emphasised the importance of mediating and moderating variables that underlie the relationship between diversity and performance outcomes.

In the academic context, a crucial issue concerns the effective management of research teams and collaborations to maximise the benefits and minimise the harm associated with multidisciplinarity. A relevant question is how the implementation of team-oriented human resource management (HRM) practices can improve the function of research teams and enhance the skills, motivations and abilities of researchers, as well as their mutual trust, thus mitigating negative effects and increasing the positive consequences of multidisciplinarity on researcher performance (Chi *et al.*, 2009). Unfortunately, research focused on this topic is scarce, and further evidence is needed to explain how team-oriented management practices affect the multidisciplinarity–research performance relationship (Edgar and Geare, 2013).

This study aimed to fill this gap in the research by proposing that HRM practices applied to personnel in research institutions are potential moderators of the relationship between multidisciplinary research and researcher performance. As explained below, the implementation of HRM practices can help to efficiently manage multidisciplinary research, optimising researcher performance to higher levels of multidisciplinarity.

This study makes three main contributions to the literature. First, it extends the findings of previous works on the curvilinear relationship between multidisciplinarity and researchers' performance, confirming that multidisciplinarity is beneficial up to a threshold beyond which these benefits are attenuated. Second, it sheds light on the importance of contextual moderators in examining the influence of multidisciplinary diversity on research performance. Specifically, it highlights important issues related to team-oriented HRM practices that are associated with the outcomes of researchers conducting multidisciplinary research. Finally, it contributes by adapting the HRM practices applied by Youndt and Snell (2004) to the context of research teams. The implementation of these practices establishes conditions under which research teams can take advantage of disciplinary diversity and reduce potential problems, thus positively affecting the performance of researchers.

The remainder of this paper is structured as follows. Section 2 presents a theoretical background on multidisciplinarity and HRM practices and states the hypotheses. Section 3 describes the data collection process and the methodology applied to evaluate the proposed model. Section 4 presents and discusses the main results of the empirical analysis. Finally, Section 5 synthesises the main conclusions, the limitations of the study and possible future lines of research derived from them.

2. Theoretical background and hypotheses development

2.1 Multidisciplinary research

An extensive amount of the literature is focused on the process and results of research involving diverse disciplines, that is, interdisciplinary research. National Academies (2005,

p. 26) defined interdisciplinary research as "a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialised knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice". From a conceptual point of view, this literature has distinguished between multidisciplinary, interdisciplinary and transdisciplinary research. These varieties of interdisciplinary research reflect differences in the process of knowledge integration, which has been referred to as a continuum ranging from no integration to a high degree of integration (Abramo *et al.*, 2018; Choi and Pak, 2006; Rafols and Meyer, 2010; Rousseau *et al.*, 2019). In practice, because the observation and measurement of the knowledge integration process is complex, the three concepts are difficult to distinguish. Consequently, they have frequently been used interchangeably in the literature (Alvargonzález, 2011; Schummer, 2004; Wagner *et al.*, 2011). In this paper, the term multidisciplinarity is used broadly to refer to interdisciplinary research.

The issue of measuring multidisciplinarity must be added to the difficulty of reaching consensus regarding its definition. On one hand, multidisciplinary research involves cognitive and social processes, and its measures should reflect both phenomena (Wagner *et al.*, 2011). On the other hand, multidisciplinary research is a complex and multi-faceted concept, and several indicators have been developed to measure it (Zhang *et al.*, 2018). Although some empirical studies have applied surveys to measure multidisciplinarity (Sanz-Menéndez *et al.*, 2001), quantitative measurements obtained through bibliometric methods (e.g. co-authorships, co-inventors, collaborations, references, citations and co-citations) have frequently been used (Wagner *et al.*, 2011; Abramo *et al.*, 2012).

In the bibliometric literature, multidisciplinarity is frequently interpreted as disciplinary diversity (Abramo *et al.*, 2018; Wang *et al.*, 2015), which is associated with the concepts of variety, balance and disparity (Stirling, 2007). For instance, Abramo *et al.* (2018) analysed disciplinary diversity (i.e. a variety, balance, disparity and integrated diversity index) of a list of references of publications and the disciplinary diversity of authors of publications to investigate the convergence between these two bibliometric approaches. Similarly, Zhang *et al.* (2018) compared the diversity of disciplines reflected in the listed affiliations of authors with that of a publication's reference list. Their results showed "that different methodologies and indicators can produce seriously inconsistent and even contradictory results. In addition, different indicators may capture different understandings of such a multi-faceted concept as interdisciplinarity" (p. 271).

2.2 Research performance

The literature provides several metrics for evaluating research performance. Common measures used in empirical studies are publication output (Gonzalez-Brambila *et al.*, 2013) and citation impact (Larivière and Gingras, 2010; Levitt and Thelwall, 2008; Yegros-Yegros *et al.*, 2015), including normalised citation counts, such as the crown indicator (Waltman *et al.*, 2011) and other measures of research impact, such as total research impact and research impact quotients (Pepe and Kurtz, 2012). Previous scholars have proposed other bibliometric indicators, such as the h-index and its variants, such as the m-index, g-index (Bornmann *et al.*, 2011), trend h-index and contemporary h-index (Sidiropoulos *et al.*, 2007), among others, to measure research performance.

2.3 Multidisciplinarity and research performance

The relationship between diversity and performance has been analysed using diverse theoretical approaches (Van Knippenberg *et al.*, 2004). Social categorisation and social identity theories (Tajfel and Turner, 1986) suggest that group members categorise

themselves and the rest of the members within subgroups (Bell *et al.*, 2011; Jansen and Searle, 2021). The similarity–attraction paradigm (Byrne, 1971) suggests that homogeneous groups should be more productive than diverse teams because attraction among members with similar attributes favours team processes (Bell *et al.*, 2011; Hass, 2010; Van Dijk *et al.*, 2012). Individuals' social identities favour cooperation with members similar to themselves (in-group), while they view others who are dissimilar (out-group) as less trustworthy and cooperative (Guillaume *et al.*, 2012). Therefore, homogeneous teams should outperform heterogeneous teams. Based on these theories, demographic attributes related to social categorisation processes (e.g. gender, race/ethnicity and age) may negatively affect team performance (Williams and O'Reilly, 1998).

In contrast, the information/decision-making perspective highlights the positive effects of work–group diversity, emphasising that heterogeneous groups should perform better than homogeneous ones (Van Knippenberg and Schippers, 2007). In this approach, heterogeneous groups have access to a greater pool of information, resources and perspectives (Aydinoglu *et al.*, 2016; Bell *et al.*, 2011). This gives diverse groups the opportunity to enrich the supply of ideas, unique approaches, creative and innovative thoughts and knowledge available to the group, thereby positively improving group outcomes (Williams and O'Reilly, 1998). A diversity of traits related to tasks (e.g. education, function and tenure) are associated with elaboration-based processes of the group and positively affect team performance (Joshi and Roh, 2009; Van Knippenberg *et al.*, 2004).

To address the inconsistent results of previous research on diversity and to explain the complexities in the relationship between team diversity and performance, integrative models of the above theories have emerged (Van Knippenberg *et al.*, 2004; Jansen and Searle, 2021). The categorisation–elaboration model (CEM) proposed by Van Knippenberg *et al.* (2004) suggests that social categorisation and information/decision-making processes interact, and that all dimensions of diversity may have both positive and negative effects (Yadav and Lenka, 2022). The CEM introduces mediator and moderator variables that have previously been overlooked in the diversity literature. Similarly, Jansen and Searle (2021) proposed a framework for integrating similarity–attraction/social categorisation and information-processing/decision-making perspectives using the job demands–resources (JDR) model. The JDR model includes cognitive, physical and social demands and resources, and considers time effects and task complexity as well as the influence of mediating and moderating variables on team performance outcomes.

Several previous studies have found that research teams with disciplinary diversity—that is, multidisciplinary teams—perform better than less diverse disciplinary teams because of a set of cognitive effects. Multidisciplinary research teams can benefit from a broader range of knowledge, skills and abilities, as well as the perspectives and opinions of their members, which favours problem-solving and decision-making processes, thereby positively affecting research performance (Horwitz and Horwitz, 2007; Jansen and Searle, 2021; Martín-Alcázar *et al.*, 2011). For instance, Cummings and Kiesler (2005) found that research projects that involved a greater number of disciplines increased positive performance related to the generation of new ideas, knowledge and outreach outcomes more than projects that included fewer disciplines. Similarly, Stvilia *et al.* (2011) pointed out that scientific teams with higher disciplinary diversity have higher productivity than teams with less diversity. Gonzalez-Brambila (2014) noted that collaboration with colleagues from different fields of knowledge is more productive than collaboration with colleagues in the same research area. Leahey *et al.* (2017) found that multidisciplinary research increased research citations and researchers' visibility.

However, some studies have suggested the existence of a threshold of cognitive diversity above which research performance decreases. For instance, Yegros-Yegros *et al.* (2015) found an inverted U-shaped relationship between the degree of multidisciplinarity and the citation

impact of individual publications. Cummings *et al.* (2013) found that larger research teams were more productive than smaller teams, although their productivity diminished as disciplinary heterogeneity increased. Lee *et al.* (2015) provided evidence that knowledge variety in scientific teams contributes to the generation of novel ideas, but decreasing effects appear when diversity increases. Similarly, De Saá-Pérez *et al.* (2015) showed that the educational diversity of research teams positively affected the number of publications to a certain level of diversity, from which the positive effects began to diminish.

Changes in positive effects at higher levels of multidisciplinarity can be explained as the intensification of cognitive conflict. Yong *et al.* (2014) explained how task and relational conflicts between members might arise in diverse groups, thereby affecting performance. Some studies have found negative effects of both task and relational conflict on performance (De Dreu and Weingart, 2003). Previous cognitive diversity studies have found a positive relationship between task conflict and performance but a negative relationship for relational conflict (Yong *et al.*, 2014). Furthermore, some studies have indicated that cognitive diversity may generate coordination costs and communication problems because of different language terms, codes and mental models in each knowledge domain (Bercovitz and Feldman, 2011; Cummings and Kiesler, 2005).

Based on these previous studies on multidisciplinary research, the diversity of knowledge and perspectives improves problem-solving and decision-making processes, which may positively affect performance; however, diversity may also generate conflict and coordination costs at higher levels of heterogeneity. Therefore, multidisciplinarity may have a non-linear effect on researcher performance. Diversity in knowledge bases can promote knowledge creation and research performance only to a point above which higher levels of multidisciplinarity can provoke diminishing returns on researcher performance. Therefore, the following hypothesis is stated:

H1. There is an inverted U-shaped curvilinear relationship between the level of multidisciplinary research and researcher performance: researcher performance increases with increasing multidisciplinarity but decreases at the highest levels of multidisciplinarity.

Previous studies on the diversity–performance relationship have proposed conceptual models in which the relationship is moderated by contextual variables. Most of these studies accounted for contextual factors related to teams and organisations that either improved or diminished the effects of diversity on outcomes (Joshi and Roh, 2009). In this line of research, authors such as Chi *et al.* (2009), Edmondson and Harvey (2018) and Guillaume *et al.* (2012) have considered HRM practices as potential moderators of the relationship between diversity and performance. In this study, because research teams were the basic units for the development of research activities, we introduced team-oriented HRM practices as a moderating variable of the relationship between multidisciplinarity and researcher performance, which has been neglected in previous studies in the literature.

2.4 Moderating role of team-oriented human resource management (HRM) practices

There has been growing academic interest in analysing the association between HRM practices and organisational performance. From a theoretical perspective, researchers have adopted a behavioural perspective or a resource-based view to examine the relationship between HRM practices and organisational outcomes (Jiang *et al.*, 2012). From the behavioural perspective (Jackson *et al.*, 1989; Schuler and Jackson, 1987), HRM practices encourage employee attitudes and behaviours that are favourable to the firm's strategic objectives, thereby affecting organisational outcomes (Jiang *et al.*, 2013). The resource-based view (Barney, 1991; Becker, 1964), human capital is considered an important potential source

of sustainable competitive advantage for firms; human resources are often viewed as valuable, rare and difficult to imitate (Boon *et al.*, 2018; McCartney and Fu, 2022). Research using the resource-based approach has suggested that HRM systems directly affect the level of human capital, thereby creating and maintaining valuable human capital, resulting in high organisational performance (Jiang *et al.*, 2012).

Drawing on these theoretical frameworks, the empirical literature provides evidence of a positive relationship between HRM practices and employee attitudinal variables, such as job satisfaction, trust in management, organisational commitment and psychological empowerment, all of which are positively related to organisational citizenship behaviours (Chung and Pak, 2021; Messersmith *et al.*, 2011; Paul and Anantharaman, 2004). Other studies have found a positive relationship between HRM practices and knowledge behaviours. For instance, Chuang *et al.* (2013) found that team-oriented HRM practices were positively related to team knowledge acquisition and knowledge sharing. Lopez-Cabrera *et al.* (2009) found that knowledge-based HRM practices were positively associated with valuable knowledge, while collaborative HRM practices were positively associated with the uniqueness of knowledge. Another set of empirical studies focused on the effects of HRM practices on collective human capital and, by extension, the intellectual capital of organisations (Sokolov and Zavyalova, 2020). Cabello-Medina *et al.* (2011) found that HRM practices enhanced the uniqueness of an organisation's human capital. Takeuchi *et al.* (2007) found that high-performance HRM practices were positively correlated with the level of collective human capital as well as the degree of social exchange collectively perceived by employees. Yang and Lin (2009) showed that HRM practices contributed to the accumulation of human capital, as well as relational and organisational capital. Youndt *et al.* (2004) found that HRM investments influenced intellectual capital development and tended to be higher in firms that exhibited high human capital profiles and high social capital profiles. Youndt and Snell (2004) found evidence that each type of HRM configuration affected one dimension of intellectual capital: acquisition and developmental of HRM configurations positively affected the level of human capital, egalitarian and collaborative HRM configurations contributed to building social capital, and documentation and information technology HRM configurations increased organisational capital, which in turn enhanced organisational performance.

Previous studies have also suggested that HRM practices are important in managing the diversity of teams, although only a few have analysed their moderating role in team diversity–performance relationships (Chi *et al.*, 2009; Guillaume *et al.*, 2012; Jehn and Bezrukova, 2004). By integrating the above findings, based on Youndt and Snell's (2004) classification of HRM practices, we considered that team-oriented HRM practices designed to foster the human, social and organisational capital of a research team to contribute to the achievement of its research goals may play a moderating role in the multidisciplinarity–performance relationship. Specifically, based on Youndt and Snell (2004), the following three bundles of HRM practices show this influence.

2.4.1 Acquisition and developmental HRM practices. The implementation of skill-enhancing HRM, such as acquisition practices, could facilitate the incorporation of researchers whose knowledge domains best fit the knowledge and skills needed in multidisciplinary research. Indeed, research teams could increase their human capital by attracting researchers from different knowledge backgrounds who possess the required expertise, knowledge and skills. Furthermore, promoting training and developmental HRM practices would ensure that researchers continually improve their skills, abilities and knowledge (Jaskiene, 2015), thus bridging the gap between advanced research requirements and researchers' current competencies (Lamba and Choudhary, 2013). Multidisciplinary teams could take advantage of HRM practices that favour decision-making processes (Martín-Alcázar *et al.*, 2011) and increase their human capital (Yang and Lin, 2009). Therefore, the following hypotheses are stated:

H2. Acquisition HRM practices positively moderate the relationship between multidisciplinarity and researcher performance.

H3. Developmental HRM practices positively moderate the relationship between multidisciplinarity and researcher performance.

2.4.2 Egalitarian and collaborative HRM practices. The application of egalitarian and collaborative HRM practices could provide opportunities for knowledge creation and knowledge sharing among researchers. Egalitarian HRM practices that help eliminate vertical and horizontal barriers within a team could facilitate communication and researcher involvement, which would favour the sharing of knowledge and information (Youndt and Snell, 2004). These HRM practices could also enhance opportunities for collaboration among team members by promoting and developing higher levels of social capital (Chuang *et al.*, 2013; Yang and Lin, 2009), fostering trust and decreasing the negative effects of diversity (García-Sánchez *et al.*, 2019). Moreover, through social interactions, multidisciplinary research team members could benefit from the researchers' external networks, thus bringing a wide range of perspectives, ideas and complementary assets and skills that are needed for advanced research (Gonzalez-Brambila *et al.*, 2013; Gonzalez-Brambila, 2014). Therefore, the following hypotheses are stated:

H4. Egalitarian HRM practices positively moderate the relationship between multidisciplinarity and researcher performance.

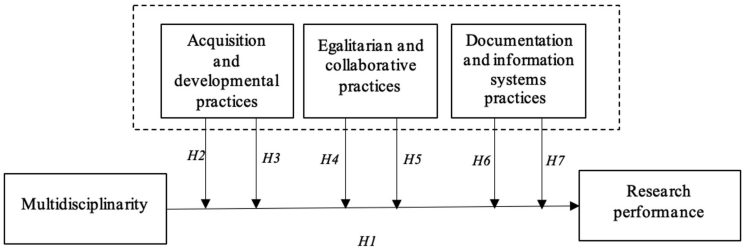
H5. Collaborative HRM practices positively moderate the relationship between multidisciplinarity and researcher performance.

2.4.3 Documentation and information systems oriented towards HRM practices. Lastly, documentation HRM practices and information-oriented HRM practices provide tools for institutionalising the explicit and tacit knowledge of the team and making it accessible. The design of user-friendly information systems helps teams develop their own organisational capital (Youndt and Snell, 2004), leading to their accumulation of knowledge and establishment of processes. Therefore, the following hypotheses are stated:

H6. Documentation systems' HRM practices positively moderate the relationship between multidisciplinarity and researcher performance.

H7. Information systems' HRM practices positively moderate the relationship between multidisciplinarity and researcher performance.

Figure 1 shows the proposed conceptual model, which was applied to test the hypotheses. The model was also used to examine the effects on researcher performance of the multidisciplinary nature of scientific research and to introduce HRM practices as moderating variables of that relationship.



Source(s): Own elaboration

Figure 1.
Conceptual model

3. Methodology and data

3.1 Data

To test the hypotheses, a quantitative study was conducted. We constructed a self-response questionnaire on HRM practices adapted from Youndt and Snell's (2004) study. A seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7) was used. Prior to administering the questionnaire, it was pretested on a sample of researchers in the management field who provided feedback about the comprehensibility of the questions, as well as the problems they experienced while completing the survey. Their suggestions were incorporated into the final version of the instrument. To mitigate the problems associated with common method bias, we complemented the evidence collected from the questionnaires with information extracted from the Scopus database in the period 2000–2016. Scopus provided information on aspects that were particularly relevant to the objectives of the study, as follows: (1) respondents' publications and their citations; (2) the co-authors of the respondents; and (3) the main research interests of the respondents and their co-authors to measure multidisciplinarity levels. To empirically evaluate the proposed model, we drew on a sample of 110 researchers who attended the annual European Academy of Administration (EURAM) congress.

3.2 Variables

3.2.1 Dependent variable. 3.2.1.1 Researcher performance. In the estimates, the dependent variable was researcher' performance. The literature provides various approaches to measuring scientific performance. Some, such as the number of publications, are used to measure *quantity*, while others, such as the number of citations, are used to measure *quality*. The h-index combines both criteria. Because it combines the quantity and impact of publications in a single indicator (Huang, 2012; Huang and Lin, 2010), this measure has been widely used in the academic community to evaluate research results (Abbasi *et al.*, 2011). Nevertheless, the h-index has also been criticised, as it does not take into account the duration of scholars' scientific careers, which is a drawback when comparing their performance at different stages of their academic lives. The h-index also ignores the number of co-authors and their contributions, fails to field-normalise citations and does not consider the ages of studies, among other shortcomings (Batista *et al.*, 2006; Hirsch, 2010; Kelly and Jennions, 2006).

Because of these weaknesses, numerous additions and variants of the h-index have been proposed in recent years to overcome the limitations of the h-index (Bornmann *et al.*, 2011). In this study, we evaluated the scientific performance of researchers using the contemporary h-index (Sidiropoulos *et al.*, 2007), which includes the age of a study.

Sidiropoulos *et al.* (2007) defined a novel score $S^c(i)$ for paper i based on citation counts as follows:

$$S^c(i) = \gamma * (Y(\text{now}) - Y(i) + 1)^{-\delta} * |C(i)|$$

where $Y(i)$ is the publication year of paper i and $C(i)$ are the studies citing paper i [1]. From the $S^c(i)$ of each publication, the contemporary h-index of each researcher is defined as follows: "A researcher has contemporary h-index h^c, if h^c of its N_p articles get a score of $S^c(i) \geq h^c$ each, and the rest (N_p - h^c) articles get a score of $S^c(i) \leq h^c$" (Sidiropoulos *et al.*, 2007, p. 258).

3.2.2 Independent variable. 3.2.2.1 Multidisciplinarity. In this study, multidisciplinary research was measured using Blau's (1977) [2] index, which is a widely used measure of diversity. This variable is calculated as $[1 - \sum_{i=1}^{k} p_i^2]$, where p is the proportion of researchers in the ith discipline and k denotes the number of disciplines represented in the co-authorship

network. The higher the score on Blau's index, the greater the degree of disciplinary diversity among collaborators. To identify the main disciplines of the respondents and co-authors, we drew on the research fields ascribed to them in the Scopus database.

3.2.3 Moderating variables. The measurement of HRM practices was based on the adaptation of Youndt and Snell's (2004) scale to the research team context. The results of the factor analysis indicated that HRM practices in the field of research management have seven dimensions. Reliability was assessed and showed a Cronbach's alpha greater than 0.73.

We used the following two measures to operationalise acquisition and developmental HRM practices:

Acquisition. It contains items related to acquisition HRM practices used in research teams.

Developmental. It includes items related to developmental opportunities, training programmes, comprehensibility of training activities, resources invested in these activities, rewards for research skills, tolerance of nonrepetitive mistakes in research and the development of one's research career.

We used three variables to measure egalitarian and collaborative HRM practices:

Collaboration. It includes items referring to the utilisation of cross-functional teams and networks, group-based incentives and teamwork in the research process.

Team building. It is composed of items related to the incorporation of new team members based on their interpersonal skills, training and development programmes that incorporate team building, as well as the use of multiple sources of information for performance feedback.

Egalitarian. It contains items related to the existence of hierarchical levels, status, empowerment and participation of team members.

We used two measures to operationalise documentation and information systems in HRM practices:

Information systems. It includes items associated with integrated, accessible and user-friendly information systems.

Documentation. It contained items related to institutionalising knowledge: encouraging the updating of theoretical knowledge; writing "lessons learned" reports; establishing a successful researcher suggestion programme; and encouraging participation in the redesigning of research processes.

3.2.4 Control variables. Factors other than multidisciplinarity and HRM practices can also influence researcher performance. To reduce the potential for omitted variable bias, we controlled for some individual and team determinants of researcher performance (Carayol and Matt, 2006). The size of the research team can benefit team productivity, but some studies have indicated a negative correlation with individual research productivity and a positive correlation with citations (Carayol and Matt, 2006; Lee *et al.*, 2015). This variable (Size) was approximated by the number of co-authors of each research surveyed. We also controlled for the researchers' gender, assuming that this demographic attribute could also be related to scientific productivity (Abramo *et al.*, 2009). Gender was introduced in the model as a dummy variable coded as female = 0 and male = 1.

4. Estimation results and discussion

In this section, we report the results of the estimated multiple regression models. According to the theoretical model, the seven HRM practices were introduced into regressions as interaction terms to test the hypotheses stated in Section 2. Table 1 shows the means and standard deviations of the variables introduced in the subsequent analyses. The variance

inflation factors (VIF) for the independent variables were found to be less than the usual threshold value of 10 (Hair *et al.*, 2014), indicating that the level of multicollinearity was not high.

As shown in Table 2, five models were estimated. Model 1 was used to test the effect of multidisciplinarity on performance. As shown in Table 2, the linear term of the multidisciplinarity variable was positive and significantly related to researcher performance. Similarly, the estimated β for the quadratic term (multidisciplinarity2) was negative and significant, confirming that the effects of this variable on scholars' performance could be depicted as an inverted U-shaped relationship. Multidisciplinary teams may benefit from having access to a greater variety of skills, knowledge and experience (Horwitz and Horwitz, 2007), but above the optimal level, multidisciplinarity may also generate discrepancies between researchers. Multidisciplinarity can have both positive and negative effects on researcher performance through information and decision-making processes. Moreover, to stimulate its positive effects, it is important to avoid the negative effects of multidisciplinarity (van Knippenberg *et al.*, 2004). Thus, H1 was supported.

Furthermore, we expected that researchers were likely to have better performance levels with higher levels of multidisciplinarity when specific HRM practices were implemented. To test this moderating effect, we introduced different interaction terms, one for each of the practices extracted from the factor analysis. The interaction terms of *Acquisition* HRM practice and *developmental* HRM practice were introduced in Model 2, but only *developmental* practice showed a positive and significant effect on this relationship. In Model 3, the interaction terms of *collaboration, team building* and *egalitarian* HRM practices were introduced; only *collaboration* in HRM practices was positive and significant. In Model 4, the variables of information systems and documentation were introduced, but neither was significant.

Model 5 was applied to evaluate the complete theoretical model, allowing us to analyse the effects of all HRM practices combined with the multidisciplinary–performance relationship. The estimation of Model 5 indicated that two of the HRM practices were significant and therefore helped moderate the effects of disciplinary diversity. The results indicated that *developmental* and *collaboration* HRM practices positively moderated the curvilinear relationship between multidisciplinarity and research performance. Thus, H3 and H5 were supported.

This result confirmed that certain HRM practices may benefit the performance of researchers with multidisciplinary levels above the maximum, thereby displacing the optimum. Indeed, through development activities, research teams can improve their human capital by improving the knowledge and skills required to conduct multidisciplinary research. Leaders of multidisciplinary teams must be able to identify training needs and offer members appropriate training programmes to develop their careers (Jackson *et al.*, 2006), including customised training and development programmes to address the needs of individual team members. Therefore, leaders with interdisciplinary management skills are essential. The implementation of collaborative HRM practices fosters interactions between researchers, thus facilitating increases in social capital and helping to reduce the possible negative effects stemming from relational and task conflicts caused by high levels of disciplinary diversity. Through these HRM practices, emotional and social resources may be increased in multidisciplinary teams, which can help offset increased emotional demands (Jansen and Searle, 2021).

However, the other HRM practices—*acquisition*, *team building*, *egalitarian*, *documentation* and *information systems*—did not show relevant effects on the multidisciplinarity–performance relationship. Therefore, H2, H4, H6 and H7 were not supported. The results of the empirical analysis also confirmed that not all HRM practices help manage internal dynamics within multidisciplinary research teams. The recruitment

Table 1.
Descriptive statistics and correlations

Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11
1. Researcher performance	2.96	3.091	1										
2. Size	8	8.21	0.108	1									
3. Gender	0.54	0.50	0.114	−0.019	1								
4. Multidisciplinarity	0.50	0.364	0.074	0.100	0.060	1							
5. Acquisition (factor)	0	1	0.104	0.121	0.198*	−0.199*	1						
6. Developmental (factor)	0	1	0.210*	−0.021	0.083	−0.122	0	1	1				
7. Collaboration (factor)	0	1	0.175	−0.024	0.033	−0.289**	0	0	1				
8. Team building (factor)	0	1	−0.081	0.006	0.041	−0.023	0	0	0	1			
9. Egalitarian (factor)	0	1	−0.042	−0.237*	0.047	0.045	0	0	0	0	1		
10. Information systems (factor)	0	1	0.101	−0.021	0.087	0.017	0	0	0	0	0	1	
11. Documentation (factor)	0	1	−0.113	−0.134	−0.086	−0.326**	0	0	0	0	0	0	1

Note(s): ** correlation is significant at the 0.01 level; * correlation is significant at the 0.05 level
Source(s): Table by authors

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coef	Std.Err.	Coef	Std.Err.	Coef	Std.Err.	Coef	Std.Err.	Coef	Std.Err
Constant		0.710		0.680		0.702		0.718		0.683
Size	0.047	0.034	0.029	0.032	0.043	0.035	0.049	0.034	0.033	0.034
Gender	0.083	0.549	0.054	0.529	0.052	0.545	0.079	0.555	0.022	0.533
Multidisciplinarity	2.529***	4.825	2.623***	4.610	2.521***	4.756	2.503***	4.883	2.581***	4.617
Multidisciplinarity^2	−2.496***	5.057	−2.548***	4.838	−2.426***	4.995	−2.468***	5.118	−2.444***	4.862
Multidisciplinarity × Acquisition			0.122	0.394					0.120	0.396
Multidisciplinarity × Developmental			0.297***	0.388					0.286***	0.388
Multidisciplinarity × Collaboration					0.235**	0.516			0.221**	0.500
Multidisciplinarity × Team building					0.007	0.511			−0.025	0.507
Multidisciplinarity × Egalitarian					−0.026	0.456			−0.013	0.443
Multidisciplinarity × Information systems							0.050	0.486	0.034	0.467
Multidisciplinarity × Documentation							−0.005	0.536	0.023	0.512
R^2		0.180		0.273		0.232		0.182		0.318
Durbin–Watson										1.218
Overall F		5.749***		6.436***		4.397***		3.823***		4.150***

Note(s): $N = 110$. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$
Source(s): Table by authors

Table 2.
Results of the regression analysis

and selection practices of academic staff vary among academic subfields, depending on their characteristics and structural and cultural context factors, which require the availability of time and financial resources (Van den Brink *et al.*, 2013). Furthermore, because multidisciplinary teams cross departmental and institutional boundaries, the recruitment and selection of HRM practices may not be easy to put into practice. It is particularly relevant that in egalitarian HRM practices, not only do team structures minimise the number of hierarchical levels, but they also encourage empowerment and participation. Moreover, minimising status among team members does not affect researcher performance. Perhaps because of the division of labour and the autonomy that characterises research activities, the influence of hierarchy is less in academia than in other contexts (Cummings and Kiesler, 2014). Thus, future research should focus beyond the egalitarian character, team structure or leadership style of research teams (O'Kane *et al.*, 2017). Similarly, the selection of collaborators based on their team-building capability is decisive when HRM practices are implemented. If teams are able to self-organise, other factors, such as expertise, access to multiple research networks and the reputation of collaborators, are likely to prevail in considering the configuration of the team (Bercovitz and Feldman, 2011). Finally, although documentation and information systems in HRM practices provide tools for institutionalising both the explicit and tacit knowledge of the group and making it accessible, the results of the present study indicate that these practices do not improve the organisational capital of multidisciplinary teams.

5. Conclusion

In recent decades, scientific research has tended towards multidisciplinarity and is now typically conducted by diverse teams that vary in size, experience, knowledge combinations and social grounding, among other dimensions (Bercovitz and Feldman, 2011). The literature on team research emphasises the effects of team-level variables on both team performance and individual performance (O'Conor, 2006; Hülsheger *et al.*, 2009).

This study applied a conceptual model to determine how researcher performance is affected by the multidisciplinary nature of scientific research and introduced HRM practices as moderating variables. In the diversity literature, there are mixed results regarding the analyses of the relationship between diversity and organisational outcomes. Previous research has highlighted the complexity of this relationship and the need to consider the potential moderating effects of contextual factors (Joshi and Roh, 2009). The present study followed this reasoning to examine the relationship between multidisciplinarity and the research performance of scholars, as well as the moderating effects of HRM practices on this relationship, which has received little attention in the academic context. The HRM practices applied in this study to the context of the research team were adapted from Youndt and Snell (2004).

In the context of multidisciplinary research, the empirical analysis yielded important results. The findings indicate that multidisciplinarity has two different but related effects on researcher performance. First, researcher performance increases when disciplinary diversity increases. At moderate levels of multidisciplinarity, researchers benefit from the greater diversity of perspectives and cognitive approaches provided by collaboration with researchers from other disciplines, which results in increased research output. Second, researcher performance decreases when disciplinary diversity exceeds a certain level. As the level of multidisciplinarity increases, disagreements and cognitive differences become more difficult to reconcile and task conflicts, coordination and communication problems appear to diminish the positive effects of researchers' disciplinary diversity.

The findings also provide support for the moderating role of HRM practices. The results of the econometric analyses confirm that the curvilinear effect of multidisciplinarity on

researcher performance is moderated by HRM practices, which is in accordance with our expectations. The results indicated that multidisciplinary researchers perform better when developmental and collaboration HRM practices are implemented. Developmental HRM practices focus on the human capital of research teams. Researchers' human capital can decrease in the long term, so it is important to define and apply appropriate HRM practices (Lopez-Cabrera *et al.*, 2009). Highly skilled academics are essential to ensuring the quality of university teaching and research. Similarly, based on the results, we concluded that when research teams implement developmental HRM practices, they increase the knowledge and skills required to bridge gaps between researchers from different disciplines (Lamba and Choudhary, 2013). In this context, the leaders of multidisciplinary teams should be able to identify training needs to develop the knowledge and skills of researchers and implement appropriate mechanisms to develop researchers' careers and reward their research skills. Multidisciplinary researchers can also benefit from the implementation of collaboration HRM practices, such as the development of cross-functional teams and networks, team incentives and teamwork competencies. These practices facilitate collaboration and social interaction among researchers in research processes, thereby providing opportunities for knowledge creation and knowledge sharing.

The findings of this study offer interesting implications for both scholars and research institutions. First, our results suggest that teams with moderate levels of multidisciplinarity can benefit from the different perspectives, ideas and skills that researchers bring to the team, thereby improving researcher performance. This implies that research managers and team leaders must consider that the composition of research teams is important and must be managed effectively to obtain the expected benefits of multidisciplinary research.

Second, research teams currently constitute a formal organisational level in universities and faculties with the objective of creating an increasingly research-intensive academic environment (Vabø *et al.*, 2016). The findings of this study have implications for research leaders and university institutional managers in employing HRM practices to increase the human capital and social capital of multidisciplinary research teams. Both developmental HRM practices that facilitate the strengthening of researchers' skills and capabilities necessary for conducting research activities and collaboration HRM practices that promote cooperation among team members must be implemented to take advantage of the disciplinary diversity of team members, thereby mitigating its potential negative consequences and positively affecting the performances of both the researcher and the university.

Because the results of this study have implications for multidisciplinary teams in which the members belong to different departments, universities and countries, they provide a solid base for future research. However, the study has the following limitations. The sample included only management academics, which may limit the generalisability of the results. Therefore, further research should be conducted to investigate whether the results of our empirical analysis are consistent with multidisciplinary teams in other scientific fields in which the research processes are substantially different. Another limitation is the sample size; therefore, the findings should be interpreted with caution. Finally, future research should be conducted to improve the understanding of the process through which the disciplinary diversity of the members of a research team influences their performance and to determine possible mediating and moderating variables in this relationship.

Notes

1. Following Sidiropoulos *et al.* (2007), we consider $\delta = 1$ and the coefficient $\gamma = 4$.
2. The index was originally proposed by Simpson (1949) and is also known as the Hirschman–Herfindahl index (Hirschman, 1964).

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