RESEARCH EXCELLENCE OR SCIENTIFIC ADVISORY BOARDS – INVESTIGATING GERMAN AND US AGRI-ENVIRONMENTAL BOARDS

Maya Göser, Stefan Wimmer, Johannes Sauer

Maya.goeser@tum.de

Produktions- und Ressourcenökonomie landwirtschaftlicher Betriebe,
Technische Universität München, München, Deutschland

2021

Vortrag anlässlich der 61. Jahrestagung der GEWISOLA
(Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V.)
„Transformationsprozesse im Agrar- und Ernährungssystem: Herausforderungen für die Wirtschafts- und Sozialwissenschaften, 22. bis 24. September 2021

Research Excellence or Scientific Advisory Boards – Investigating German and US Agri-Environmental Boards

Abstract

Scientific advisory boards are frequently established to provide scientific insights and advice to policy makers. Advisory board appointing bodies often state that research excellence and scientific seniority are the main grounds on which advisory board members are selected. Many authors have pointed out that there is more to giving good scientific advice than just being an expert for a specific research field. The aim of this study is to analyse if and how research excellence correlates with the probability of being appointed as a scientific advisory board member. We have collected data for scientific advisory boards from both the US and Germany. Our dataset includes current board members and a control group of non-board-members with similar expertise. We use logit regression models to analyse how research excellence correlates with the probability of appointment to a scientific advisory board. We use the h-index as a highly cited proxy for individual research excellence and factor in the research excellence status of the associated institution as well as other potentially correlating factors indicating scientific seniority. Our results suggest that research excellence is insignificant or even correlates negatively with the probability of being appointed to a scientific advisory board.

Keywords

Advisory boards, life science, scientific excellence, agriculture

1. Introduction

It is common policy practise to consult scientists for specialized advice on policy related matters. For example, the German Federal Ministry of Food and Agriculture (BMEL) has recently appointed a new commission on the future of German Agriculture ("Zukunftskommission Landwirtschaft") (Federal Ministry of Food and Agriculture 2020), the purpose of which is to support future agricultural policy. Among the 32 appointed members there are six representatives of the scientific community with an individual h-index ranging from 2 to 20 (scopus 9/11/2020).

Including scientists as advisors to the policy making process is a well-known policy concept (Sutherland et al. 2013). The appointing authorities often state that the factors determining a possible appointment are scientific expertise and scientific credibility of the individual researcher (Federal Ministry of Food and Agriculture 2019; United States Environmental Protection Agency 2019). This is often claimed to represent the selection of researchers based on their scientific excellence. However, researchers have argued that providing excellent advice to policy makers requires more than simply being an expert of a specific research field (Gluckman 2014; Stirling 2010). Scientific advisory boards need to evaluate current research findings and have to decide how to effectively communicate evidence to policy makers. This requires not only communication but also collaboration skills. Most of these skills are not measureable. Nevertheless, bodies in charge of appointing advisory boards continue to claim that they rely solely on scientific excellence. Hence, it is the aim of our analysis to empirically evaluate how scientific peer-group acknowledged indicators for scientific excellence correlate with the probability of being appointed to a scientific advisory board.

For practical reasons, our empirical cases comprised advisory boards in similar scientific disciplines that were primarily concerned with the structure and process of knowledge production in the said disciplines. Disciplines may vary a lot in their publication dynamics. Since many of the research excellence metrics are based on publications and related citations, we decided to investigate scientific advisory boards that are active in the same field of science to increase the comparability and relevance of our analyses. We chose life sciences because of its publication dynamics and, in particular, the applied author ranking rule: In life sciences it is customary to name the main author of a publication first in the list of authors. Aside from this, scientific advisory boards are more commonly used by policy makers in the life sciences (such as environmental policy) than in other fields of science (GROUX et al. 2018). Still, life sciences encompass several disciplines, such as biology and chemistry but also economics. Since these disciplines can vary in their publication behaviour, the results from interdisciplinary metric comparisons need to be interpreted carefully. Interpreting metrics such as the h-index is easier for innerdisciplinary comparisons.

We collected data on the current members of ten scientific advisory boards. Of these boards five are appointed by the German Federal Ministry of Food and Agriculture (Bundesministerium für Ernährung und Landwirtschaft - BMEL) and five are appointed by the United States Environmental Protection Agency (EPA). Our dataset also includes a valid control group of non-board-members with similar scientifc expertise.

Using this dataset we measure if and how scientific excellence is correlated with the probability of being an appointed member of a scientific advisory board. Are policy makers relying on scientific excellence when appointing board members? To rate the scientific excellence of individuals, researchers commonly refer to indicators such as the h-index, the number of publications or the number of citations.

We apply logit regression models to analyse how research excellence influences the probability of an appointment to a board. We use the h-index as a proxy for individual research excellence and include an indicator for the research excellence of the affiliated institute of each researcher. While the h-index is not an ideal indicator of research excellence (ALONSO et al. 2009; BORNMANN and DANIEL 2007), it is widely used due to its transparency and the lack of alternatives (see, e.g., HIRSCH 2005; NARIN and HAMILTON 1996, BORNMANN et al. 2008). Our results suggest that research excellence and the probability of an appointment to a scientific advisory board are not at all or even negatively correlated.

The remaining study is structured as follows. In section 2 we give an overview of existing literature related to the topic under investigation and the context of scientific advisory boards and policy consulting. Section 3 sets out the context of the scientific advisory boards considered in this study. We present the data and empirical estimation process in section 4. In section 5 we summarize the results and discuss possible implications. Section 6 gives concluding remarks.

2. Literature Review

Empirical research on scientific advisory boards is scarce (GROUX et al. 2018). However, establishing scientific advisory boards to support policy making has become very common in many political systems and some authors have voiced an interest in closer integration of science in the political decision-making process (SUTHERLAND et al. 2013).

Nevertheless, to ensure the effectiveness of scientific advisory boards it is important that those in charge of appointing these boards are provided with the necessary tools and information to ensure a suitable make-up of such scientific advisory boards (GROUX et al. 2018).

In a comment about chief scientific advisers in the United Kingdom, the authors (DOUBLEDAY and WILSDON 2012) state that there needs to be “better support and networks to ensure that science advice to governments is robust”. The same may also apply to scientific advisory boards in general. Nevertheless, high quality scientific advice may require more than just expertise in a specific field. While some authors stress the importance of expertise, seniority in their field and reputation in academia or industry when appointing scientific advisors (DOUBLEDAY and

WILSDON 2012), others also note that other skills are also relevant for successful communication of scientific context (GLUCKMAN 2014).

Another concern about the work of scientific advisors is whether the board's advice should present a uniform consensus of the advisory board, or whether presenting a range of potentially contrasting opinions might be a better representation of what the scientific evidence suggest (STIRLING 2010). Should scientific advisors give clear instructions for the policy to follow, or should they rather interpret the scientific context in a more open and plural way? It is emphasized that not only scientific expertise but also communicative expertise are essential in giving effective scientific advice to policy makers.

When examining the policy and industry consulting activities of agricultural and applied economists, CONLEY et al. (2018) found a positive correlation between published papers and outside consulting income. Although the consulting activities were not limited to policy advice, this evidence could be interpreted by concluding that the higher the monetary incentive, the more those researchers who have a successful publication record are likely to consider consulting activities. Although scientific policy advice is not a new concept, and a closer integration of science in the political decision-making process has been demanded (SUTHERLAND et al. 2013) a lack of incentives might be the cause of a lack of participation. Nevertheless, it can be assumed that more altruistically inclined personalities would pursue such activities without significant monetary remuneration. Although on some boards members are indeed monetarily compensated, policy advising activities are not very highly regarded in the scientific world. Researchers are primarily evaluated by their publication success, based on the number of publications and citations but also considering the rating of the respective scientific outlets or other forms of metrics related to the individual publishing performance (HIRSCH 2005; NARIN and HAMILTON 1996). In some cases, the success in acquiring third-party funding may also play a role, but publication performance is the primary scientific quality indicator when applying for an academic position or for third-party funding (GEUNA and MARTIN 2003; HICKS 2012). Where reputation in the scientific community is concerned, the importance of publication performance cannot be overstressed - as implied by the widely used term "publish or perish" (LABAND and TOLLISON 2003).

The characteristics and measurement of research excellence and related indicators are at the centre of many academic and public discussions. Some scholars criticize the validity of currently used indicators or propose new measures. Yet most researchers agree on the necessity and validity of such indicators if only because they assume that the wider public and especially policy makers have to rely on such indicators when determining the quality of research or the quality of the work by individual researchers (see, for example, 2018; FERRETTI et al. 2018).

FERRETTI et al. (2018) interview researchers, policy advisors and policy makers with respect to the importance and accuracy of the metrics for research quality. They find that interview respondents largely agree that current metrics are biased or misleading. However, respondents also conclude that there is currently no better way of measuring research quality and that such measurements are essential. These metrics seem crucial for quality assurance related to scientific advisory services and public acceptance of resulting political decisions, especially where the need to meet political demands concerning accountability and assessment is concerned.

Thus far, the necessity of advising policy makers has not been sufficiently acknowledged in the literature. Therefore, when evaluating the characteristics of researchers in scientific advisory boards selection bias may occur. Selection into or the application for an advisory position is probably mainly driven by the individual researcher's motivation. Highly successful researchers, as measured by their publication performance, might not want to spend time on other activities that could not only jeopardize or slow down their rate and success in publishing but also might not significantly contribute to their future research excellence status. Other peers might be willing to use some of their time for such advisory activities and/or are driven by altruistic considerations regarding advisory input for policy makers. However, the empirical identification of a possibly causal relationship between scientific excellence and the probability of a board appointment would require time-related observational data. Nevertheless, based on comprehensive cross-sectional surveys and controlling for a host of possibly confounding factors using a state-of-the-art empirical identification strategy, our findings have clear and robust policy implications. Finally, the empirical results reported in this study should trigger further empirical research on the links between scientific excellence and the transparency and robustness of policy advisory structures and processes.

3. Context of the scientific advisory boards

We focus on scientific advisory boards engaged by German and US governmental bodies. In particular, we consider the scientific advisory boards of the German Federal Ministry of Food and Agriculture and the United States Environmental Protection Agency. Our decision to compare the boards of the German BMEL and the US EPA was because of their similar policy field orientation. Both focus on topics related to life sciences, especially on environmental and agriculture-related issues.

The German Federal Ministry of Food and Agriculture had six scientific advisory boards at the time of our data collection. In our study, however, we only consider five of these boards. The sixth board takes the form of a council of experts, consisting of representatives of different interest groups, resulting in an assembly of rather non-scientific advisors. On the other hand, the United States Environmental Protection Agency had five standing committees at the time of data collection all with a primarily scientifc focus, hence, we consider all five of them in this study.

In our analysis we want to examine the relationship between individual scientific excellence and board membership. The main objective of the scientific advisory boards is indeed to give scientific advice. Therefore, the main focus when appointing new advisory board members needs to be their relative scientific rank. The BMEL states that the purpose of the boards is to scientifically evaluate results and advise policy makers. Similarly, the EPA seeks to base their actions and decisions on scientific data, analyses and interpretations, and therefore asks the scientific advisory boards to predominantly provide the EPA with peer review and advice in scientific matters.[1] Thus, both, the BMEL and the EPA seek scientific expertise from the advisory boards.

In the US, scientific advisors can either nominate themselves or be nominated by the public. The EPA's administrator then evaluates whether the nominated scientific advisory board candidates can provide the advice in question before appointing them to the boards. The EPA specifies several criteria on which the administrator has to base their decisions. Among these criteria are scientific expertise and scientific credibility (UNITED STATES ENVIRONMENTAL PROTECTION AGENCY 2019). Similarly, the BMEL appoints members who shall have experience or knowledge in the research fields of the respective boards (FEDERAL MINISTRY OF FOOD AND AGRICULTURE 2019). While the EPA appoints the experts initially for a period of three years, the election period for each board in Germany may vary from three to five years. All boards offer the possibility of re-appointment. When appointing candidates to boards, both the EPA and BMEL base their decision on the scientific expertise of the respective candidate.

---

[1] For more information regarding the purpose of each board we refer to the websites of the United States Environmental Protection Agency and the German Federal Ministry of Food and Agriculture.

4. Data and estimation

4.1. Scientific advisory boards

The dataset includes information on the members of ten different scientific advisory boards. For our analysis we consider the scientific advisory boards of the German Federal Ministry of Food and Agriculture and the United States Environmental Protection Agency. We collected cross-sectional data for the German advisory board constellation in 2018 and the US advisory board constellation in 2019. We obtained individual information for a total of 75 German board members (two researchers are members of two boards each) and 81 US board members from publicly available sources. All information on the board members used in our analysis was collected via publicly available curriculum vitae or other related information found on personal websites or websites of team members and employers.

Unfortunately, no public information was or is available to allow for a complete replication of the board member composition for earlier years. Hence, only cross-sectional data is available for our analysis. However, this should not significantly impair our empirical analysis because scientific excellence and relative ranking at a certain point in time can, to a large extent, be regarded as a cumulative indicator of past research excellence and quality. Accordingly, each cross-sectional board member's research excellence at time t is highly likely to be at least the same as their research excellence at t-1 etc., and therefore panel data would only add minor extra information to our proposed empirical analysis.

4.2. Control groups and expertise

For a robust comparison of the scientific excellence of board members and non-board members we created corresponding control groups. When creating these control groups we tried to find individuals with similar scientific expertise to that of the board members (for example, if there was a board member specialized in agricultural economics, we searched for other researchers specialized in the same field). In a first step we searched for colleagues and researcher in the same insititute with similar research foci as the respective researcher in the advisory board. After examining the home institute of the advisory board member we searched for similar institutes and looked for researchers with similar expertise there. We created the control groups for the German and US boards separately. Both procedures involved several steps of data collection and verification focusing mainly on creating control groups whose scientific expertise matched that of the respective board members. For both the US and the German control group we refrained from including retired individuals. We built control groups for each board based on its different expertise and research foci.

4.3. Variables

The h-index is a widely accepted measure for the quantity and quality of knowledge and evidence production, i.e. scientific excellence (BORNMANN et al. 2008). Hence, we consider the h-index as a proxy for the individual scientific excellence to be considered in our empirical study. We collect the individual h-index related scores from the Scopus database (http://www.scopus.com/). We also include a proxy for institution-related scientific excellence with which we want to consider the possible effect of the research excellence of the institution that the researcher is employed at. We therefor create a dummy for membership in the German Excellence Initiative (FEDERAL MINISTRY OF EDUCATION AND RESEARCH 2020; GERMAN RESEARCH FOUNDATION 2020) for the German sample. If the researcher is employed at an institution that is part of the Excellence Initiative, the institutional research excellence dummy receives the value one. For the US data we create a similar dummy variable based on the Carnegie Ranking (https://carnegieclassifications.iu.edu/). Hence, if the US-sample related researcher is employed at an institution that is classified as a very high research institution[2] the dummy will have the value one.

We expect a specific title or academic rank to be a strong signal for scientific seniority and, hence, peer group acceptance when considering potential scientists. Therefore, an additional variable included in the analysis is a dummy for indicating whether an individual researcher holds a senior scientific rank. This dummy has a value of one if the person holds a professorial title and zero otherwise. To further distinguish between the differences in rank of those academic titles we add a dummy variable to account for senior position. Here, the dummy takes the value one if the researcher has a leadership position.

Several studies have discussed the influence of gender on scientific productivity (e.g. GRADDY-REED et al. 2019, WHITTINGTON and SMITH-DOERR 2005, EUROPEAN COMISSION 2004, LERCHENMUELLER and SORENSON 2018). The decision to appoint someone to a specific scientific advisory board might be influenced by perceived differences in scientific productivity between men and women as well as the structural bias with respect to women in senior scientific positions. We therefore include a gender dummy to consider possible gender related effects.

In addition to these individual characteristics we also consider variables reflecting the relative reputation and scientific status of each researcher's employing institution. Most commonly the employer is an academic institution in the form of a unviersity, but there are also other research-related institutions such as think tanks, sectoral and/or political party-related research and advisory institutions etc. To allow for the significance of the respective employer's status and reputation on the probability of serving as a member of a scientific advisory board we use a university-indicating dummy. We consider up to two employing intistutions for each researcher, if at least one employing institution is a university, the dummy is given the value one.

Finally we include two interaction terms for measuring potential effects due to interacting characteristics. Hence, we assume that a leadership position could be more important for measuring the scientific seniority of employees outside the university-based system, while the h-index can have a more significant impact on the probability of being selected as a board member for scientists working inside the university system.

Table 1 provides descriptive statistics for those variables considered in the empirical analyses.

Table 1: Descriptive Statistics

	German data (557 observations)				**US data (527 observations)**			
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Board member	0.13	0.34	0	1	0.15	0.36	0	1
h-index	15.08	15.39	0	115	27.14	18.59	0	146
Institutional excellence	0.28	0.45	0	1	0.69	0.46	0	1
Female	0.33	0.47	0	1	0.20	0.40	0	1
Professor title	0.57	0.50	0	1	0.79	0.41	0	1
University	0.63	0.48	0	1	0.90	0.30	0	1
Senior position	0.60	0.49	0	1	0.15	0.36	0	1

4.4. Estimation

Our main aim is to empirically analyse the impact of scientific excellence (measured by the h-index as the most commonly accepted research excellence indicator) on the probability of being appointed as a member of a scientific advisory board. Hence, in a first step we estimate a

[2] Classification 15 in the Carnegie Ranking.

regression model that models the binary distribution of the dependent variable (member or not) and apply a simple logit estimator as outlined by equation (1)

$$P(board\ member = 1\ |x) = G(\beta_0 + \beta_1\ h\text{-}index + \beta_2\ excellence + \beta_3\ female + \beta_4\ title + \beta_5\ employer + \beta_6\ senior\ position + \beta_7\ hindex * employer + \beta_8\ position * employer), \quad [1]$$

where G is the logistic function having values strictly between 0 and 1.

The dependent binary variable indicates whether an individual researcher is member of a scientific advisory board or not. Additionally, we use six independent variables and three interaction terms to explain variation in the dependent variable. The h-index is a continuous explanatory variable indicating the h-index at the point of data collection for the respective individual. Female is a gender-related dummy specifying whether an individual is female or male. We add a dummy for an individual scientist's rank or title, distinguishing between professor and all other titles (or no title). The university-related dummy indicates whether the respective employing institution is a university or not. To allow for the level of the individual scientist we include a binary independent variable indicating whether or not the individual has a senior or executive position.

The German dataset consists of 557 observations while the US dataset consists of 527 observations. The distribution of board members and non-board members is rather unbalanced. To validate and verify the robustness of our results we apply Firth´s penalized likelihood approach in addition to the standard logistic regression. Firth`s approach also allows us to mitigate bias that might arise from having a low absolute number of events in the dataset (i.e. scientists in scientific advisory boards) (FIRTH 1993; HEINZE and SCHEMPER 2002).

We conduct several regressions. First we apply both the standard logit and the Firth penalized likelihood to the complete US sample and to the complete German sample respectively (i.e. we pool the sample across all scientific advisory boards for the US and Germany respectively). In a second step, to account for possible heterogeneity between different boards, we repeat the logit and Firth regression but in this case for each scientific advisory board and its individual control group.

Finally, it is important to bear in mind that, despite our comprehensive data collection and verification efforts, the explanatory power of our proposed analyses remains limited and therefore interpretation of the estimates should be performed with caution.

5. Results

We present results for both the standard logit regression and the Firth penalized likelihood estimation in Table 2 for the US and German sample respectively.[3] It is evident that the h-index correlates negatively with the probability of being appointed to a scientific advisory board in each model. While in the German case the institutional excellence of the employing institution does not show any significant effect on an appointment, it shows a strong statistical significance for the US sample. In the US, institutional excellence correlates negatively with an appointment to an advisory board. Holding a professorial title also seems to correlate in opposing directions for the US and Germany. While a professorial title correlates positively for German scientists, we observe a negative correlation for US scientists, with both being statistically significant. For the German sample we also find a positive correlation between occupying a senior position and the probability of a board appointment. For the remaining characteristics we do not find a statistically significant effect in either sample.

[3] We have additionally applied a probit regression, which yielded similar results and is therefore not included in this article.

We also estimated the logit and Firth approach for each scientific advisory board sample (see Tables 3 and 4). Since the number of observations in the treatment group (board members) might be relatively low and the imbalance in characteristics between board and control group members is higher for the individual boards compared to the overall sample for both the US and German data, the results should be interpreted with caution. The direction of the correlation for the h-index varies with the type of board and regression model applied, although the correlation is mostly negative, and seems not to be statistically significant at a convincing level for the individual boards. This is except for the Firth regression for SAB5 USA, where there is a siginificant negative correlation of the h-index and the probability of a board appointment. Institutional excellence shows a significantly negative correlation for SAB2 GER and significantly positive correlation for the SAB4 GER board. We find similar result for the US samples. Here we observe a negative correlation for institutional excellence and board membership with respect to the SAB1 USA and SAB2 USA boards. For the other board samples it shows no significant effect.

The gender-related female dummy is only seen to have a significant negative correlation with the probability of scientific advisory board appointment for the SAB2 GER board. For the US samples, we cannot find any significant correlation for any of the individual boards. The indication of professorial title correlates in different ways for the various US and German advisory boards. While we find a positive and significant correlation for the regression results related to the SAB1 GER board, the results for the US boards all indicate a negative and significant correlation. Whether the employer is a university or not, is shown to be insignificant for all boards under consideration whether in the US or Germany.

For the dummy indicating a senior position we find a negative correlation in the regression results for the SAB3 USA board. Here the logit results show significance, while the Firth regression results do not. However, the German results vary. Here we find a positive significant correlation for the SAB4 GER board and for the SAB5 GER board.

The interaction between h-index and being employed by a university shows no significant effect for the US samples for all advisory boards. In the German case there is a significant negative correlation in the logit regression results for SAB4 GER.

The second interaction term (measuring the interaction between having a senior position and being employed at a university) demonstrate to have a positive and significant correlation for both the SAB4 GER and the SAB3 USA board, although only for the logit regression results. The Firth regression results show no significance of the second interaction term.

Table 2: Estimation Results for the Logit and Firth Regression Models for the German and US samples

	Dependent variable: board member			
	Germany		**USA**	
	Standard logit	**Firth logit**	**Standard logit**	**Firth logit**
h-index	-0.06* (0.03)	-0.05* (0.03)	-0.04** (0.02)	-0.03** (0.02)
Institutional excellence	0.05 (0.29)	0.06 (0.28)	-0.97*** (0.32)	-0.95*** (0.32)
Female	-0.33 (0.31)	-0.30 (0.30)	0.11 (0.34)	0.11 (0.33)
Professor title	1.72*** (0.51)	1.65*** (0.49)	-1.65*** (0.35)	-1.63*** (0.35)
University	-0.64 (0.73)	-0.53 (0.69)	-0.56 (0.64)	-0.51 (0.63)
Senior position	1.11** (0.55)	1.07** (0.53)	-0.26 (0.65)	-0.26 (0.65)
h-index*university	0.04 (0.03)	0.03 (0.03)	0.02 (0.02)	0.02 (0.02)
Senior position*university	-0.49 (0.79)	-0.56 (0.76)	0.13 (0.80)	0.16 (0.78)

Constant	-2.72*** (0.46)	-2.66*** (0.44)	0.92* (0.50)	0.85* (0.49)
Observations	557		527	
Board members	75		81	
Control group	482		446	
Note: We estimate a standard logit regression and Firth´s penalized likelihood approach. Standard errors in parenthesis. *p < 0.1; **p < 0.05; ***p < 0.01.				

Table 3: Estimation Results for the Logit and Firth Regression Models for each German Scientific Advisory Board

	Dependent variable: board member									
	Germany									
	SAB1 GER		**SAB2 GER**		**SAB3 GER**		**SAB4 GER**		**SAB5 GER**	
	Logit	**Firth**	**Logit**	**Firth**	**Logit**	**Firth**	**Logit**	**Firth**	**Logit**	**Firth**
h-index	-0.00 (0.04)	0.01 (0.03)	-0.08 (0.07)	-0.04 (0.05)	-0.13 (6,976)	0.03 (0.07)	-0.03 (0.70)	-0.00 (0.08)	-0.14 (0.10)	-0.09 (0.07)
Institutional excellence	0.37 (0.52)	0.37 (0.49)	-1.36* (0.79)	-1.17* (0.68)	0.46 (0.57)	0.41 (0.53)	2.14* (1.16)	1.58* (0.99)	0.35 (0.57)	0.33 (0.53)
Female	0.09 (0.52)	0.14 (0.48)	-2.00* (1.05)	-1.55** (0.80)	0.49 (0.64)	0.51 (0.58)	-2.14 (1.54)	-1.25 (1.09)	-0.24 (0.62)	-0.16 (0.55)
Professor title	2.95** (1.25)	2.54** (0.97)	1.43 (1.04)	1.25 (0.86)	22.64 (43,431)	2.08 (1.26)	-0.29 (1.65)	-0.29 (1.42)	1.39 (0.97)	1.25 (0.84)
University	-0.55 (1.44)	-0.27 (1.17)	-1.44 (1.41)	-0.87 (1.12)	19.81 (84,925)	1.59 (1.89)	-0.19 (1.42)	0.14 (2.03)	-0.45 (1.56)	-0.20 (1.23)
Senior position	-0.81 (1.34)	-0.52 (1.11)	0.25 (0.91)	0.35 (0.80)	-0.58 (92,787)	0.42 (1.70)	34.16*** (0.24)	2.54* (1.68)	2.36** (1.19)	2.06** (0.97)
h-index* university	-0.03 (0.05)	-0.04 (0.04)	0.08 (0.07)	0.05 (0.05)	0.09 (6,976)	-0.07 (0.07)	-0.10*** (0.02)	-0.08 (0.10)	0.15 (0.10)	0.10 (0.07)
Senior position* university	1.26 (1.70)	0.64 (1.39)	-0.13 (1.48)	-0.60 (1.25)	0.80 (92,787)	-0.35 (1.93)	1.33*** (0.37)	0.73 (2.56)	-2.13 (1.63)	-2.18 (1.34)
Constant	-4.55*** (1.19)	-4.07*** (0.93)	-2.25*** (0.66)	-2.27*** (0.58)	-44.48 (95,385)	-5.49*** (1.62)	-34.57*** (1.35)	-2.99*** (1.43)	-3.78*** (1.11)	-3.49*** (0.88)
Observations	302		342		254		66		312	
Board members	20		17		15		8		17	
Control group	282		325		239		58		295	
Note: We estimate a standard logit regression and Firth´s penalized likelihood approach. Standard errors in parenthesis. *p < 0.1; **p < 0.05; ***p < 0.01.										

Table 4: Estimation Results for the Logit and Firth Regression Models for each US Scientific Advisory Board

	Dependent variable: board member									
	USA									
	SAB1 USA		**SAB2 USA**		**SAB3 USA**		**SAB4 USA**		**SAB5 USA**	
	Logit	**Firth**	**Logit**	**Firth**	**Logit**	**Firth**	**Logit**	**Firth**	**Logit**	**Firth**
h-index	-0.03 (0.04)	-0.02 (0.04)	-0.01 (0.04)	-0.01 (0.04)	0.03 (0.04)	0.02 (0.04)	-0.04 (0.03)	-0.03 (0.03)	-0.11* (0.06)	-0.07** (0.04)

Institutional excellence	-0.93* (0.52)	-0.90* (0.50)	-1.39** (0.61)	-1.31** (0.57)	-0.66 (0.66)	-0.67 (0.61)	0.57 (1.09)	0.36 (0.96)	22.24 (55,015)	1.22 (1.45)
Female	-0.09 (0.65)	-0.05 (0.61)	0.25 (0.61)	0.28 (0.57)	-0.27 (0.73)	-0.16 (0.65)	-0.06 (0.70)	-0.03 (0.66)	-1.69 (1.27)	-1.22 (0.98)
Professor title	-1.37** (0.65)	-1.36** (0.62)	-1.75*** (0.68)	-1.68** (0.64)	-1.41* (0.77)	-1.43* (0.71)	-3.92*** (1.05)	-3.56*** (0.90)	-3.27** (1.56)	-2.93** (1.06)
University	0.72 (1.10)	0.72 (1.05)	0.89 (1.16)	0.78 (1.11)	0.66 (1.44)	0.44 (1.28)	0.26 (1.33)	0.20 (1.21)	-22.9 (55,015)	-1.82 (1.78)
Senior position	-0.55 (1.31)	-0.28 (1.17)	-0.53 (1.41)	-0.24 (1.30)	-32.38*** (0.98)	-1.33 (1.91)	-0.15 (0.88)	-0.07 (0.86)	0.74 (1.25)	0.71 (1.11)
h-index* university	-0.04 (0.05)	-0.04 (0.04)	-0.00 (0.04)	-0.00 (0.04)	-0.03 (0.05)	-0.02 (0.04)	-0.02 (0.05)	-0.01 (0.04)	0.05 (0.07)	0.04 (0.05)
Senior position* university	0.71 (1.51)	0.53 (1.36)	-0.63 (1.8)	-0.51 (1.60)	32.49*** (0.54)	1.59 (2.05)	-0.61 (1.42)	-0.45 (1.31)	-21.95 (65,817)	-0.75 (1.79)
Constant	-0.61 (0.93)	-0.62 (0.87)	-0.84 (0.89)	-0.79 (0.85)	-1.93 (1.22)	-1.64* (1.06)	0.08 (0.74)	0.00 (0.72)	0.40 (1.09)	0.07 (0.92)
Observations	385		229		278		255		302	
Board members	22		20		15		17		7	
Control group	363		209		263		238		295	

Note: We estimate a standard logit regression and Firth´s penalized likelihood approach. Standard errors in parenthesis. *p < 0.1; **p < 0.05; ***p < 0.01.

6. Conclusions

Previous research has thoroughly established and discussed the need for the integration of science and policy making. However, there is no consensus with respect to the particular qualifications and characteristics that scientists should have to be eligible for appointment as scientific advisors. Past publications have in particular stressed communication and collaboration skills, while others refer only to scientific expertise and excellence as crucial determinants. Many governmental agencies and bodies in charge of appointing scientific advisory boards also mostly cite factors related to scientific expertise and seniority and therefore solely focus on the scientific excellence of the individual scientist.

In the preceding empirical analysis we have therefore compared members of scientific advisory boards to scientists with similar expertise who were not appointed to an advisory board. In total, we considered five scientific advisory boards based in the US and five based in Germany. We applied standard logit regression as well as a Firth penalized likelihood regression approach to achieve more robust results. Our results suggest no significant or even a negative correlation between the selected research excellence indicators and the probability of a scientific advisory board appointment.

These findings may arise for several reasons: first and foremost the self-selection of scientists into policy advisory services should be addressed. Highly successful researchers, as measured by scientific excellence, might not be willing to spend a significant fraction of their time in consulting activities that do not primarily and directly benefit their scientific career as based on peer-reviewed publication output and quality. Only highly altruistic scientists might chose to cut back on their own research-related time to support policy makers for the greater good of scientifically-proven policy decisions. This might not only be based on individual preferences regarding research and consulting work-related time allocation, but might also be triggered by scientific process and structure-related incentive mechanisms that do not particularly encourage policy advisory work and knowledge dissemination. In most leading academic systems, relative scientific success is predominantly measured based on publication quantity and quality. Until now, serving on scientific advisory boards has not been highly regarded by scientific peers. However, if participation in policy advising activities was part of the career-related evaluation of scientists and/or relevant for the decision on applications for funding, this might be different.

On the other hand, some scientists state that offering policy advice is mainly about interpreting current research on specific topics and communicating it in a way that is appropriate for policy makers. Therefore, success as measured by publications in scientific journals or scientific excellence alone might not be sufficient for effectively fulfilling a scientific advisor role.

Finally, there may well be other factors playing a significant role in the appointment process for scientific advisory board members. Depending on the setting of the scientific advisory board, an individual scientist's party affiliation might be relevant. Furthermore, social (scientific) networks of already appointed board members that also include potential new board members might have a high impact on the probability of being appointed. While these factors are difficult to measure, they might well be of interest in future research.

Literatur

ALONSO, S., F. J. CABRERIZO, E. HERRERA-VIEDMA & F. HERRERA, 2009: h-Index: A review focused in its variants, computation and standardization for different scientific fields. Journal of Informetrics **3** (4), 273-289.

BORNMANN, L. & H.-D. DANIEL, 2007: What do we know about theh index? J. Am. Soc. Inf. Sci. **58** (9), 1381-1385.

BORNMANN, L., R. MUTZ & H.-D. DANIEL, 2008: Are there better indices for evaluation purposes than theh index? A comparison of nine different variants of theh index using data from biomedicine. J. Am. Soc. Inf. Sci. **59** (5), 830-837.

CONLEY, K. L., J. L. LUSK, J. L. PARCELL & G. T. TONSOR, 2018: Consulting Activities of Agricultural Economists and Response to University Policies. Applied Economic Perspectives and Policy **55** (5), 637.

DOUBLEDAY, R. & J. WILSDON, 2012: Science policy: Beyond the great and good. Nature **485** (7398), 301-302.

FEDERAL MINISTRY OF EDUCATION AND RESEARCH, 2020: Excellence Strategy. https://www.bmbf.de/en/excellence-strategy-5425.html (14.04.2020).

FEDERAL MINISTRY OF FOOD AND AGRICULTURE, 2019: The BMEL's Advisory Councils. https://www.bmel.de/DE/Ministerium/Organisation/Beiraete.html (20.10.2019).

FEDERAL MINISTRY OF FOOD AND AGRICULTURE, 2020: Future Commission Agriculture. https://www.bmel.de/SharedDocs/Pressemitteilungen/DE/2020/120-einsetzung-zukunftskommission-landwirtschaft.html.

FERRETTI, F., Â. G. PEREIRA, D. VÉRTESY & S. HARDEMAN, 2018: Research excellence indicators: time to reimagine the 'making of'? Science and Public Policy **45** (5), 731-741.

FIRTH, D., 1993: Bias reduction of maximum likelihood estimates. Biometrika **80** (1), 27-38.

2004: Gender and Excellence in the Making. Office for Official Publications of the European Communities, Luxembourg.

GERMAN RESEARCH FOUNDATION, 2020: Excellence Initiative (2005-2017/19). https://www.dfg.de/en/research_funding/programmes/excellence_initiative/index.html (14.04.2020).

GEUNA, A. & B. R. MARTIN, 2003: University Research Evaluation and Funding: An International Comparison. Minerva **41** (4), 277-304.

GLUCKMAN, P., 2014: Policy: The art of science advice to government. Nature **507** (7491), 163-165.

GRADDY-REED, A., L. LANAHAN & J. EYER, 2019: Gender discrepancies in publication productivity of high-performing life science graduate students. Research Policy **48** (9), 103838.

GROUX, G. M. N., S. J. HOFFMAN & T. OTTERSEN, 2018: A Typology of Scientific Advisory Committees. Global challenges (Hoboken, NJ) **2** (9), 1800004.

HEINZE, G. & M. SCHEMPER, 2002: A solution to the problem of separation in logistic regression. Statistics in medicine **21** (16), 2409-2419.

HICKS, D., 2012: Performance-based university research funding systems. Research Policy **41** (2), 251-261.

HIRSCH, J. E., 2005: An index to quantify an individual's scientific research output. Proceedings of the National Academy of Sciences of the United States of America **102** (46), 16569-16572.

LABAND, D. N. & R. D. TOLLISON, 2003: Dry Holes in Economic Research. Kyklos **56** (2), 161-173.

LERCHENMUELLER, M. J. & O. SORENSON, 2018: The gender gap in early career transitions in the life sciences. Research Policy **47** (6), 1007-1017.

NARIN, F. & K. S. HAMILTON, 1996: Bibliometric performance measures. Scientometrics **36** (3), 293-310.

2018: Science needs to redefine excellence. Nature **554** (7693), 403-404.

STIRLING, A., 2010: Keep it complex. Nature **468** (7327), 1029-1031.

SUTHERLAND, W. J., D. SPIEGELHALTER & M. A. BURGMAN, 2013: Policy: Twenty tips for interpreting scientific claims. Nature **503** (7476), 335-337.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, 2019: EPA Science Advisory Board (SAB). www.epa.gov/sab (14.10.2019).

WHITTINGTON, K. B. & L. SMITH-DOERR, 2005: Gender and Commercial Science: Women’s Patenting in the Life Sciences. J Technol Transfer **30** (4), 355-370.