

## **The Effect of Service on Research Performance: A Study on Italian Academics in Management**

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## **The Effect of Service on Research Performance: A Study on Italian Academics in Management**

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7 Academics all over the world are feeling the increasing pressure to attain satisfactory  
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9 research performance. Since research is not the only activity required of academics, though,  
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11 the debate on how it may be coupled with other knowledge transfer activities like teaching,  
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13 patenting, and dissemination has been captivating scholars interested in higher education.  
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15 Literature is surprisingly silent about the interplay between research performance and other  
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17 roles and tasks that faculty are expected to carry out, namely academic citizenship, intended  
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19 as the service that they provide to their institution, to the scientific community, and to the  
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21 larger society. Through a negative binomial regression conducted on 692 Italian academics in  
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23 management, this paper investigates both the direct and moderating effect exerted by  
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25 academic citizenship on the relationship between research performance in two subsequent  
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27 evaluation exercises, thus advancing our knowledge of the relationship between research and  
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29 service. Findings show that institutional service acts as a pure moderator, discipline-based  
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31 service is a quasi-moderator, while public service exerts only a direct negative effect on  
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33 research performance. In light of the emergent interplay between research and service, the  
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35 necessity to boost reflection on academic citizenship is discussed and suggestions for its  
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37 acknowledgement and advancement are formulated.  
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## Introduction

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2 The pursuit of research performance has become the mantra of academics all over the world  
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4 (e.g., Vogelgesang *et al.*, 2010; Bak and Kim, 2015). Research excellence is deemed to  
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6 promote national system development, as well as to introduce valuable transparency and  
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8 clarity in the management of public resources (Frølich, 2011). Consequently, research on  
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10 higher education has reinforced the effort to increase our understanding of what may foster or  
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12 hamper the achievement of a satisfying research performance. Individual characteristics, such  
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14 as previous performance and embeddedness in an international network of ties, and  
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16 contextual features, such as university size and orientation to research, have been  
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18 investigated. In an attempt to better grasp how to enhance research, the relationships between  
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20 the various tasks and roles expected of academics have been taken into account. In particular,  
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22 a vibrant debate has delved into the interplay between different knowledge transfer activities,  
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24 e.g., research, teaching, dissemination, and spin-off creation (e.g., Landry *et al.*, 2010; Bak  
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26 and Kim, 2015; Rossi and Rosli, 2015), with the goal to realize whether they are  
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28 complementary, substitute or independent of each other. Surprisingly, academic citizenship,  
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30 intended as the service provided to the university and to the wider society, has remained in  
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32 the background of the reflection on higher education (e.g., Vogelgesang *et al.*, 2010;  
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34 Macfarlane, 2011; Lawrence *et al.*, 2012). Academic citizenship comprises a set of activities  
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36 and roles that are mostly implicitly expected to be part of the academic profession, but that  
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38 are often not clearly recognized and rewarded (O'Meara *et al.*, 2019). The ambiguity linked  
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40 to the status of service in academia calls for a study inquiring into its relationship with  
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42 research to inform our understanding of how emphasis on research performance impinges  
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44 upon faculty's other duties and roles.  
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55 We investigated the engagement in research and in academic citizenship of 692 Italian  
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57 faculty in management in the 2004-2013 time span, that is to say, before and after the  
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1 introduction of a reform formally endorsing research performance in the appraisal of  
2 universities and academics. Based on a negative binomial regression, our findings disclosed  
3 how, in addition to the effect of path dependency, visiting scholarship experience, recognition  
4 of research achievements, and university orientation to research, public service negatively  
5 affected research performance, while service to the scientific community exerted a positive  
6 influence. In addition, institutional service negatively moderated the relationship between  
7 research performance in two evaluation exercises. Interestingly, a negative moderating effect  
8 of discipline-based service enhanced the scientific productivity of academics with limited  
9 former research performance, but reduced the performance of scholars with solid publication  
10 track records.

11 Overall, this study helps fill a gap in our knowledge of higher education system functioning,  
12 contributing to the comprehension of the interplay between the individual and organizational-  
13 level factors that account for research performance. Awareness is here raised towards the fact  
14 that academic citizenship influences the attainment of research performance along complex  
15 pathways. Consequently, it is high time that policy makers, university managers, and  
16 academics took into account service in the design of institutions as well as in the choice of  
17 the courses of actions to undertake. The call for making the evaluation of academic  
18 citizenship in career pathways less puzzling is reinforced by this paper. Some suggestions for  
19 conveying the well-deserved relevance to service are then formulated, based on the  
20 consideration that in academia, as in most organizations, individuals do not need to excel in  
21 all dimensions, while their employing organizations as a whole should.

## 22 **The Influence of Academic Citizenship on Research Performance**

23 Almost all higher education systems have been embracing research excellence as their  
24 primary target over the past decades (e.g., Knights and Clarke, 2014; Pifer and Baker, 2013).

1 The rationale for promoting better research performance lies in the belief that the quality of  
2 research outcomes positively affects the success of single institutions and sustains national  
3 development and collective welfare (Fussy, 2017). Research excellence is in fact  
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5 meaningfully referred to as ‘the engine of growth’ (Salter *et al.*, 2017:1769). Given that the  
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7 academic profession is multifaceted (Bak and Kim, 2015; Guarino and Borden, 2017), a  
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9 lively debate has nonetheless addressed the effects that the pursuit of research proficiency can  
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11 have on other academic duties and expectations. In particular, a substitution effort has been  
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13 evoked between research and teaching (Holmstrom and Milgrom, 1991), based on the claim  
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15 that research is about specific contents and contributions to bring to a specialized community,  
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17 whereas teaching is about the ability to convey knowledge to a less expert and more  
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19 heterogeneous audience (Wiley *et al.*, 2016). At the same time, a positive link has been  
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21 posited between these two core tasks of faculty, though, since teaching may help clarify and  
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23 adapt research topics, especially when communicated to diversified sets of students (Hattie  
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25 and Marsh, 1996). In parallel, whether the other types of knowledge transfer that academics  
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27 can engage in and which vary from patenting and spin-off creation to consulting services, are  
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29 substitute, complementary, or independent of research has been largely discussed (Landry *et*  
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31 *al.*, 2010; Rossi and Rosli, 2015).  
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41 Although no shared interpretation has emerged yet concerning the interplay between the  
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43 various knowledge transfer activities, teaching included, it is remarkable how academic  
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45 citizenship has been sidelined in the discourse on higher education (Thompson *et al.*, 2005;  
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47 Macfarlane, 2007, 2011; Carli *et al.*, 2018). Academic citizenship represents, alongside  
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49 teaching and research, a pillar of university functioning: these three core sets of activities  
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51 have been referred to as the ‘tripartite vision’ (Macfarlane, 2011) or as the ‘contested triad’  
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53 (Pifer and Baker, 2013) of academic profession, depending on whether they are viewed as  
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55 complementary or substitute for each other. Academic citizenship can be defined as the roles  
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1 and activities that faculty perform for the sake, and on behalf, of their institution. Latest  
2 reflection on these much-neglected tasks embrace a perspective that goes beyond the  
3 university boundaries to extend to the impact of academics on the wider society,  
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5 distinguishing between internal and external service (Guarino and Borden, 2017). According  
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7 to Thompson et al. (2005) and Macfarlane (2007), academic citizenship behaviors can in fact  
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9 refer to assistance and guidance provided to students, such as counselling and coaching  
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11 (student service), and to colleagues, such as mentoring PhDs (collegial service), contribution  
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13 to internal governance bodies like committees and Senate (institutional service), as well as it  
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15 can refer to reaching a larger audience. This latter ranges from service yielded to the  
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17 scientific community, such as acting as a reviewer or organizing a scientific conference  
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19 (discipline-based service), to impacting upon the collective through public lectures or  
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21 participation in the media (public service). The roles that academics can exert in addition to  
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23 knowledge transfer activities are key to turning the university, often called a ‘secluded  
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25 campus’ or ‘ivory tower’, into a ‘placeful university’, i.e., an organization amongst other  
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27 organizations that share knowledge and set future common development pathways (Nørgård  
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29 and Bengtsen, 2016). Engaging in academic citizenship requires effort and time and poses a  
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31 dilemma to faculty, who wonder whether they should take charge of service and what  
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33 positive or negative consequences their enactment might convey to research and career  
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35 advancement (e.g., Holland, 1999; Macfarlane, 2011). The scant reflection currently  
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37 available on the relationship between research and service does not allow yet to formulate  
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39 any indication to this regard. This paper investigates the very influence that playing out  
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41 academic citizenship can have on research performance.  
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53 Studies have been flourishing about the factors that promote or hamper the attainment of  
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55 research performance. According to a line of reasoning, individual-level characteristics are  
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57 more relevant than institutional-level factors in engendering research outcomes (e.g.,  
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1 O'Connor and O'Hagan, 2016). From a different perspective, it is mostly institutional  
2 features that drive and determine research effort and achievements (Lewis, 2014; Lewis and  
3 Ross, 2011). It is more likely, though, that individual and institutional characteristics jointly  
4 affect the capability to carry out research and attain satisfactory results (George and Jones,  
5 2012; Vogelgesang *et al.*, 2010). Adhering to this latter interpretation of academic life, the  
6 rest of the paper will delve into the factors that may sustain or hinder research performance  
7 that the literature on this issue has proposed as prominent.  
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17 Among the individual characteristics, path dependency, embeddedness in an international  
18 network, visiting fellowship experience, and acknowledgement of researcher status will be  
19 taken into account as antecedents of research performance. In addition, organizational  
20 features such as university orientation to research and size will be considered. Finally, the  
21 effects of the enactment of academic citizenship will be fleshed out.  
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### 31 **Path Dependency**

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34 The capability to carry out high-quality research can be impacted by previous research  
35 experience. Behavioral consistency theory posits that human achievements be influenced by  
36 previous performance in the same domain (Wernimont and Campbell, 1968). Individuals tend  
37 in fact to stick to previous courses of action that have turned out to be satisfying and  
38 rewarding. From a psychological point of view, this trend can be framed within the search for  
39 self-continuity as a means to be socially validated by others: repeating well-established  
40 behaviors enables self-verification, thus reinforcing the professional identity in this case  
41 (Ashforth, 2000; Swann *et al.*, 1987). Specifically, scholars who have formerly accomplished  
42 a good publication record tend to remain productive over time (Carli *et al.*, 2018; Salter *et al.*,  
43 2017). A cumulative advantage for scientific recognition has been claimed for the hard  
44 sciences (Bonaccorsi *et al.*, 2017): researchers who have a distinguished publication record  
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1 are endowed with more resources, such as laboratories, equipment, and team members, which  
2 sustain their research effort and achievements over time. Accordingly, the following  
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4 hypothesis can be formulated:  
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7 *Hypothesis 1: Subsequent research performance is positively related to previous research*  
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9 *performance.*  
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### 11 12 13 14 **Embeddedness in an International Network**

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16 The literature on higher education has stressed the importance of network ties to achieve  
17 outstanding research outcomes. Outperformers are usually nested within a network of  
18 international collaborations able to offer a fertile environment for conducting research:  
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availing oneself of a set of international linkages likely conveys interesting hints to start investigations as well as provides support throughout the whole process (e.g., Adams et al., 2005; Lee and Bozeman, 2005). In particular, cooperation with international coauthors can be fruitful for promoting and seeing through publication processes, as they can offer access to new perspectives on how to do research that colleagues located in the same environment cannot convey (Benedetto *et al.*, 2016; Daraio and Moed, 2011). Therefore, it can be conjectured that:

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*Hypothesis 2: Research performance is positively related to international collaborations.*

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Exposure to different contexts, especially international settings, can be beneficial for faculty's research. Shielded from daily obligations and consolidated patterns of behavior, academics can free up their mind, build new connections, and get stimuli to undertake high-quality research (Defazio *et al.*, 2009; Edler *et al.*, 2011). This evidence gets corroborated when a researcher moves from the periphery of the research arena towards the center, i.e.,



1 from less to more prestigious institutions, and opportunities for launching and finalizing new  
2 studies increase (Jonkers and Cruz-Castro, 2013). The support to research that experiences in  
3 a stimulating environment provide leads to the formulation of the below hypothesis:  
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7 *Hypothesis 3: Research performance is positively related to visiting scholarship experiences.*  
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### 10 11 **Acknowledgment of Researcher Status**

12 The attainment of academic awards signals the relevance of the research carried out to the  
13 scientific community, thus communicating the researcher status, and usually plays an  
14 important role in tenure evaluation processes (Lutter and Schröder, 2016). The impact of  
15 academic awards on research performance has been debated, and a distinction has to be made  
16 concerning whether they are due to an outstanding performance in research or in other tasks  
17 such as teaching or fundraising (Allison and Long, 1990). In the first case, it is plausible that,  
18 according to expectancy theory (Vroom, 1964), there be a virtuous relationship between the  
19 achievement of public recognition for a behavior and the willingness to reinforce the same  
20 conducive behavior: if individuals apply input (time, effort, competencies, relationships) to  
21 reach a performance that is rewarded with valuable outcomes, then the motivation to reapply  
22 the same—or even bigger—input is high. Accordingly, research-related recognition is likely  
23 to commit academics further to the pursuit of high-quality research outcomes. These  
24 considerations lead to formulate the following hypothesis:  
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46 *Hypothesis 4: Research performance is positively related to research awards.*  
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### 51 **Academic Citizenship**

52 Enacting service inside and outside the institution can endanger commitment to research.  
53 This statement, which resonates with daily experience in academia, emerges from the  
54 reflection on academic citizenship (e.g., Thompson et al., 2005; Lawrence et al., 2012;  
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Bolden et al., 2014). Academic citizenship in fact diverts attention and consumes time that could be profitably spent on research. This holds particularly true for institutional and public service, which call for different skills from those needed to produce valuable research and whose opportunities for mutual fertilization with research is still scant (Thompson et al., 2005; Guarino and Borden, 2017). A different claim can be made for discipline-based service: since it addresses and unfolds within the scientific community, profitable synergies between acting as a reviewer or organizing a conference and producing good pieces of research can be expected (Macfarlane, 2011). Accordingly, the following hypotheses can be formulated:

*Hypothesis 5a: Research performance is negatively related to institutional service*

*Hypothesis 5b: Research performance is negatively related to public service*

*Hypothesis 5c: Research performance is positively related to discipline-based service*

As anticipated above, organizational features can also influence the capability to perform outstanding research. The literature on higher education has highlighted the relevance of the orientation to research of the academic context as well as the effect of the university size.

### **Contextual Orientation to Research**

The ability to achieve a brilliant publication record is affected by the surrounding environment. A context that at different levels fosters research through the allocation of appropriate resources (e.g., funding, administrative staff, support to project bid elaboration) and explicitly rewards it is expected to lead to better research performance (Salter *et al.*, 2017). The orientation to research of the context in which faculty are nested can exert a positive influence at various levels, varying from the university to which one belongs to the department to which one is affiliated, to the colleagues of the same discipline who operate in the same department (Carli *et al.*, 2018). Some studies conducted on PhD socialization

1 processes help grasp the importance of the social environment on research achievements.  
2 Hottenrott and Lawson (2017) showed how PhD students who availed themselves of attentive  
3 and expert advisors and proactive research group tended to make scientific and career choices  
4 that put research centerstage. Relatedly, Park and Gordon's work (1996) testified to how PhD  
5 students who were able to publish thanks to the endorsement and guidance enjoyed during  
6 their PhD program remained more productive after the program was over than colleagues  
7 who did not have this opportunity. In the end, the beneficial effect that a research-oriented  
8 context can have on faculty research performance can be elaborated as follows:  
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19 *Hypothesis 6: Research performance is positively related to university research orientation.*  
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## 24 **University Size**

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26 The bigger endowment of resources that are usually available to large-sized universities can  
27 create a fertile setting to conduct research. The tangible and intangible assets, which range  
28 from specialized staff to international cooperation agreements, that large institutions can offer  
29 to their members sustain their capability to carry out and finalize high-quality research  
30 (Landry *et al.*, 2010; Taylor and Cantwell, 2015). This assumption, corroborated by empirical  
31 evidence, is particularly relevant for disciplines that necessitate significant hardware and  
32 facility investments, such as laboratories and machines in the STEM field (Bonaccorsi *et al.*,  
33 2015). Consequently, the below hypothesis can be formulated:  
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46 *Hypothesis 7: Research performance is positively related to university size.*  
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## 51 **The Moderating Effect of Academic Citizenship on Research Performance**

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53 Academic citizenship can be posited to moderate the relationship between individual and  
54 organizational-level antecedents and research performance. Undertaking service that does not  
55 directly address research, such as institutional and public service, can not only subtract time  
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1 and effort from research, but requires skills and competencies, such as negotiation, conflict  
2 management, and verbal abilities, that do not match the skills and competencies necessary to  
3 carry out excellent research. The literature on higher education has underlined the potential  
4 for divergencies that taking on heterogeneous roles—instructor, researcher, organizational  
5 representative—can spawn, as well as the complications that it brings (e.g., Bolden et al.,  
6 2014; Knights and Clarke, 2014; Pifer and Baker, 2013). Conversely, some complementarity  
7 can be expected between discipline-based service and research (Macfarlane, 2007; Pifer and  
8 Baker, 2013). In this case, knowledge foundations and competencies are similar and a  
9 virtuous learning cycle can take place leading individuals to produce more valuable research.  
10

11 Along this line of reasoning, the following hypotheses can be expressed:  
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13 *Hypothesis 8a: Institutional service moderates the relationship between previous and*  
14 *subsequent research performance, such that the effect of previous research performance on*  
15 *subsequent research performance is weakened when institutional service is high.*  
16

17 *Hypothesis 8b: Public service moderates the relationship between previous and subsequent*  
18 *research performance, such that the effect of previous research performance on subsequent*  
19 *research performance is weakened when public service is high.*  
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21 *Hypothesis 8c: Discipline-based service moderates the relationship between previous and*  
22 *subsequent research performance, such that the effect of previous research performance on*  
23 *subsequent research performance is reinforced when discipline-based service is high.*  
24

### 25 **Control variables**

26 The need to control for some variables has been raised in the literature. Gender has been  
27 often evoked as a variable able to explain different publishing patterns. Male faculty are  
28 expected to produce more research than their female colleagues, although the quality of  
29 outcomes is still debated: according to some studies, women carry out fewer publications, but  
30 with a higher target (e.g., Long and Fox, 1995; Groot and García-Valderrama, 2006).  
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1 Academic rank has been extensively called into question, too, although its influence remains  
2 controversial (Baccini *et al.*, 2014). Based on some evidence, full professors enjoy the so-  
3 called ‘status effect’: they are involved in publications by their peers owing to their  
4 reputation and visibility in the scientific community (Tien and Blackburn, 1996). Conversely,  
5 according to other studies, once obtained the tenure, full professors are less motivated than  
6 lower-ranking colleagues to undertake research (e.g., Xie and Shauman, 1998). Eventually,  
7 some contributions do not disclose any significant relationship between rank and research  
8 performance (Over, 1982).

9 Also the interplay of discipline and research performance has prompted discussion in the  
10 literature on higher education (Jaffe, 2014; Landry *et al.*, 2010). The intensity of knowledge  
11 transfer activities, among which stands out research, is affected by the field in which  
12 academics operate, with academics in STEM and management producing a high volume of  
13 activities aimed at disseminating knowledge beyond the scientific community (Salter *et al.*,  
14 2017). Figure 1 represents the hypotheses of the paper.

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Insert Figure 1 about here  
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## **Data**

To test our hypotheses, we collected data on Italian academics in management in the 2004-  
2013 period. This time frame was chosen to take into account two evaluation exercises  
promoted by the Italian National Agency for the Evaluation of the University and Research  
System (ANVUR): the former gauged the research outcomes achieved between 2004 and  
2010, while the latter measured research performance from 2011 to 2013. In between the two  
periods, marking a dramatic change in Italian higher education, lied the so-called Gelmini

1 reform issued in 2010 that fostered research performance as the main evaluation target of  
2 individuals, departments, and universities, and introduced a two-step process for career  
3 progressions (Anon, 2010; Frischknecht, 2008; Rebora and Turri, 2013). All faculty who aim  
4 for a promotion to associate or full professor must undergo a National Qualification Exam  
5 (Abilitazione Scientifica Nazionale or ASN) that is based first on the attainment of given  
6 research outcomes, measured through ‘threshold values’ equal to the research performance  
7 medians in the discipline, and then, if and only if these values are met, on the analysis of the  
8 publication record, product contents, and curriculum vitae (CV) by national committees.  
9 Subsequently, individuals who have successfully passed the Qualification Exam can apply  
10 for the positions opening at single universities; at this stage, candidates’ publication record,  
11 product contents, and CV are gauged by locally appointed committees. Italian academia  
12 represents an interesting and extreme case when research performance is under study  
13 (Eisenhardt and Graebner, 2007; Bonaccorsi et al., 2017), as research performance had been  
14 declining nationwide since 2008 and an institutional action was evoked to bring its relevance  
15 to the fore (Cartlidge, 2010). Within this framework, academics in management are  
16 prominent since they have long been unbalanced on the generation of knowledge addressing  
17 practitioners, such as consulting services for public and private companies, while sidelining  
18 the pursuit of research excellence (Salter *et al.*, 2017). Consequently, meeting high research  
19 requirements has been remarkably challenging for these academics, who had to rethink and  
20 adjust their behavioral patterns (Butler *et al.*, 2015). In addition, interest in management is  
21 enhanced by the fact that it comprises many different fields, thus offering an exhaustive  
22 outlook (Salter *et al.*, 2017).

23 In particular, we gathered and analyzed data concerning 692 faculty members in the fields of  
24 accounting, strategy, marketing, banking, and finance, distributed in 63 universities. 59.8%  
25 are males, 43.8% are assistant professors, 27.7% are associate professors, and 28.5% are full  
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1 professors. The  $\chi^2$  tests used to compare the sample with the Italian population of academics  
2 in the same disciplines confirmed that there are not significant differences in distribution  
3  
4 across gender and academic rank.  
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7 CVs represent an established source to analyze academic careers since they allow to keep  
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9 track of activities, roles, and achievements over time (e.g., Gaughan, 2009) and are becoming  
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11 the main reference for career advancements (Macfarlane and Burg, 2019). CVs were used to  
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13 grasp visiting scholarship, research awards, and the number of academic citizenship activities  
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15 and roles performed (institutional, discipline-based, and public service). CVs were collected  
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17 from the National Qualification Exam website for 28.5% of the sample and downloaded from  
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19 universities' and research projects' websites for academics who did not participate in the  
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21 qualification process. The National Qualification Exam website collects the CVs of  
22  
23 candidates who wish to participate either in the assessment procedure or in committees: these  
24  
25 latter are sorted out of a list of faculty who comply with 'threshold values' that are usually  
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27 higher than those required of the former. It is noteworthy that the National Qualification CV  
28  
29 format has become the standard for CV elaboration in Italy since its launch in 2012;  
30  
31 consequently, there is substantial homogeneity in the information reported across CVs that  
32  
33 abide by this format. The criterion of consistency with the qualification exam format drove us  
34  
35 in the retention of CVs among those available on the Internet. We then fine-tuned the sample  
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37 selection by discarding CVs that were not updated to January 2014 at least, as the 2010-2013  
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39 national evaluation exercise comprised all the data up to December 2013 included. We met  
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41 several times to define coding criteria with two coders based on batches of CVs that each of  
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43 us had singularly examined, then regularly again to discuss and solve doubtful cases that  
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45 arose during further independent coding (Gioia *et al.*, 2013).  
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56 Information about publications of academics and networks of international collaboration  
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58 were retrieved from the Scopus database (Chavarro *et al.*, 2017). Additionally, reports  
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1 published by ANVUR and the database on the Italian Research Evaluation Exercise  
2 (Valutazione della Qualità della Ricerca or VQR) provided data about university research  
3 orientation, while reports by the Statistical Office of the Italian Ministry of Education,  
4 University, and Research (MIUR) were used to gather data on university size.  
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## 10 11 **Variables**

12 Research performance can be traced back to two significant dimensions that have been  
13 identified in the lively debate targeting the appraisal of research performance. The former  
14 refers mostly to the quantity of publications on indexed journals carried out by each  
15 academic, also known as scientific productivity (Lee *et al.*, 2015; Moed, 2010), while the  
16 latter parses out the impact of publications on the scientific community, or scientific  
17 influence (e.g., Glänzel, 2008; Moed, 2010).  
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28 Among the various and somewhat controversial measures of scientific influence proposed in  
29 the literature, such as the journal impact factor and h-index, the number of citations appears  
30 to be the most widely used (Bongioanni *et al.*, 2014). Accordingly, we counted the number of  
31 papers listed on Scopus for each academic in the 2011-2013 period (Harzing and Alakangas,  
32 2016) as a proxy for scientific productivity and the number of citations received from every  
33 scholar as reported on Scopus (Daraio *et al.*, 2018) as a proxy for scientific influence. This  
34 second measure was standardized by the number of years since the publication date of each  
35 paper, as earlier articles are likely to be cited more than later products<sup>1</sup>.  
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48 The independent variables were elaborated for the years going from 2004 to 2010. Previous  
49 scientific productivity and previous scientific influence were measured with the same  
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56 <sup>1</sup> To avoid endogeneity, we calculated citations respectively for the papers published in the first evaluation  
57 exercise and for those published in the second exercise, which differ in their time length. We counted the  
58 citations per author reported on Scopus at 2017. For both periods, we adjusted the citation per paper by the  
59 number of years since its publication date: for instance, if a paper published in 2012 received 20 citations at  
60 2017, we divided 20 by the years from 2012 to 2017, i.e., 5, counting 4 citations for that paper.  
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1 approach as the dependent variables to test Hypothesis 1 on path dependency.

2 International collaborations were defined as the count of each academic's co-authors  
3 affiliated to a foreign university (Ponomariov and Boardman, 2010). In our case, we counted  
4 them using the authoring data reported on Scopus.  
5  
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7 Inspired by Jonkers and Cruz-Castro (2013), visiting scholarship was defined as a binary  
8 variable coded as 1 if the academic had done at least a period of visiting in a foreign  
9 university between 2004 and 2010, and 0 otherwise.  
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11

12 Research awards were based on the coding of academics' CVs considering several types of  
13 acknowledgements, such as best paper and best dissertation awards (Allison and Long, 1990;  
14 Lutter and Schröder, 2016).  
15  
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17 Academic citizenship was measured by three variables—institutional, public and discipline-  
18 based service—according to Macfarlane (2005, 2007), Thompson et al. (2005), Vogelgesang  
19 et al. (2010), and Bolden et al. (2014).  
20  
21

22 Information on institutional service was coded from CVs as a variable that counts the  
23 activities and roles undertaken by each academic to serve university committees and boards  
24 between 2004 and 2010. Some examples are membership in the faculty or department boards,  
25 in the Senate, in PhD program committees, or in other committees (e.g., funding,  
26 internationalization, quality assurance) and the roles of Head or Deputy Head of Department,  
27 Dean or Deputy Dean.  
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30 Similarly, public service was appraised as the count of activities and roles related to service  
31 in public bodies and non-profit organizations, such as membership in boards of directors or in  
32 boards of auditors, roles in the boards or committees of professional associations,  
33 membership in authorities or formal roles in regional or local institutions.  
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36 Discipline-based service was defined as the number of roles in editorial boards of scientific  
37 journals (e.g., editor in chief, senior editor, associate editor) or in conference committees  
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1 (e.g., conference program chair, member of the scientific committee or of the organizing  
2 committee) or as reviewers.  
3

4 The research orientation of the university was gathered from the detailed report published by  
5 ANVUR on the 2004-2010 evaluation exercise, using the rates assigned to research quality.  
6

7 University size was defined as a categorical variable, dividing universities into three classes:  
8 small (fewer than 10,000 students), medium (between 10,000 and 20,000 students), and large  
9 (more than 20,000 students).  
10

11 Control variables on gender and rank (assistant, associate, and full professor) were taken  
12 from CVs, while the discipline was coded as a categorical variable to attribute academics to  
13 three wide subject areas: accounting, strategy and marketing, and finance.  
14

15 Table 1 presents the descriptive statistics and Pearson correlations among variables.  
16

17 Remarkably, the dependent variable's mean is similar to the first predictor (Previous  
18 Scientific Productivity), although this latter was calculated on a three-year timeframe instead  
19 of seven, as the two subsequent evaluation exercises differed in their time span. Few  
20 correlations among independent variables above the cutoff of 0.6 involved previous scientific  
21 productivity, international collaborations, and previous scientific influence, but they did not  
22 generate effects of multicollinearity, as we checked by assessing the Variance Inflation  
23 Factors (VIF).  
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31 Table 2 presents descriptive data on scientific productivity reporting mean values, standard  
32 deviations, and median values for university size, gender, academic rank, and discipline. A  
33 generalized increase in productivity from the first to the second evaluation exercise can be  
34 noted, although the second exercise period lasted less, as specified above. This trend can be  
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1 grasped from the median values, which all moved to 1 in the second exercise. Moreover, we  
2 observed a reduction in standard deviations from the first to the second period, highlighting a  
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4 convergence towards the mean values.  
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## 14 **Method**

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16 The nature of the dependent variables, scientific productivity measured by papers published  
17 on Scopus-indexed journals and scientific influence measured by citations, suggested not to  
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19 use an OLS regression to test the hypotheses, but a negative binomial model that is able to  
20  
21 explain the particular distribution of count variables with over-dispersed outcomes (Lee and  
22  
23 Jung, 2017). The likelihood-ratio test for the overdispersion coefficient (alpha) was  
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25 performed to verify whether the negative binomial model had a better fit than a Poisson  
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27 model assuming equal mean and variance: the resulting value testified to a significant  
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29 increase in fit using a negative binomial model.  
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36 The aim of our study is to look at the combined influence of individual and institutional-level  
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38 variables on scientific productivity and influence. The use of a multilevel analysis enabled to  
39  
40 distinguish the effects of the context from individual features and activities (Klein *et al.*,  
41  
42 1999). To explain variability at the university level, we developed a random intercept model  
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44 (Snijder and Bosker, 1999), assessing differences among universities and measuring the  
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46 variance of the intercept related to individuals' university membership.  
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51 The equation of the multilevel model is:

$$52 \quad (1) \ln y_{ij} = \beta_0 + \beta_1 x_{ij} + u_j + e_{ij}$$

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54 Model (1) is a random intercept model, where the intercept can vary across groups, i.e.,  
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56 universities.  $y_{ij}$  represents the productivity or influence of the individual  $i$  in the university  $j$ .  
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1 The random part of the model is given by  $u_j$  and  $e_{ij}$ .  $u_j$  is the group effect, which is assumed  
2 to follow a normal distribution with mean equal to zero and variance  $\sigma_u^2$  that we measured in  
3 the analysis, while  $\sigma_e^2$  is the variance of the residuals' distribution. We calculated the  
4 Interclass Correlation Coefficient (ICC) and the significance values of both variances.  
5 Likelihood-ratio tests were conducted to compare the fit of the multilevel model with the  
6 correspondent negative binomial models, always finding a significant improvement of fit  
7 with the multilevel approach, as reported at the bottom of Tables 2 and 3.

8 In our theorizing, the three moderation hypotheses (8a, 8b and 8c) were first combined with  
9 hypotheses on the direct effect of the moderators on the dependent variable 'scientific  
10 productivity' (5a, 5b and 5c). The combination of these hypotheses means that we were  
11 looking for quasi-moderation effects where the moderator had also a direct influence on the  
12 criterion variable. To empirically test quasi-moderations, according to the method suggested  
13 by Sharma et al (1981), we performed a hierarchical regression with three models: Model 1  
14 with the independent variables as regressors, as argued above, Model 2 including the  
15 moderators as regressors, Model 3 adding the interaction terms between moderators and the  
16 regressors at stake, as follows:

$$(2) \ln y_{ij} = \beta_0 + \beta_1 x_{ij} + \beta_2 z_{ij} + u_j + e_{ij}$$

$$(3) \ln y_{ij} = \beta_0 + \beta_1 x_{ij} + \beta_2 z_{ij} + \beta_3 (x_{ij} \times z_{ij}) + u_j + e_{ij}$$

17 Adopting hierarchical regression analysis, it is possible to distinguish between a pure  
18 moderation and a quasi-moderation. This latter requires that both the effect of the interaction  
19 term between the moderator variables and the independent variable and the effect of the  
20 moderator as independent variable be significant.

21 In order for a moderation effect to be detected, the beta of the interaction term in Model 3  
22 must be significant ( $\beta_3 \neq 0$ ). Subsequently, to evaluate if it is a pure or a quasi-moderation  
23 effect, the significance of the relationship of the moderator with the criterion variable in

1 Model 2 must be verified. If  $\beta_2$  is significant, Model 1 and Model 2 are different, and  $z$  is a  
2 quasi-moderator; if not, the two models are equivalent, and  $z$  is a pure moderator. The same  
3 approach was adopted to study scientific influence, using a hierarchical regression in models  
4 4, 5 and 6, considering previous scientific influence in the interaction term.  
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9 To estimate the parameters of the negative binomial regressions we used robust estimators to  
10 control for mild violation of underlying assumptions, as suggested by Cameron and Trivedi  
11 (2013). The VIF tests for multicollinearity showed an average value equal to 1.79 and a  
12 maximum value equal to 3.52, below the suggested cutoff of 10 (Hair *et al.*, 2010).  
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## 21 **Findings**

22 In this section, the results of the three negative binomial regressions related to scientific  
23 productivity are presented. Then, the other three models for scientific influence are  
24 introduced by stressing the differences from findings on scientific productivity.  
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31 In Table 3 the effects of the independent variables on the criterion variable are displayed as  
32 exponential coefficients that measure how much the dependent variable would change for a  
33 unitary variation in the independent variable. If an exponential coefficient is higher than 1, it  
34 means that the predictor has a positive effect given by the coefficient value minus 1.  
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41 Conversely, if the exponential coefficient is inferior to 1, the independent variable has a  
42 negative effect equal to 1 minus the coefficient value. Table 3 reports also the level of  
43 significance and standard errors, while the fit parameters are listed at the bottom.  
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55  
56 Model 1 partially confirmed the first hypothesis on path dependency: academics who  
57 published a large number of papers in the previous evaluation exercise were more likely to be  
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1 productive in the following exercise. An additional paper published from 2004 to 2010  
2 increased the predicted outcomes by 15.8%. Nevertheless, previous research influence did  
3 not exert a significant influence on scientific productivity. Having an impact with former  
4 publications did not make the scholars under exam more productive later.  
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7 International collaborations did not exert a significative effect on scientific productivity, thus  
8 leaving Hypothesis 2 unconfirmed, while having been a visiting scholar at a foreign  
9 university wielded a significant payoff in terms of scientific productivity (52.1%), supporting  
10 Hypothesis 3.  
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13 Research awards had only a partially significant effect on scientific productivity in Model 1,  
14 but their positive effect was verified in Models 2 and 3 that better approximate our data.  
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17 According to Model 3, a research award could raise research outcomes by 8.1%, thereby  
18 giving support to Hypothesis 4.  
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21 Model 2 included academic citizenship variables that were also tested as moderators: first, we  
22 observed their direct effect on scientific productivity, which did not turn out to be as posited.  
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25 Institutional service did not appear to have a significant direct effect on productivity.  
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28 Consequently, Hypothesis 5a was not confirmed. Conversely, roles and activities connected  
29 to public service had a significative negative effect (-3.2%) on research outcomes, in line  
30 with Hypothesis 5b. Finally, we found that past discipline-based service enhanced subsequent  
31 scientific productivity with a positive significant effect equal to 2.3%, confirming Hypothesis  
32 5c, too.  
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35 Contextual factors posited in Hypotheses 6 and 7 can be gleaned from Model 1. Hypothesis 6  
36 on the effect of university ranking was confirmed. Working in a university with a good  
37 research outlook facilitated scientific productivity. As can be observed from Table 1, the  
38 scale used to assign rates in the evaluation exercises run by ANVUR is quite compressed,  
39 going from 0 to 0.588. Model 1 showed that a 0.1 increase in ANVUR ranking impacted  
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1 positively on scientific productivity (80.4%).

2 Hypothesis 7 was not confirmed by data analysis: working in a large institution did not exert  
3 a significant effect on research outcomes. A coordination issue might be at play (George and  
4 Jones, 2012): while large universities can yield more resources than smaller ones, organizing  
5 and coordinating them in a way that is beneficial to scholars might be difficult and generate  
6 inefficiencies in research processes (Brandt and Schubert, 2013).

7 Model 3 shows the three interaction terms that we intended to delve into. The first interaction  
8 between previous scientific productivity and institutional service emerged as significant,  
9 giving support to Hypothesis 8a. Moreover, the non-significance of the direct effect of the  
10 moderator on the criterion variable, which was tested in Model 2, as anticipated by the lack  
11 of support for Hypothesis 5a, confirmed that institutional service was a pure moderator of the  
12 relationship between previous and subsequent scientific productivity. This effect is  
13 represented in Figure 2, which shows the predicted values of the dependent variable for  
14 different levels of former scientific productivity and of institutional service, keeping the other  
15 variables at their average. Each line stands for the expected productivity of academics with  
16 different levels of institutional service engagement, ranging from 0 to 9. The x-axis shows the  
17 number of papers reported on Scopus in the 2004-2010 time length. Lines are almost totally  
18 overlapping for low values of previous scientific productivity, but, looking at academics who  
19 published 9, 12, or even more papers in the previous evaluation exercise, a clear difference  
20 stands out: those who had performed less institutional citizenship published more, while  
21 those who had been more committed to this type of service reduced their possibility of  
22 generating the same amount of papers as colleagues who had not exceeded in this service. It is  
23 noticeable that academics who had published few papers were not negatively impacted by  
24 their commitment to institutional citizenship. The moderation effect became relevant for  
25 academics who had formerly strongly focused on the advancement of their publication

1 records: enacting institutional academic citizenship lowered the number of publications  
2 expected of them according to path dependency in the following exercise.  
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11 The interaction term involving public service did not turn out to be significant, thereby  
12 providing no support for Hypothesis 8b. Only a direct effect of public service on the  
13 dependent variable was confirmed (see Hypothesis 5b).  
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17 A significant effect of discipline-based service as a moderator was found, but with a different  
18 trend from the one hypothesized (8c): in fact, evidence ran counter the conjecture that high  
19 values of discipline-based service enhanced the effect of previous scientific productivity on  
20 the criterion variable. Our findings depicted that increasing commitment to discipline-based  
21 citizenship reduced the impact of previous scientific productivity on predicting future  
22 outcomes. An explanation of this effect might lie in the action of discipline-base service as  
23 quasi-moderator instead of pure moderator: its direct effect on the dependent variable was  
24 significant and positive in Model 2, as testified by the support found for Hypothesis 5a.  
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39 Playing out discipline-based service had a positive impact on the dependent variable, but as  
40 the engagement in this activity increased, it lessened the positive effect of previous scientific  
41 productivity on the dependent variable. Figure 3 provides a visual representation to better  
42 comprehend this complex pattern. The lines show, as per Figure 3, the expected number of  
43 research outcomes at different levels of commitment to discipline-based service, while the x-  
44 axis depicts different levels of previous scientific productivity.  
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1 Faculty who had published few Scopus-indexed papers in the previous evaluation exercise  
2 (<6) obtained some benefits from the enactment of discipline-based service, in comparison  
3 with those who did not have any involvement in this type of academic citizenship. This result  
4 might be interpreted as a positive impact of discipline-based service for faculty members with  
5 a limited publication record, who might learn from doing reviews or participating in  
6 conference committees. Variance in the moderator proved to be ineffective at around six  
7 publications to then capsize: academics who had carried out a large number of Scopus papers  
8 in the past were expected to produce more research outcomes if they were less involved in  
9 discipline-based service. This trend might be due to the fact that well-experienced academics  
10 who took on editorial roles or actively served on conference committees had to reduce time  
11 and energy dedicated to research: no positive spillover was recorded.

12 Control variables confirmed some of the conjectures that had been formulated. First, being a  
13 female increased the likelihood of producing more high-quality research, in line with Groot  
14 and García-Valderrama's findings (2006). We did not find any significant effect of academic  
15 rank and of discipline on scientific productivity.

16 The variance of the intercept related to university membership and the variance of the  
17 residuals were found highly significant. The ICC showed that, conditional to the fixed-effects  
18 covariates, research productivity was scarcely correlated within the same university,  
19 accounting for 15.6% of the total residual variance (Model 3).

20 The results found for the multilevel negative binomial models performed on scientific  
21 influence (number 4, 5 and 6 reported in Table 4) were very similar to the results related to  
22 scientific productivity. We underline the few emergent differences.

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Insert Table 4 about here  
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1 First, being in a medium-sized university negatively affected scientific influence (-47.7%)  
2 compared with belongingness to a small university, and being in strategy rather than in  
3 accounting exerted a positive effect, even though only in Model 4. The main difference  
4 between scientific productivity and influence stemmed from the analysis of moderation  
5 effects: while a quasi-moderation between discipline-based service and scientific influence  
6 proved to be significant, consistently with Hypothesis 8c, the interaction between research  
7 influence and institutional service was not significant.  
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10 As with the previous models focusing on scientific productivity as dependent variable, both  
11 the variances of the group effect and of the residuals were significant, with a low ICC (8.5%),  
12 which indicates that university membership did not account for much of the overall residual  
13 variance.  
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## 29 **Discussion**

30 In the debate on universities becoming ‘psychotic’ and academics becoming ‘bipolar’ due to  
31 the multiple, often conflicting, expectations placed on them (Sievers, 2008; Bolden *et al.*,  
32 2014), the relationship between research performance and academic citizenship has  
33 surprisingly been sidelined. When reflecting upon the levers to enhance research performance  
34 in fact, the effect that service within and outside the university boundaries can exert has been  
35 only marginally, and mostly theoretically, called into question. Conversely, a great deal of  
36 attention has been devoted to grasping other individual and organizational-level antecedents.  
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48 This study enriches our comprehension of the antecedents and moderators of research  
49 performance by including different types of academic service.  
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53 Our findings, rooted in 692 Italian academics in management, show that research  
54 performance is influenced by previous research-oriented individual achievements, such as  
55 scientific productivity, research awards, and international co-authorship, and by the  
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1 orientation to research of the university to which a scholar belongs. A complex relationship  
2 links service and research. Public service in fact negatively influenced research performance,  
3 without exerting any moderation effect, while institutional service negatively moderated the  
4 path dependency effect on research productivity in two subsequent evaluation exercises. A  
5 possible explanation could be that actively contributing to university management requires  
6 the development of specific skills and behaviors, e.g., political and decision making abilities,  
7 that encroaches upon successful research pathways (e.g. Tagliaventi *et al.*, 2019). In addition,  
8 discipline-based service has a quasi-moderation effect on the relationship between research  
9 performance in two subsequent evaluation exercises. The direct effect of discipline-based  
10 service is positive, but the moderation effect tells us something more: academics with a  
11 limited publication record could benefit from the effect of discipline-based commitments that  
12 reinforced their scant publication experience, whereas productive academics would enjoy less  
13 publication success if they committed to more discipline-based activities. It is plausible that  
14 engagement in the scientific community represents a learning opportunity for the former, but  
15 a burden and a distraction for the latter. We posited a positive mediating effect based on the  
16 affinity between activities directed at the scientific community and activities aimed at  
17 publishing. Conversely, findings seem to contradict this expectation and to corroborate the  
18 service nature of discipline-based citizenship, highlighting its kinship to the other types of  
19 academic citizenship rather than to research.

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46 Interesting contributions to management of higher education systems ensue from the above  
47 considerations. First of all, we can claim, thus testifying to a well-voiced concern (e.g.,  
48 Lawrence et al., 2012; Macfarlane, 2011; Vogelgesang et al., 2010), that academic  
49 citizenship, while benefiting the university and the wider collective, takes a toll on research.  
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56 As Knights and Clarke (2014) stated, pursuing research can turn academic life into a  
57 ‘bittersweet symphony’ in which activities that differ in nature, such as publishing and being  
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1 a good citizen of the university, are hard to be matched. It is particularly remarkable that  
2 acting as editor or even reviewer and organizing scientific conferences and workshops likely  
3 foster the development of skills and ties that sustain a high research performance for faculty  
4 who formerly had an inadequate publication record. This consideration sheds a different light  
5 on forms of active participation of junior researchers in the scientific community that might  
6 be interpreted as interfering with the straightforward attainment of research goals. As a  
7 matter of fact, service to colleagues in the same field enhances, rather than puts at risk, the  
8 achievement of brilliant research performance by academics who need to further their  
9 publication record. This hint contributes to the conversation on socialization to the academic  
10 profession, which has largely stressed the influence of the closest environment, such as the  
11 department's orientation to research and the advisor's publication record, on research training  
12 (Hottenrott and Lawson, 2017). A profitable approach to research can ensue from a  
13 proximate context that fosters research, but also from involvement in the more distant  
14 scientific community.

15 Policy makers, university managers, and ultimately faculty themselves should keep a special  
16 eye on academic citizenship. If academic citizenship and research performance are  
17 potentially conflicting, as emerges from this study, the importance of academic citizenship  
18 needs to be clearly communicated and rewarded in systems that emphasize research. Up to  
19 now, the reasons and potential returns for embarking on service have been ambiguous. In  
20 some contexts, service is considered as part of the 'contested triad' alongside research and  
21 teaching (Krause, 2009), with the implicit expectation that it might be somewhat taken into  
22 account for tenure. In other cases yet, performing academic citizenship can even turn into a  
23 disadvantage, since people are deemed to take charge of service to make up for their inability  
24 to perform research successfully (Thompson *et al.*, 2005). Assessment and reward for service  
25 is still 'foggy as opposed to clear' (O'Meara *et al.*, 2019, p. 5). Time is ripe for rethinking the

1 way academic citizenship is gauged and compensated in academic careers. The need to  
2 formally recognize the relevance of service for university functioning and, in general, for  
3 societal advancement has been expressed in the literature (e.g., Lawrence *et al.*, 2012;  
4 Macfarlane, 2011). Thompson et al. (2005) recommended that academic citizenship  
5 requirements be specified when opening positions. Extending Valentine and Sandborg's  
6 (2013) reflection on medicine school faculty, O'Meara et al. (2019) proposed that academics  
7 be assigned credits for their various activities and given the chance to trade credits in one  
8 area for credits in other areas to generate an overall system equity. Along this line of  
9 reasoning on the development of a 'choice environment' (Kahneman, 2011), Maiden and  
10 Perry (2011) and Curcio and Lynch (2017) advocated for a planned and shared rotation of  
11 less and more-preferred, less and more time-consuming academic tasks so that they are no  
12 longer carried out by the same people, who end up undermining their research potential.  
13 We join and integrate this call from another perspective: departments could be designed and  
14 managed so as to comprise individuals with different domains of expertise and excellence—  
15 some in teaching, others in research, others yet in service, thus echoing what happens in  
16 companies, where different functional orientations (e.g., sales, marketing, and R&D)  
17 altogether are expected to produce satisfying organizational performance. Groups composed  
18 of heterogeneous members, each of them outperforming in at least one domain, instead of all  
19 targeting the same domain and refraining from the others, would live up to the expectation of  
20 bettering the overall higher education system.

### 21 **Limitations and Hints for Future Research**

22 This work has limitations that can pave the way for additional studies on the interplay  
23 between research and academic citizenship. First of all, it gleans on from Italian management

1 faculty only: considering scholars in different fields and countries would enable us to get a  
2 more thorough view on the relationship between heterogeneous types of academic activities  
3 and roles. How female faculty live and handle possible competing requirements deserves  
4 further elucidation. A ‘gendered nature’ of service has been claimed in the literature  
5 (Babcock *et al.*, 2017; Vogelgesang *et al.*, 2010). Women tend to take charge of service,  
6 often repeatedly over time: they are so keen on ‘institutional housekeeping’ that a ‘gully of  
7 service’ has been highlighted for them (Guarino and Borden, 2017, p. 674). Implicit social  
8 biases have been taken into account. Women are scarcely willing to negotiate their position  
9 and are the target of requests for ‘not-promotable’ tasks from male colleagues as well as from  
10 students, who both perceive them as nurturing and prone to help (Babcock *et al.*, 2017). In  
11 parallel, women have been shown through a range of investigation tools varying from survey  
12 to focus groups, and from interviews to annual faculty activity reports, to be less focused on  
13 research than men (Bozeman and Gaughan, 2011). Our study unravels that female scholars  
14 were able to respond to the pressure to advance scientific productivity prompted by an  
15 institutional reform through a heftier increase in papers published on Scopus-indexed journals  
16 than their male colleagues. Further investigation should complement this evidence by  
17 unraveling whether a stronger publication effort came at the expense of service involvement  
18 or whether and how female faculty succeeded in balancing heterogeneous courses of action.  
19 Additionally, a more thorough outlook on knowledge transfer activities that takes into  
20 account patenting, spin-offs, consulting, funding, and teaching, would allow us to better grasp  
21 the influence that the different tasks and roles enacted by faculty exert on each other. Finally,  
22 we invite academics to proceed along the pathway of understanding the complex intertwining  
23 of factors that underlie daily behaviors and choices in university life, and that ultimately  
24 determine our performance as individual scholars, but also as members of a collective.  
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#### 48 **Conflict of interest statement**

49 On behalf of all authors, the corresponding author states that there is no conflict of interest.

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**Table 1. Descriptive statistics and Pearson correlations**

	Variables	Mean	SD	Min	Max	Variables														
						1	2	3	4	5	6	7	8	9	10	11				
1	Scientific Productivity	1.895	2.744	0	18	1														
2	Scientific Influence	3.420	7.889	0	60.183	0.742	1													
3	Previous Scientific Productivity	1.704	3.785	0	45	0.576	0.543	1												
4	Previous Scientific Influence	3.502	13.020	0	188.725	0.466	0.539	0.808	1											
5	International Collaborations	0.637	2.441	0	36	0.341	0.447	0.664	0.716	1										
6	Visiting Scholarship	0.272	0.445	0	1	0.248	0.257	0.220	0.210	0.216	1									
7	Research Awards	0.384	1.234	0	14	0.300	0.242	0.382	0.359	0.297	0.107	1								
8	Institutional Service	3.984	4.852	0	32	-0.067	-0.046	-0.073	-0.080	-0.066	0.021	0.083	1							
9	Public Service	1.782	3.462	0	31	-0.087	-0.062	-0.033	-0.020	-0.004	-0.084	0.039	0.140	1						
10	Discipline-based Service	1.637	3.825	0	28	0.145	0.173	0.235	0.174	0.138	0.014	0.131	0.176	0.026	1					
11	University Research Orientation	0.307	0.102	0	0.588	0.264	0.248	0.274	0.230	0.218	0.129	0.164	-0.024	-0.091	0.106	1				

Table 2. Descriptive data on Scientific Productivity

University Dimension	Previous Scientific Productivity (2004-2010)			Scientific Productivity (2011-2013)		
	Average	Standard deviation	Median	Average	Standard deviation	Median
Small	1.293	2.415	0	1.813	2.375	1
Medium	2.320	4.302	1	2.022	2.664	1
Large	1.518	3.726	0	1.856	2.837	1
Female	1.522	3.265	0	1.993	2.706	1
Male	1.826	4.096	0	1.829	2.770	1
Assistant Professor	1.244	2.284	0	1.967	2.636	1
Associate Professor	1.677	3.632	0	1.885	2.817	1
Full Professor	2.437	5.361	1	1.792	2.843	1
Accounting	1.118	3.139	0	1.640	2.518	1
Strategy and marketing	2.597	4.489	1	2.287	2.960	1
Finance	1.783	3.816	1	1.922	2.888	1
Total	1.704	3.785	0	1.895	2.744	1

Table 3. Multilevel negative binomial regression results for Scientific Productivity

Independent Variables	Model 1			Model 2			Model 3		
	Exp. Coef.	Robust Std. Err.	Exp. Coef.	Robust Std. Err.	Exp. Coef.	Robust Std. Err.	Exp. Coef.	Robust Std. Err.	
Previous Scientific Productivity	1.158***	0.032	1.147***	0.029	1.217***	0.035			
Previous Scientific Influence	0.992	0.005	0.993	0.005	0.989**	0.005			
International Collaborations	0.989	0.031	0.991	0.032	1.002	0.023			
Visiting Scholarship	1.521***	0.130	1.537***	0.125	1.546***	0.140			
Research Awards	1.058*	0.034	1.067**	0.032	1.081***	0.028			
Institutional Service			0.987	0.008	0.998	0.009			
Public Service			0.968*	0.017	0.970*	0.016			
Discipline-based Service			1.023*	0.013	1.056***	0.012			
Previous Scientific Productivity × Institutional Service					0.993***	0.002			
Previous Scientific Productivity × Public Service					0.999	0.004			
Previous Scientific Productivity × Discipline-based Service					0.992***	0.002			
University Research Orientation	8.043***	5.718	7.011***	4.813	5.454***	3.505			
University Dimension (ref.: Small)	0.746	0.141	0.736	0.141	0.753	0.140			
Large university	0.853	0.141	0.830	0.135	0.864	0.137			
Male	0.826**	0.079	0.829*	0.081	0.802**	0.076			
Academic Rank (ref.: Full Professor)	1.257**	0.144	1.301**	0.149	1.286**	0.144			
Assistant Professor	1.158	0.164	1.247	0.178	1.221	0.173			
Associate Professor	1.131	0.134	1.067	0.119	1.031	0.111			
Strategy and marketing	1.054	0.134	0.996	0.115	0.975	0.118			
Finance	0.599*	0.158	0.677	0.173	0.654	0.173			
Constant	-0.417***	0.159	-0.456***	0.163	-0.556***	0.185			
ln(alpha)	0.659***	0.105	0.634***	0.103	0.573***	0.106			
$\sigma^2$ (residuals)	0.104***	0.034	0.105***	0.034	0.106***	0.034			
ICC		0.136		0.142		0.156			
Wald $\chi^2$ (Prob. > $\chi^2$ )		186.31 (0.0000)		242.97 (0.0000)		356.15 (0.0000)			
LR test vs. neg. binomial mode LR $\chi^2$ (3) (Prob. > $\chi^2$ )		19.23 (0.0000)		19.88 (0.0000)		21.49 (0.0000)			

N= 692; \*\*\*p &lt; .01; \*\*p &lt; .05; \*p &lt; .1

Table 4. Multilevel negative binomial regression results for Scientific Influence

Independent Variables	Model 1		Model 2		Model 3	
	Exp. Coef.	Robust Std. Err.	Exp. Coef.	Robust Std. Err.	Exp. Coef.	Robust Std. Err.
Previous Scientific Productivity	1.182***	0.046	1.167***	0.041	1.190***	0.046
Previous Scientific Influence	1.009	0.011	1.006	0.010	1.014	0.012
International Collaborations	1.049	0.040	1.063	0.043	1.058	0.043
Visiting Scholarship	2.164***	0.338	2.193***	0.348	2.230***	0.369
Research Awards	1.088	0.066	1.103	0.066	1.100	0.068
Institutional Service			0.990	0.021	0.995	0.021
Public Service			0.939**	0.029	0.935**	0.028
Discipline-based Service			1.045**	0.019	1.078***	0.029
Previous Scientific Influence × Institutional Service					0.998	0.002
Previous Scientific Influence × Public Service					1.002	0.008
Previous Scientific Influence × Discipline-based Service					0.996***	0.001
University Research Orientation	53.805***	51.868	44.741***	40.449	36.331***	31.757
University Dimension (ref.: Small)	0.523**	0.145	0.491**	0.138	0.496**	0.149
Large university	0.810	0.207	0.729	0.182	0.753	0.209
Gender (ref.: Female)	0.791	0.142	0.769	0.139	0.751*	0.129
Academic Rank (ref.: Full Professor)	1.059	0.208	1.119	0.226	1.117	0.216
Associate Professor	0.807	0.201	0.887	0.228	0.870	0.219
Discipline (ref.: Accounting)	1.663**	0.427	1.457	0.374	1.442	0.359
Strategy and marketing	0.788	0.218	0.724	0.197	0.702	0.189
Finance						
Constant	0.425**	0.184	0.536	0.233	0.536	0.238
ln(alpha)	0.915***	0.104	0.893***	0.106	0.873***	0.112
$\sigma^2$ (residuals)	2.498***	0.260	2.442**	0.258	2.394***	0.269
$\sigma^2$ (constant)	0.219**	0.116	0.210**	0.118	0.224**	0.116
ICC		0.081		0.079		0.085
Wald $\chi^2$ (Prob. > $\chi^2$ )		140.82 (0.0000)		149.80 (0.0000)		181.43 (0.0000)
LR test vs. neg. binomial mode LR $\chi^2$ (3) (Prob. > $\chi^2$ )		8.42 (0.0019)		7.73 (0.0027)		9.04 (0.0013)

N= 692; \*\*\*p &lt; .01; \*\*p &lt; .05; \*p &lt; .1

Figure 1. Research hypotheses

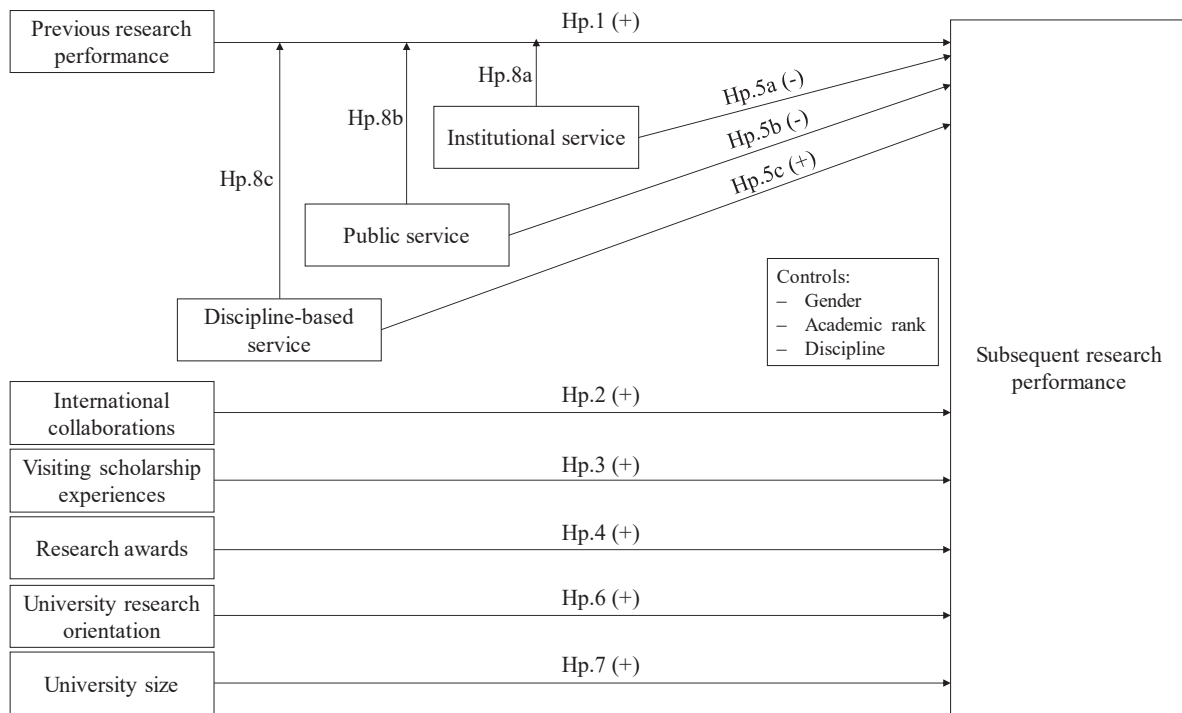




Figure 2. The full moderation effect of Institutional Service on the relationship between past and future Scientific Productivity.

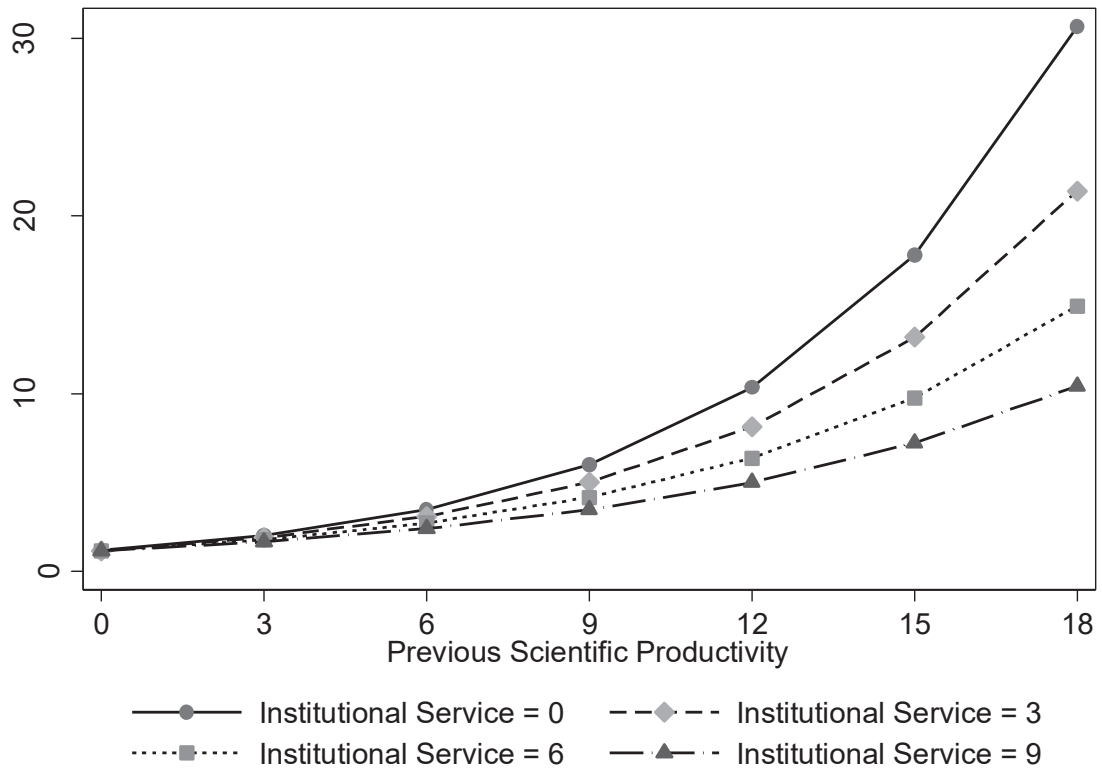


Figure 3. The quasi-moderation effect of Discipline-based Service on the relationship between past and future Scientific Productivity.

