What Maximizes Research Excellence? Productivity and Impact in Social Science

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Synopsis: What contributes towards research excellence in political science? To consider this issue, *Part I* describes the core concepts of academic productivity and impact and their operationalization, using the h-index. The study theorizes that variations in this measure may plausibly be influenced by *personal characteristics* (like gender, career longevity, and formal qualifications), *working conditions* (academic rank, type of department, and job security), as well as *subjective role perceptions* (exemplified by the perceived importance of scholarly research or teaching). *Part II* sets out the new evidence used for exploring these issues, drawing upon the ECPR-IPSA World of Political Science survey. This study gathered information from 2,446 political scientists in 102 countries around the globe. *Part III* presents the distribution and analysis of the results, as well as several robustness tests. *Part IV* summarizes the key findings and considers their broader implications. In general, several personal characteristics and structural working conditions prove significant predictors of h-index scores, whereas motivational goals and role perceptions add little, if anything, to the models. The gender gap also becomes insignificant once controls are introduced for career longevity and formal qualifications.

Keywords: h-index, bibliometrics, research performance, political science

Word count: 9773

Recent decades have seen a proliferation of performance metrics designed to identify research excellence in academia. Among the available measures, this study focuses upon the h-index. First introduced by Jorge Hirsch (2005), this aims to identify persistently productive academics who advance scientific knowledge and generate stellar ideas which shape their discipline during their careers, as acknowledged by their peers. The h-index is designed to generate a summary measure of research excellence during each author's lifetime based on the twin components of *productivity* (the number of papers they publish) and *impact* (the number of citations per paper). The h-index, standardized for career longevity, is commonly used to evaluate the status and reputation of individual scholars, as well as the collective prestige of departments and universities. This measure has spawned many variants, all usually strongly correlated with the original (Bornmann, Mutz and Hug 2011).

What contributes towards research excellence in the discipline of political science, monitored by ratings in the h-index? To address this issue, this study draws upon a new largescale survey of political scientists in the United States and around the world. *Part I* describes the core concepts and their operationalization then identifies several factors which may plausibly be associated with research productivity and impact. These can be clustered into three categories including the potential role of *personal characteristics* (like gender, career longevity, and formal qualifications) which scholars bring to the academic labor market, *working conditions* which provide resources and the structure of opportunities for research and publications (like academic rank, contractual status, and job security), and *subjective role perceptions* which drive academic priorities (exemplified by the perceived importance of scholarly research or teaching). *Part II* sets out the evidence used for exploring these issues, drawing upon the ECPR-IPSA World of Political Science survey. In Spring 2019, this study gathered information from 2,446 political scientists in 102 countries around the globe (Norris 2020). *Part III* presents the distribution and analysis, demonstrating that several characteristics are consistently associated with h-index scores, notably career longevity, academic rank, and job security. The effects of gender become insignificant once controlling for career longevity and qualifications. Robustness tests suggest that these key relationships hold even after controlling for several other conditions. *Part IV* summarizes the main findings and considers their broader implications. Understanding the correlates of productivity and impact is important to provide insights into potential barriers and opportunities for research in academia, such as by informing policies enhancing the paths and training for early career, women and minority scholars.

I: Conceptual framework and theories

In the past, recruitment and evaluation processes traditionally relied upon subjective assessments to compare individual scholars, like peer review references for job applicants. Similarly, reputational surveys by experts have been used for comparisons, asking political scientists to rate the 'most influential scholars' working in American university departments (Somit and Tanenhaus 1967; Roettiger 1978), as well as the most prestigious and highly rated political science journals (Roettger 1978; Crewe and Norris 1991; Norris and Crewe 1993; Norris 1997; Giles and Garand 2007). But the potential limits of relying upon reputational evaluations alone are well-known. Tacit assessments in appointment and promotion processes can reinforce implicit social biases within academia, with stereotyping heuristics

and 'like me' choices limiting social and ideological diversity (Moss-Racusin et al 2012). This danger can be reinforced by growing disciplinary and sub-field specialization, making it increasingly difficult to assess scholars across diverse areas of expertise. The risks rise when making global comparisons of hundreds of journals or universities around the world, where familiarity and name recognition may outweigh excellence. Reputational evaluations of departments and universities may favor the most visible and long-established institutions, the Ivy Leaguers, rather than up-and-coming institutions (Katz and Eagles 1996). The publication of reputational rankings can generate a hall of mirrors effect, where expert judgments gradually converge to reflect each other. Expert judgments are also lagged indicators, providing a more reliable guide to past status and prestige, perhaps reflecting the prestige of one or two well-known academic stars, rather than the future performance by rising junior faculty. The rankings may be unreliable: Robey (1982) found that reputational surveys of the top scholars in political science were poorly correlated with other indices such as citation counts, although Klingemann (1986) reported a closer fit between these measures when evaluating departments.

For all these reasons, the aim of bibliometrics has been to supplement implicit and impressionistic reputational judgments with more 'objective' and transparent measures of performance. Metrics on scholarly inputs, outputs and outcomes have become an increasingly common way to evaluate the performance of academic researchers. Evidence-based decision-making is particularly important for making consistent and systematic large-scale comparisons of journals, departments, subfields, and universities, especially when this has important consequences for allocating funding resources.

Bibliometric measures can serve many pragmatic functions (Barnes 2014), including to help university committees make consistent, fair and transparent decisions about hiring, tenure, and promotions, as well as negotiated salaries and benefits.

Performance data also provides independent benchmarks for awarding prestigious accolades and honors, such as by identifying highly cited researchers in election to scholarly academies. The h-index is associated with promotions, grants, and status, even the highest awards and academic honors, like admission to the club of Nobel prize laureates (Schreiber and Giustini 2018). In the case of the Johan Skytte Prize, for example, the most prestigious academic award in political science (Zheng and Liu 2015), recipients during the last decade had an average h-index of 77, ranging from 36 to 114, according to Google Scholar.[1]

Similarly, performance metrics can assist funding organizations and research councils seeking to shortlist grant applications and allocate scarce resources. Impact factors and CiteScores are also routinely used to rank the top articles and journals in a sub-field, for example to guide authors considering where to submit new papers. Libraries use such bibliometric measures when deciding to acquire or retain journal subscriptions. Research metrics are also part of the information typically used in national research evaluation exercises for rating the collective scientific productivity of universities and allocating funding, like those in Italy, France, Poland and Australia (Rebora and Turri 2013). Influential global university rankings combine several measures of research performance for each institution, including citation and publication counts, for example in the rankings published annually by *US News and World Report* and *the Times Higher Education (*Shin, Toutkoushian, and Teichler 2011).

Even more importantly, identifying the fundamental drivers of science through performance indicators can help to formulate policies designed to accelerate the enterprise and our capacity to address societal and political problems.

[Figure 1 about here]

An extensive bibliometric literature has debated the construction and measurement of alternative citation impact indicators (see Waltman 2016). The standard types are categorized in Figure 1.

Input metrics include the opportunities and resources available for research, for example whether early career women and men faculty have similar teaching workloads, access to grant awards, and sabbatical leave policies, as well as shared time constraints from care of children and dependents.

The concept of academic '*productivity*' refers to research outputs, traditionally measured through weighted academic publication counts in journals and books. Online publications communicating research findings among broader user communities, through social media and blog commentary, are increasingly recognized as important for disseminating scientific results beyond the ivory tower to governments and policymakers, local stakeholders, and the general public.

The related notion of '*impact*' refers to the influence of research outputs, both within the academy, gauged by scholarly citation counts, as well as more broadly the social value in public affairs, using metrics like Altmetric measuring attention to research in legacy and social media. For instance, for the last decade the UK's Economic and Social Research Council has included a 'pathways to impact' section for grant proposals to emphasize the importance of funding "researchers who generate the knowledge that society needs, and the innovators who can turn this knowledge into public benefit."[2] Many bibliometric indices have been developed, each with certain strengths and limits (Waltman 2016), and the dominant approaches include scholarly *publication* counts, designed to gauge productivity, as well as *citation* counts, designed to monitor impact within academia, and the '*h-index*' and its variants, which seek to combine both.

Operationalization and measurement

The most straightforward method for assessing the output of scholarly productivity counts the total *number of publications* by an author, either within a certain period or cumulatively over their career. Sources for assessing individuals include curriculum vitae, such as by a board comparing shortlisted job applicants, or ideally from publications recorded in a verifiable database, like annual reports. Counts commonly devise elaborate weighting schemes to distinguish the fractional points awarded for different types of contributing roles, such as whether scholars are sole authors, co-authors, editors or coeditors, as well as for different types of publications, such as for monographs and edited anthologies, journal articles, conference papers, and policy reports, and to take account of the prestige of the journal or university press. Publication counts can be standardized through the mean score to compare researchers within similar disciplinary fields and at equivalent stages of their professional career, as well as across different countries. Adopting this approach, Hesli and Lee (2011)

used the total number of refereed journal articles published a scholar as their measure of research productivity in political science, excluding all other types of publications such as authored monographs, edited books or chapters, and policy reports.

Alternatively, the method of *citation counts*, another widely used technique, is designed to measure the impact of publications within a scientific discipline. This approach counts the number of times that a publication has been referenced in other scholarly publications. It can be applied to gauge the impact of individual authors, or to compare journals, departments, institutions, or even countries. This process followed the creation of electronic citation databases of the scientific literature, including the Journal Citation Reports in the Web of Science (launched in 1997), Scopus (developed by Elsevier in 2004), and the broader range of journals and book publications monitored in Google Scholar (starting in 2004). Records from these databases allow comparison of an author's total or average number of citations per annum or cumulatively over their lifetime. Citation metrics are designed to provide a snapshot of a researcher's impact within a scholarly sub-field or discipline. It is a sort of crowd-sourcing method used to highlight the publications which academics judge most worthy of referencing. Citation metrics have been used for ranking exercises in political science, including to generate lists of the so-called 'top-400' scholars by counting the total number of lifetime citations among those employed in American university departments of political science, breaking down the results by age cohort, research subfield, and gender (Klingemann, Grofman, and Campagna 1989; Masuoka, Grofman, and Feld, 2007; Kim and Grofman 2019). Publication records, and citation counts, have also been used elsewhere to produce similar comparisons of political scientists in the UK (Coleman, Dhillon, and Coulthard 1995), Switzerland (Bernauer and Gilardi 2010), and Australia (Dale and Goldfinch 2005).

H-index

Building upon these approaches, the h-index was designed by Jorge E. Hirsch (2005) to combine information about both publication *and* citation counts. The h-index was created by Hirsch based on a researcher's total number of publications (as a measure of scientific *productivity,* like the performance count method) combined with their total number of scholarly citations (as a measure of scientific *impact,* like the citation count method). The *h-index* is measured by the total number of papers which an author has published in academic journals and books which have each amassed at least that number of citations. For example, if a scholar has 15 publications, each of which has at least 15 citations, their h-index is 15. As Hirsch (2005) defined the concept: "*The h-index is an indicator of the impact of a researcher on the development of his or her scientific field. Scientists with a high h-index strongly influence the scientific production of other researchers and determine the development of their fields*." The h-index is thereby designed to correct for the disproportionate weight of a few highly cited publications by rewarding scholars producing a good range of papers with good levels of citations. Records to construct the h-index can be retrieved from any of the standard Google Scholar, Scopus, and Web of Science electronic databases, although the h-index varies among these (Bar-Ilan 2008; Harzing and Alakangas 2016). A high h-index therefore requires more than simply churning out numerous papers (which may include many of indifferent quality), or else publishing a few articles which are highly cited (for whatever reason). Instead, the h-index is

designed to demonstrate both productivity (publication of a substantial number of articles over a lifetime career) combined with scientific impact (so that these studies are widely acknowledged as important through citation by peers in the field).

As a further refinement, to identify academic stars, 'Highly Cited Researchers' have been measured as those with an h-index in Google Scholar of 100 or higher. By this estimate, in September 2019 Google Scholar includes around 3,436 Highly Cited Researchers, living or dead, across all disciplines.[3] Web of Science/InCites generates a similar annual list of almost 4000 Highly Cited Researchers.[4] Many attempts have been made to improve the h-index mathematically, for example, with measures seeking to reward highly cited papers, or correct for career length. Nevertheless, none of the variants have been as widely adopted and meta-analysis reviews report that most alternatives are highly correlated with the h-index, without adding much substantially new information (Bornmann, Mutz and Hug, 2011; Jan and Ahmad 2020).

Strengthens and limitations of these measures

The pros and cons of bibliometric measures, including the h-index, have been widely debated in the literature (Egghe 2010; Norris & Oppenheim 2010; Panaretos and Malesios 2009; Waltman 2016; Kreiner 2016).

- Publication counts may encourage a 'publish or perish' culture, generating pressures to churn out many low-quality publications irrespective of their merit (Abritis and McCook 2017).
- Estimates of publications and citations, and thus the h-index, are inconsistent for the same author based on alternative databases, which differ in the scope of their coverage (Harzing and Alakangas 2016). The Web of Science and Scopus focus on citation to academic journal articles, with Web of Science adding book chapters only recently. By contrast Google Scholar also includes citations from a far wider range of publications, including academic books, peer-reviewed papers, theses, preprints, abstracts, other scholarly literatures, and technical reports (Bar-Ilan 2008; Waltman and van Eck 2012).[5]
- Studies can fail to identify disciplinary boundaries. For example, Kim and Grofman (2019) only counted citations for regular faculty members employed in U.S. graduate departments of political science. The study thereby systematically excluded all non-American based political scientists as well as those located elsewhere institutionally within the U.S., such as those working in other cross-disciplinary or multidisciplinary organizational units, like research centers for area studies, women's studies, or international relations, as well as schools and departments of public policy, public administration, law or constitutional law, history, economics, psychology or social psychology, statistics/methods, communications and media studies, philosophy, sociology, area studies, or international studies.
- It can be even more challenging to define professional disciplinary boundaries cross-culturally, since academic institutions and research fields are organized in different ways around the world. Outside of America, it is common for social scientists to be located within multidisciplinary organizational units. For example, in the ECPR-

IPSA World of Political Science survey, completed by self-identified political scientists, less than half (47%) of the respondents were located in departments of political science (or equivalent names, such as Political Studies, Politics, or Government). By contrast, one fifth (21%) were employed in departments (or schools) of social science, one sixth (12%) were in departments of international relations, international studies or area studies, and 9% were in departments of public policy, law, or public administration. Any survey of political scientists which excludes the majority of faculty in the discipline remains partial, and the exclusions are likely to skew the results of any analysis, for example, in terms of the distribution of sub-fields and even gender/age profiles.

- More generally, studies disregard the reasons why scholars acknowledge published work. Citations can be positive, signifying a publication's quality, originality and contribution to scholarship. But papers can also be cited because they contain major errors or flaws, even those with deliberately fraudulent and fabricated data, falsification of results, ethical misconduct, or plagiarism. Indeed, many retracted scientific papers receive more citations *after* they were discredited than before (Bornemann, Szilagyi, and Sandner-Keisling 2016). The problem is far from trivial; *Retraction Watch* has identified more than 18,000 retracted papers dating back to the 1970s (Brainard and You 2018). In political science, this includes a paper by LaCour and Green (2014) presenting falsified data on attitudes towards gay marriage, subsequently retracted from *Science*. In addition, controversial papers, attracting rebuttals designed to correct or criticize the original research, are actually more cited than non-commented papers (Radicchi 2012).
- Citation metrics also incentivize well-known practices of self-citation (Amjad, Nielsen and Wullum 2018). For example, a study of 100,000 top researchers by Ioannidis, Klavens and Boyack (2019) found that the mean self-citation rate is 12.7%, while at least 250 scientists amassed more than half of their citations from themselves or their co-authors. Academic 'bubbles' may exist in relatively closed and highly-specialized subfields among scholars who frequently cite each other's work. Some of these practices may be legitimate, but, of course, the danger arises from gaming the system. There is a problem about citation inflation, as the total number of citations is estimated to grow annually by around 4%, meaning that longitudinal analysis over successive decades needs to deflate counts to provide a correct assessment of the impact of prior generations (Petersen et al 2019).
- Subject sub-fields and disciplines have also been found to differ in their citation practices and norms (Radicchi, Fortunato and Castellano 2008). For example, Web of Science InCites estimate that the annualized expected citation rates for papers in a research field is around 25 citations per paper in Molecular Biology but only 8 in the Social Sciences.[6] Similarly, the number of Highly Cited Papers in this database varies from 30,000 in Clinical Medicine but around 10,000 in the Social Sciences, and around 2000 in Microbiology.
- There are many measurement challenges, with publication counts depending upon somewhat arbitrary weighting mechanism to determine the fractional points

allocated for authored, coauthored, or edited books compared with, say, a single-authored or coauthored journal article.

- In exceptional cases the quality of the research may not reflect its immediate impact through citations, for example if revolutionary work is far ahead of its scientific sub-field, so that recognition takes many years to become apparent. Finally, citation counts of the scientific literature published in academic journals and books do not take account of broader sorts of impact on society, policymakers, and public affairs. Alternative metrics like Altmetric are designed to monitor attention and dissemination in public affairs well beyond the academy.[7] This is measured by the overall volume of discussion of research publications in a broad range of online outlets, such as counting mentions to books and articles in blogs, Twitter, Facebook, and Wikipedia, and coverage of research findings in online social media and op-ed newspaper commentary (Ravenscroft, Liakata and Clare 2017).

Overall, therefore, there is considerable need for caution in treating the alternative estimates. The indices are most useful for large-scale research evaluation and ranking exercises comparing across multiple units within a specific discipline, for example to assess the total scholarly publication output to compare institutions and subfields. Like all research metrics, however, given these sorts of criticisms, ideally quantitative measures should be supplemented by more subjective qualitative evaluations of scholarship, especially at individual author-level, such as peer review of the quality of a body of work by specialists in the field, the allocation of honors and awards reflecting scholarly prestige, and expert assessments of academic reputations.

II: Data and research design

Productivity and influence are complex matters where many intangible factors may contribute towards the originality, insights, and influence of a scholar's research. A meta-analysis of the bibliometric literature by Hoffmann, Berg, and Koufogiannakis (2014) identified diverse factors associated with academic research productivity across several disciplines, including individual attributes like education and experience, community networks like mentoring and collaboration, and institutional support, such as institutional size and reputation. An earlier study, drawing upon a survey of American political scientists, by Helsi and Lee (2011), reported that gender was important for journal publication counts, along with teaching loads, faculty rank, and conference attendance.

To update the analysis, and broaden the analysis globally, this study focuses upon several factors thought likely to be associated research excellence within the discipline of political science, measured by the proxy of author-level h-indices. This paper investigates the significance of three categories: personal characteristics which people bring to the academic labor market, working conditions in university employment, and role perceptions motivating research priorities.

Personal characteristics: Gender, career longevity, formal qualifications, and domestic responsibilities

Personal characteristics includes the factors which individual employees bring to academic labor markets, notably gender, race and ethnicity, career longevity, formal qualifications, and domestic responsibilities.

An extensive literature has examined the *gender* gaps in research productivity and citations. A series of previous studies have reported that, compared with men, on average women scholars often have fewer publications in the top journals, and lower citation counts. This pattern has been documented in many science, technology, engineering and mathematics (STEM) disciplines, with the publication gap widening over time as more women enter scientific careers (Huang etal 2020), as well as being observed in political science (Helsi and Lee 2011; Dion, Sumner, Mitchell and McLaughlin 2018; Kim and Grofman 2019; Teele and Thelen 2017). Similar challenges are raised for members of minority populations in academia, by race and ethnicity, as well as for inequalities arising from disparities in income, wealth and social class, although issues of class, race and ethnicity are difficult to analyze cross-nationally due to the varying salience of cleavages in each society.

Debate continues about the underlying reason for these widely observed patterns (Anderson, Nielsen and Wullum 2018). One potential explanation for gender gaps in productivity rests on differences in women and men's domestic lives, including experience of career breaks for maternity/paternity leave and care of family dependents, where women scholars are typically more likely to have to juggle the demands of tenure, research, and publications with the responsibilities to care for children and/or the elderly. For example, Carr, Ash and Friedman (1998) compared medical faculty with children, reporting that women have fewer publications and slower career progression than men, although no significant gender gaps were observed for faculty without children. Despite growing equality of sex roles, this burden still falls disproportionately upon women in the household, especially in traditional cultures and in societies like the United States with expensive childcare facilities and limited maternity rights (Mason, Wolfinger and Goulden 2013). Another alternative explanation for gender gaps in productivity, however, rests on broader structural disparities facing women and men in the academic workplace not the home, such as opportunities for appointment, tenure, and awards. Hence a recent global multidisciplinary comparison by Huang, Gates and Sinatra (2020) reported that the gender gap in both productivity and impact diminishes after controlling for career longevity, although not fading away entirely. There may also be gendered biases in publication and citation practices (Dion et al 2018), such as the preferences for quantitative studies over the sort of qualitative research which engages many women scholars (Teele and Thelen 2017). Studies of gender gaps in the h-index therefore need to examine whether these persist after controlling for domestic characteristics (marital status and care of dependents) and the structure of the workforce (career longevity and academic rank).

Career longevity is also likely to be important more generally for performance indices: the h-index is designed to provide an objective measure of the *cumulative* scientific impact of an author's scholarly output, and their overall contribution to their scientific community over their lifetime. It is widely established that career longevity matters for lifetime cumulative productivity and citations (Hirsch 2005; Costas, van Leeuwen, and Bordons 2010). This can be monitored either by the age of scholars or, more precisely, by the year they were awarded their highest degree, symbolizing their entrance into the job market.

Formal qualifications should also predict subsequent academic success, notably through PhD programs generating academic capital and technical knowledge useful for research and

publications, including educational training, analytical capacities, professional experiences, collaborative networks, and methodological skills.

Working conditions: rank, income, job security, type of department and country

Personal characteristics can be conceptualized as the things which scholars bring to the job market. The employment environment and working conditions are also likely to matter for productivity by shaping opportunities and resources for scholarly research, such as academic rank and status, household income, tenure and job security, as well as the size of departments and institutions, and the country of work.

Academic rank is likely to be closely correlated with the h-index, although it is not possible to determine the direction of causality from cross-sectional surveys alone. On the one hand, demonstrating an active record of research publications is the gold standard for appointment, tenure and promotion, which may outweigh teaching, advising, and contributing towards university and public service. But also, senior scholars with a demonstrated past track record of research are more likely to gain access to further useful resources which facilitate future large-scale empirical research projects and publications – paid sabbatical leave, external funding awards and internal grants, travel, workshop and conference resources, equipment, and administrative and research staff support. Academic rank and status also shape income, with more affluent scholars having access to greater resources to subsidize research costs, such as periods of unpaid leave for visiting fellowships. In practice, career longevity is often closely related to rank and personal income, although conceptually clearly distinct.

Job security is related to rank and status but not identical. Faculty holding full-time academic contracts with tenure have job security, better working conditions, and periods of paid sabbatical research leave, as well as other opportunities to qualify for grants and build a cohesive research program. By contrast, academics with part-time jobs or fixed term contracts without tenure, who are employed primarily as adjunct instructors, typically lack these employment benefits and work security. This sector has rapidly expanded following the growing casualization of higher education, constituting half of all U.S. university and college faculty today (Lederman 2019).

The *size and type of department and university institution* are also likely to prove important for research careers. Scholars based in larger departments and prestigious research universities work in an environment with many colleagues, related departments, research centers and institutes, and doctoral programs, including opportunities to teach advanced level courses reflecting specialized areas of expertise which compliment research interests. By contrast, those located in smaller departments and universities, or in liberal arts colleges in America, often lack access to these sorts of resources and they may be expected to devote more time to mentoring and teaching general introductory-level classes (Hoffmann, Berg, and Koufogiannakis 2014).

The *country of work* is also likely to prove important for research productivity and impact (Kulczycki, Engels and Polonen 2018). Scholars can be expected to benefit from working in affluent post-industrial societies which invest a high proportion of GDP in research and development, with a highly educated population, and with many long-established prestigious universities and research centers. To identify the type of research environment in each

country, we can use the 2019 Web of Science list of Highly Cited Researchers across all disciplines. This reports that 85% of such leading scholars were located in just ten nations worldwide, respectively, in the US, China, UK, Germany, Australia, Canada, the Netherlands, France, Switzerland and Spain.[8] The global distribution is even more concentrated; 44% of the total list of Highly Cited Researchers were based in American institutions. Harvard University alone had more Highly Cited Researchers (203) than countries such as Canada, France and Spain. Accordingly, we can see whether political scientists living and working in the most highly ranked ten nations by Web of Science differ from those based elsewhere in the world.

Motivational attitudes and role perceptions

Alternatively, however, social psychological perspectives suggest that research performance and academic success may also be closely related to subjective characteristics and motivational attitudes which individual bring to their working environment, notably their role perceptions and achievement goals. Hill (2020) recently called attention to the importance of understanding cultural values in the academy and how scholarly careers vary over time with respect to creative ambitions and achievements. Roles reflect the set of learnt expectations about the appropriate norms, obligations and behaviors associated with work, acquired through formal training processes and observing informal social practices. Some occupations in traditional hierarchical bureaucracies have a set of fixed and demarcated roles and tasks, but professional jobs typically allow greater flexibility and individual autonomy. Scholars face many trade-off choices and conflicting demands determining their strategic priorities and workloads when deciding how to allocate limited resources of time and energy.

Role perceptions for academic work can be expected to be particular important in determining the relative importance of investing in teaching, research and administrative/public service. If motivational attitudes are important for academic priorities, it is likely that those most professionally committed to generating funding grants, collaborating on large-scale research projects, disseminating the results at professional meetings and placing refereed publications, would have achieved a record of greater productivity and impact on the discipline compared with other scholars who prefer to prioritize the rewards of teaching, developing curricula, and mentoring students, or who choose an academic job to influence public policy and politics, or who become academics for the benefits of pay, job flexibility, and working conditions compared with other available employment opportunities.

These issues can be explored empirically with new survey data in the discipline of political science. In Spring 2019, the ECPR-IPSA *World of Political Science* survey (WPS-2019) was launched to establish a representative profile of the political science profession across the world (Norris 2020).[9] This study is similar to the series of TRIP surveys of International Relations faculty.[10] Invitations asking political scientists to participate in WPS were distributed through social media notifications (Facebook, emails, and Twitter), the ECPR Newsletter list and IPSA lists, and through several national associations from 3 February to 7 April 2019. Overall, 2,446 responses were collected from respondents currently studying or working in 102 countries. These can be collapsed into eight global regions, including North America (the US and Canada), Western, Northern, Southern and Eastern Europe, Latin America and the Caribbean, Asia-Pacific and continental Africa. Unfortunately, there

were too few responses to permit reliable analysis of the Middle East and North Africa, where political science departments are also least well represented.

Research productivity and impact are monitored through author-level h-index categorical scores. At the end of the questionnaire, respondents were asked "*What is your 'h' index (all years) in Google Scholar, if known?*", along with an online link to Google Scholar. The survey selected Google Scholar as the source of the h-index since this database includes a comprehensive range of publication sources, as well as being freely available for access in all countries. By contrast, the Web of Science requires library access, which may not be easily available in all institutions in developing societies. In total, around 1000 respondents replied by specifying their h-index category. To maintain confidentiality, and prevent the identification of any individuals, seven categories of response were provided for this question, ranging from None (0) and 'Under 10' (1) to 'more than 60' (7). For descriptive purposes, the coding was collapsed into four categories: Very low (less than 10), Fairly Low (10-20), Fairly High (20-30), and Very High (More than 30). In any descriptive comparisons, to control for career longevity, career cohorts using 5-year and 10-year intervals were defined by the year that the respondent's final degree qualification was awarded.

The questionnaire also includes the factors which may help to explain the distribution of the h-index among political scientists across world regions, as summarized in the Technical Appendix and discussed below. In particular, the measure of role perceptions was constructed from a series of 19 items where respondents were asked about their importance, using 5-point scales from 'very unimportant' (1) to 'very important' (5). The items, shown in Table 1, were subject to principle component factor analysis and this process generated five summary scales, standardized 0-100, including the roles of research, policy advocacy, teaching, publishing and work-life balance.

[Table 1 about here]

III: Results

First, descriptively what is the observed distribution of the h-index categories among political scientists? As shown in Figure 2, overall the distribution is highly skewed towards the lower end of the scale. Thus, the majority of political scientists (59%) reported that their h-index was categorized as 'very low' (under 10), and another one fifth reported that their index was 'fairly low' (between 10 and 20). The multivariate models were run with the log of the h-index scale as the dependent variable, to bring the skewed distribution closer to normal.

[Figure 2 about here]

To explore the data, Table 2 presents the results of a series of regression analysis models, where the dependent variable is the logged h-index. *Model A* includes just the role of gender. *Model B* adds the other personal characteristics discussed earlier, namely career longevity, formal qualifications, and care of domestic dependents. Model C adds working conditions, while the final Model D adds role perceptions. All models were checked by tolerance tests and confirmed to be free of problems of multicollinearity. It should be noted that inclusion of all the variables reduced the number of responses considerable although further tests using imputed missing values did not substantially alter the main findings.

[Table 2 about here]

Gender gaps and other personal characteristics

Model A for the effects of gender alone confirms that women and men do differ in their h-scores, with women having lower impact on average, as expected from previous studies. As mentioned earlier, the underlying reasons for the widely documented gender gap remain under debate. On the one hand, it may arise from broader structural barriers which continue to shape gender disparities in the labor force, limiting women's opportunities for research and publications due to recruitment, retention, and promotion practices in the academy. Alternatively, however, it may be due to domestic conditions, especially the persistence of traditional sex roles in the home and family, where care of children and elderly dependent relatives often continues to fall disproportionately upon women (Cameron, White and Meeghan 2016).

To explore the importance of some of the other personal characteristics on research productivity and impact, Model B adds several other personal characteristics which individuals bring to the academic labor force. The results show that care of domestic dependents in the home, both children and the elderly, is not significantly associated with the logged scores in the h-index. By contrast, however, both career longevity and the highest level of education completed are both significantly associated with research productivity and impact. Once these factors are added to the model, the fit improves dramatically, explaining almost half (46%) of the variance in the h-index. As the h-index measures the cumulative count of total productivity and impact over a scholar's lifetime, not surprisingly the h-index has often been observed in previous studies to be strongly correlated with the longevity of academic careers (Costas, Leeuwen and Bordons 2010). Figure 3 illustrates the pattern and how the type of h-index usually falls by academic cohort (measured by the year the researcher's final degree was completed) broken down by regions across the world. Across most regions, as expected, the h-index is generally highest for the scholars with the longest career-spans, falling progressively among early-career scholars. The pattern for Asia-Pacific, and Africa fluctuates more widely, but this is largely due to the lower number of cases by cohort from these regions. Central and Eastern Europe displays a distinctive pattern, with a peak in the h-index observed among the new generation of freshly minted scholars who graduated in the early-1990s, after the end of Communism and the transformation of political science in the region, bringing an infusion of new blood into the profession.

[Figure 3 about here]

Moreover, the gender gap in the h-index becomes insignificant once Model B controls for longevity and qualifications. To understand the interaction visually, Figure 4 breaks down h-index scores for women and men by decade-long career cohorts. The graph confirms the gender gap in the survey data, as many previous studies have observed -- but demonstrates how the size of the disparity between men and women shrinks by career cohort in political science. Thus, the gender gap is observed to be most substantial among the oldest academic cohort, who received their highest degree in the 1970s or earlier. It gradually diminishes over successive cohorts, until the gap between women and men vanishes among the youngest cohort.

[Figure 4 about here]

Working conditions

Model C adds a range of other working conditions which can be expected to facilitate or hinder opportunities for research and publications by scholars, which reflect the broader institutional environment. Of these, academic rank proves significant; not surprisingly as senior faculty enjoy access to many employment benefits and research resources which are likely to facilitate productivity, although the direction of causality in this relationship remains indeterminate from the cross-national data, for the reasons discussed earlier. Perceived job security, faculty employed with full-time contracts, and the size of departments also prove to be significantly linked to h-index scores. By contrast, tenure, institutional size, and working in countries ranked by Web of Science with many highly cited researchers, as a proxy for the broader research environments, were not significant in the model. The tenure issue in particular may be surprising to American scholars, but this may be because the standards for tenure vary a great deal across countries, and in some systems of higher education this formal step is treated as semi-automatic after a few years and part of the regular career promotion process. It appears that a subjective sense of job security matters more for building successful research careers than the legal conditions of contractual tenure.

Role perceptions

Finally, Model D adds role perceptions, as the measure of motivational priorities and ambitions. There are many reasons to believe that those academic treating research and publications as high priorities in their career ambitions should be more likely to succeed in achieving a higher h-index, but in practice, however, the evidence from this survey fails to confirm this hypothesis. The only modest impact concerned those who gave high importance to their role as teachers and mentors, which was slightly negatively associated with their h-index scores at the 0.10 significance level, but the other role perceptions do not predict the record of research productivity and impact.

Several robustness tests were included in additional models, not displayed here, but none of these improved the fit of the models or proved significant, including factors such as frequency of attendance at national and international professional conferences, the location of employment in different major countries and world region, migrant status, type of methodological skills, and type of sub-field within political science. In particular, although others have noticed contrast in citation practices across scientific disciplines (Radicchi, Fortunato and Castellano 2008), the h-index was not affected by sub-field, nor were there contrasts among those who used different methods, such as normative analysis, behavioral approaches, experimental techniques, or historical narratives and qualitative case-studies. In this regard, the h-index is not skewed, and it can be used to make consistent comparisons of scholars across different branches of political science and across countries.

IV: Conclusions and implications

Use of the h-index metric to compare scholarly productivity and impact has become a standard part of the evaluation process. It is especially helpful for reviewers who are not experts within a particular sub-field, for example, when faculty committees select from a

lengthy list of applicants for academic job interviews, for promotion and tenure decisions, and for awarding research resources. Bibliometric indices supplement tacit judgments embedded in qualitative sources of assessment, like traditional letters of recommendation, which can suffer from reputational and cultural biases. The mean h-index, and trends over time, have also been aggregated from author-level data to compare and assess the collective impact of a department, faculty, or university, sub-field, journal, or discipline. It is therefore important to identify what contributes towards variations in the h-index among scholars, including what makes political scientists productive and influential among their peers.

This study generates three key findings.

Firstly, as many have reported, women and men political scientists do differ in their h-index scores, but this gender gap diminishes and becomes insignificant once models control for career longevity and formal qualification. Among early career scholars, women and men have similar low indices. If this pattern is the product of career cohorts, then the h-index gender gap can be expected to gradually fade over time.

Secondly, among other working conditions, for reasons already discussed, the survey suggests that research productivity and impact were significantly strengthened by academic rank and status, feelings of job security, full time employment contracts, and working in larger departments. In meritocratic academic labor markets the process is likely to be interactive, in a virtuous circle; a strong resume with a record of publications and citations in leading journals and university presses is likely to prove important for appointments and promotions in the profession. In turn, employment in prestigious research departments, and more senior status in higher education, open further research opportunities, like access to funding grants, travel, advanced level research students, and sabbatical leave or lighter teaching loads.

Finally, after controlling for personal characteristics and working conditions, subjective role perceptions, which should motivate priorities about the importance of teaching, service and research, did not help to predict productivity and more academic success. This may be because few scholars see themselves as specialists in only one of these roles; instead most colleagues regarded all these as important priorities. Moreover, academic norms and formal appointment and promotion requirements often require scholars to excel at all three functions during their lifetimes, rather than allowing specialization in only one.

In short, research productivity and impact in political success, as monitored by the h-index, is usually associated less with cultural attitudes, personal career ambitions, and psychological motivations, and more with career longevity combined by the opportunities arising from structural working conditions.

Figure 1: The typology of academic research performance metrics

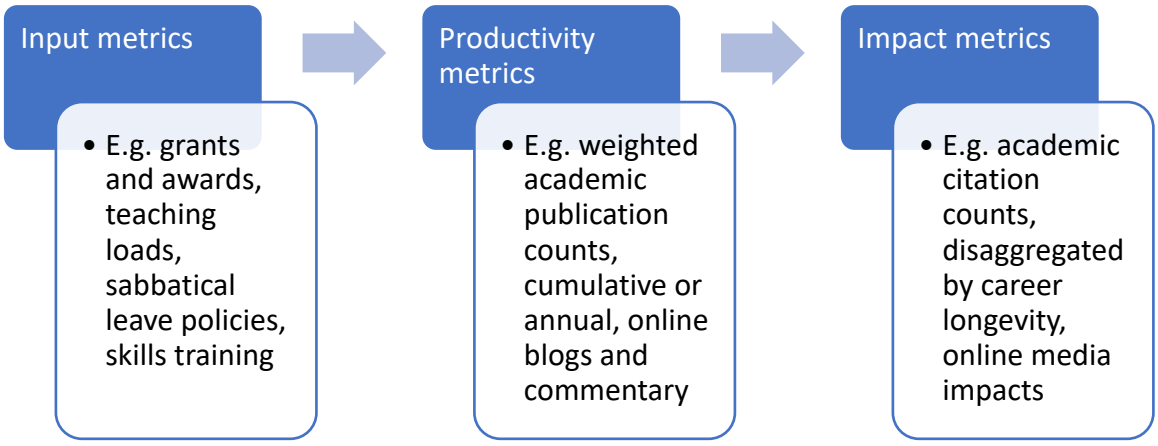
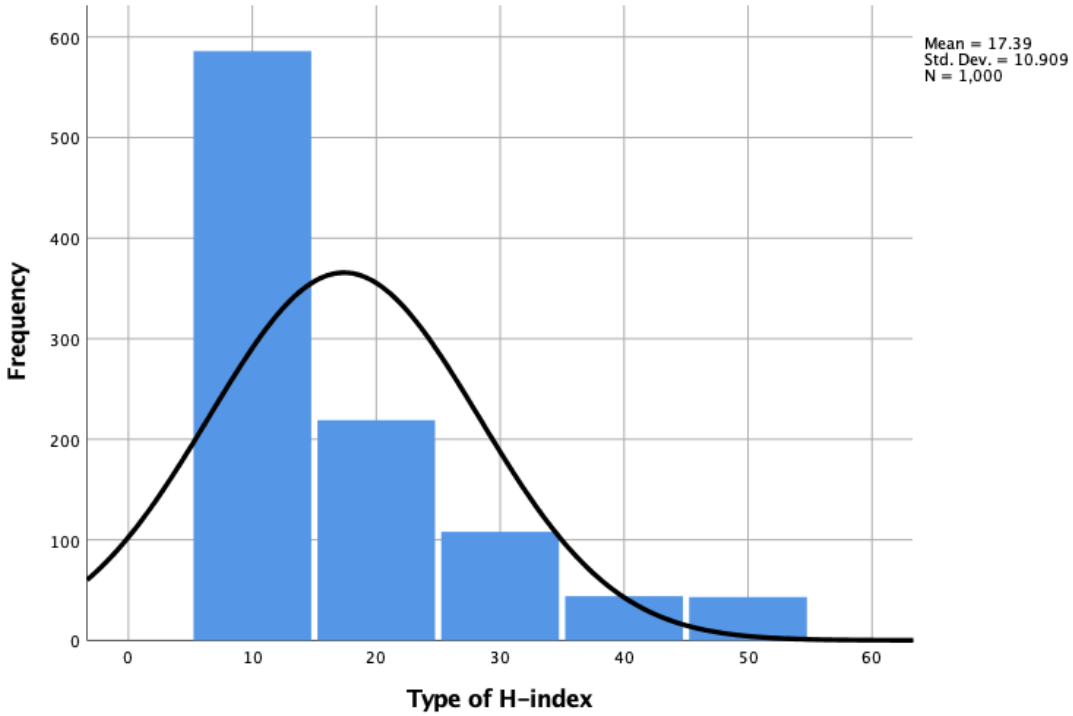
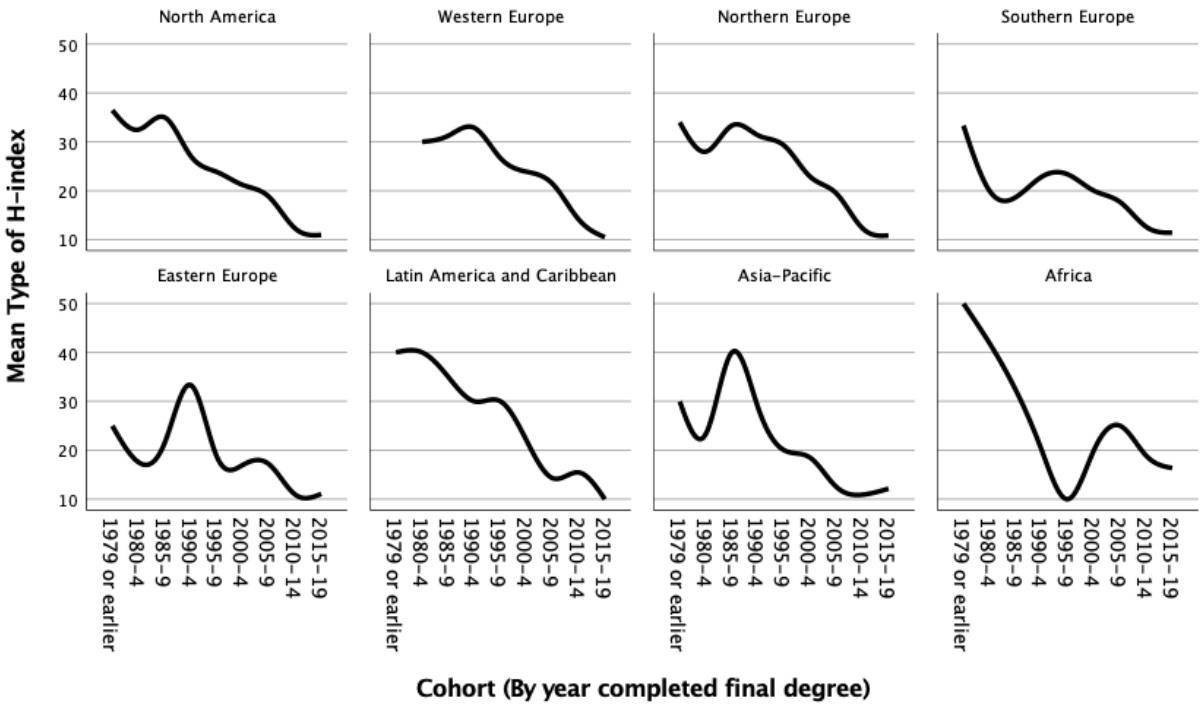


Figure 2: The distribution of the h-index categories in political science



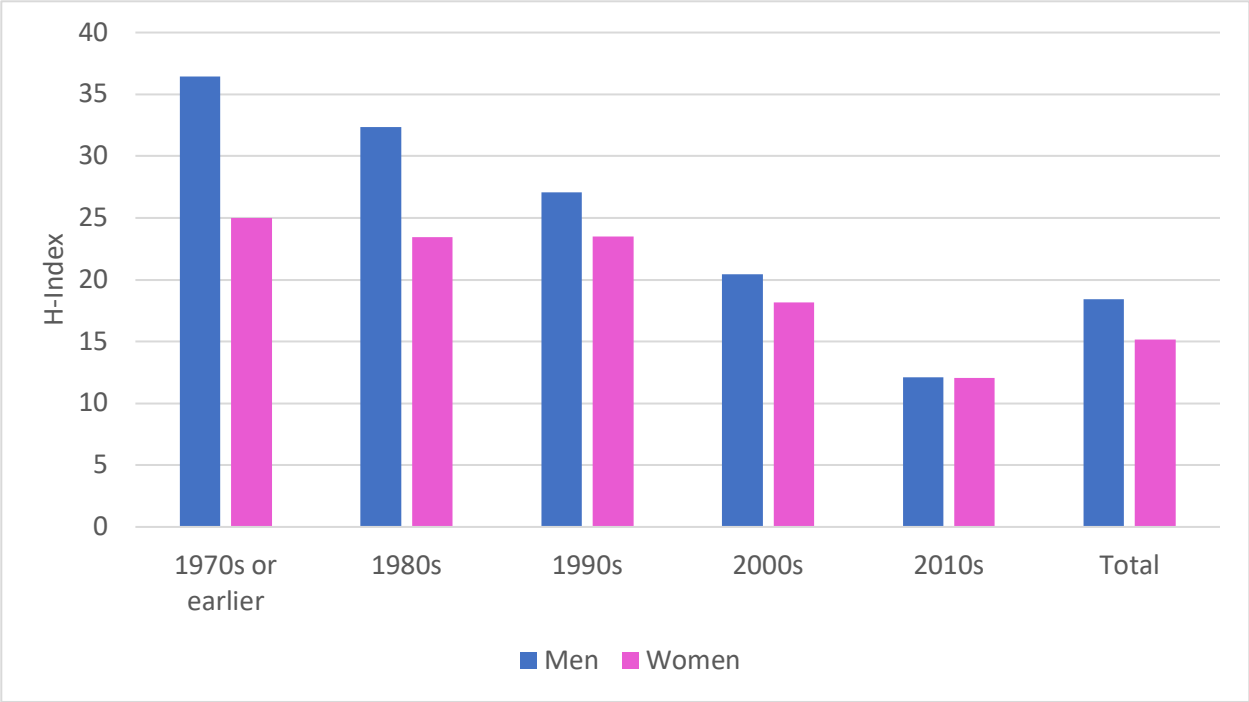
Source: ECPR-IPSA World of Political Science survey, Spring 2019

Figure 3: Type of h-index by academic cohort and global region



Source: ECPR-IPSA World of Political Science survey, Spring 2019

Figure 4: Type of h-index by gender



Source: ECPR-IPSA World of Political Science survey, Spring 2019

Table 1: The roles of political scientists

	Research	Policy advocacy	Teaching	Publishing	Work-life
Fund-raising and managing research projects	0.71				
Organizing conferences, workshops and events	0.68				
Being active in professional associations	0.63				
Managing administrative tasks efficiently	0.58				
Working collaboratively in teams	0.55				
Advocating for political change		0.81			
Helping solve society's problems		0.77			
Motivating people to engage in politics		0.70			
Advising practitioners and policymakers		0.62			
Engaging students to learn			0.86		
Teaching effectively in the classroom			0.84		
Developing new curricula and pedagogic methods			0.68		
Mentoring early-career scholars	0.42		0.46		
Publishing peer-reviewed articles in the best journals				0.82	
Publishing books and chapters in the best university presses				0.78	
Advancing the boundaries of scholarly knowledge				0.59	
Maintaining a work-life balance					0.73
Having a well-paid and secure position					0.72
Enjoying flexible work schedules					0.69
% Variance	27.50	9.80	8.3	7.5	5.5

Notes: Principal component factor analysis with varimax rotation. *"How important are each of the following to you personally? Please use the following scale where '1' means 'very unimportant' and '5' means 'very important'."*

Source: The ECPR-IPSA World of Political Science survey (Norris), spring 2019 N.2,466

Table 2: Factors associated with the logged h-index categorical scores

	Model A Gender				Model B +Personal characteristics				Model C +Working conditions				Model D +Role perceptions			
	B	SE	Beta	Sig.	B	SE	Beta	Sig.	B	SE	Beta	Sig.	B	SE	Beta	Sig.
GENDER																
Sex (female)	-0.12	0.05	-0.10	***	-0.03	0.04	-0.02	N/s	-0.02	0.03	-0.02	N/s	-0.01	0.04	-0.01	N/s
PERSONAL CHARACTERISTICS																
Career longevity					-0.03	0.00	-0.65	***	-0.03	0.00	-0.48	***	-0.03	0.00	-0.48	***
Highest level of education completed					0.20	0.05	0.12	***	0.10	0.06	0.06	*	0.12	0.06	0.07	*
Care of domestic dependents					0.03	0.03	0.02	N/s	-0.01	0.03	-0.01	N/s	-0.01	0.03	-0.01	N/s
WORKING CONDITIONS																
Academic Rank									0.07	0.01	0.21	***	0.07	0.01	0.21	***
Annual income									0.01	0.01	0.03	0.36	0.01	0.01	0.03	N/s
Perceived job security									0.05	0.02	0.11	**	0.05	0.02	0.11	**
Tenured									0.01	0.04	0.01	0.75	0.01	0.04	0.01	N/s
Full-time employment									-0.14	0.06	-0.07	*	-0.13	0.06	-0.07	*
Departmental size									-0.03	0.01	-0.09	**	-0.03	0.01	-0.08	**
Institutional size									0.01	0.01	0.04	0.24	0.02	0.01	0.04	N/s
Countries with many highly cited researchers									0.03	0.03	0.03	0.38	0.02	0.03	0.02	N/s
ROLE PERCEPTIONS																
Role: research													0.00	0.00	0.01	N/s
Role: teaching													0.00	0.00	-0.07	N/s
Role: publishing													0.00	0.00	0.02	N/s
Role: policy impact													0.00	0.00	0.01	N/s
Role: work-life balance													0.00	0.00	0.01	N/s
(Constant)	0.47	0.03			67.5	3.24			49.8	3.97			50.0	3.99		
Adjusted R^2	0.01				0.46				0.51				0.51			

Note: See the Technical Appendix for the construction of all items. **Source**: The ECPR-IPSA World of Political Science survey (Norris), 2019. N.642

Technical Appendix

Var	Measure	Question	Coding
	PERSONAL CHARACTERISTICS		
V32	Gender	What is your gender	1 Female/ 0 male
Q24	Career longevity	In what year did you complete your highest degree?	Year (1943-2019)
Q22	Formal qualifications	What is the highest level of education you successfully completed?	Undergraduate degree (1), Masters or professional degree (2), doctoral degree or equivalent (3).
Q34	Dependents	Do you currently have responsibilities for any dependents living at home?	Additive scale from No dependents (0), yes children (1), yes elderly relatives (1)
	WORKING CONDITIONS		
V16	Academic rank	Which of the following categories best describes the most senior position you have held?	7-pt scale from Graduate student (1) to Senior administrative position such as PVC, Dean, Head of Faculty or School, or equivalent (7)
V29	Income	Please indicate your gross personal annual income before taxes and benefits	
V12_6	Job security	Thinking about your current employment, please indicate how true you feel each of the following statements are: My job is secure.	4-pt scale from 'Not at all true' to 'Very true'.
V17	Contract	If in academic employment, which of the following best describes your current post?	Temporary post (no legal contract eg hourly paid work) (1), fixed term contract (2),

			Continuous contract (tenured position(3).
V15	Work status	Which of the following best describes your current work status?	
Q21	Size of department	If currently in academic employment or studying, which of the following best describes the approximate number of FTE academic teaching and research staff in your current university or college (or past one if retired or unemployed) (excluding administrative staff).	6-point scale from 9 or fewer (1) to 50 or more (5)
Q22	Size of institution	If currently in academic employment or studying, which of the following best describes the approximate number of FTE students in your current university or college (or past one if retired or unemployed).	5-pt scale from 9,000 or fewer (1) to 50,000 or more (5)
Q2	Highly cited society: Country of work/study	In what country do you currently work or study?	Recoded (0/1) by the top 10 nations in the 2019 WoS list of countries with the most highly cited researchers across all disciplines (1) or not (0).
	ROLE PERCEPTIONS		
Q6-9	Research	How important are each of the following goals to you personally?	See Table 1
Q6-9	Teaching	How important are each of the following goals to you personally?	See Table 1
Q6-9	Publishing	How important are each of the following goals to you personally?	See Table 1
Q6-9	Policy impact	How important are each of the following goals to you personally?	See Table 1
Q6-9	Work-life balance	How important are each of the following goals to you personally?	See Table 1

Source: The ECPR-IPSA World of Political Science survey (Norris), spring 2019. N.2,466

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