UNIVERSIDAD COMPLUTENSE DE MADRID

FACULTAD DE CIENCIAS ECONÓMICAS Y EMPRESARIALES
Departamento de Organización de Empresas

TESIS DOCTORAL

Merit and internal politics in public organizations: the case of the Hungarian Academy of Sciences

Meritocracia y política interna en las organizaciones públicas: el caso de la Academia Húngara de las Ciencias

MEMORIA PARA OPTAR AL GRADO DE DOCTOR

PRESENTADA POR

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MERITOCRACIA Y POLÍTICA INTERNA EN LAS ORGANIZACIONES PÚBLICAS: EL CASO DE LA ACADEMIA HÚNGARA DE LAS CIENCIAS

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To Giorgio

"Here´s looking at you, kid!" - Casablanca

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Resumen de la Tesis

Título: Meritocracia y política interna en las organizaciones públicas: el caso de la Academia Húngara de las Ciencias

Introducción al resumen

EN las últimas décadas, el estudio de las empresas privadas ha recibido una atención creciente, aumentando así nuestra comprensión del comportamiento de los empleados y directivos en este tipo de organizaciones. El éxito de esta línea de investigación se ve reflejado en los premios Nobel otorgados a personalidades como Ronald Coase, Oliver Williamson y Jean Tirole, y en la importancia adquirida por áreas como la Teoría de la Organización (Cyert y March 1963), la Economía de los Costes de Transacción (Williamson 1985), la Estrategia Organizacional (Nickerson y Silverman 2009) y la Economía Organizacional (Gibbons y Roberts 2013).

Al mismo tiempo y pese al tamaño del sector público en las economías modernas, se ha dedicado mucha menos atención a las *organizaciones públicas* y a las características peculiares que las distinguen de las privadas. Una gran parte de la investigación sobre las empresas públicas se ha centrado en las ventajas de las privatizaciones y sus efectos sobre el rendimiento (Hart *et al*. 1997; Shleifer 1998; Cuervo y Villalonga 2000; Megginson y Netter 2001; Cuervo 2003, 2004; Levin y Tadelis 2010). Recientemente se ha abierto una prometedora línea de investigación en Ciencia Política y Economía que, partiendo del trabajo pionero de Weber (1921), ha investigado el funcionamiento de las agencias públicas y el comportamiento de los *burócratas*. Sin embargo, Moe (2013) ha observado cómo dicha literatura ha sido principalmente teórica, siendo necesario ampliar el número de análisis

empíricos que nos permitan entender cómo los empleados y directivos públicos responden a reglas organizativas e incentivos.

Síntesis de los objetivos y resultados

Mi tesis doctoral contribuye a cubrir el vacío de investigación empírica acerca de las organizaciones públicas, ofreciendo una evidencia detallada sobre cómo la Academia Húngara de las Ciencias selecciona sus nuevos miembros.

Una importante razón para abordar este estudio de caso internacional es que, a diferencia de la gran mayoría de las organizaciones públicas, la Academia Húngara publica los datos sobre las elecciones de sus miembros, haciendo así posible que las variables determinantes de dichas elecciones puedan ser investigadas empíricamente.

En un sentido más amplio, el estudio de las políticas de reclutamiento de una organización pública de ámbito científico como la Academia Húngara de las Ciencias es relevante por varios motivos. Por un lado, para analizar el papel clave de las prácticas de reclutamiento en el funcionamiento de las organizaciones públicas y, por otro, debido a la importancia de la investigación científica en el crecimiento económico de las economías modernas. La importancia del reclutamiento en las organizaciones públicas se debe a que sus empleados suelen tener autoridad decisional aun estando sujetos a incentivos débiles y un control laxo, lo que convierte la selección de empleados competentes e intrínsecamente motivados en un reto clave (Weber 1921; Williamson 1999). En cuanto a la investigación científica, se ha demostrado como ésta afecta positivamente al crecimiento económico de las economías avanzadas (ej., Stephan 1996; Mora-Valentin et al. 2004; Acemoglu et al. 2006; Montoro-Sánchez et al. 2006) y se le ha asignado un papel central en planes europeos de desarrollo como la *Agenda de Lisboa* y el plan *Europa 2020*. Por último, el estudio desarrollado en mi tesis es potencialmente relevante también desde el punto de vista de las políticas públicas. La Academia Húngara es la principal agencia de coordinación del país en el ámbito científico-académico, por tanto la comprensión de las fuerzas y debilidades de su sistema de reclutamiento podría inspirar reformas en agencias similares en España (CSIC, ANECA) y en el resto de la Unión Europea.

El análisis empírico de las políticas de reclutamiento en la Academia Húngara de las Ciencias surgen indica la presencia de dos pautas principales. Por un lado, la calidad científica objetiva de los candidatos, medida por sus citas, afecta solo

marginalmente su probabilidad de ser elegidos como miembros de la Academia. Por el otro lado, la existencia de relaciones profesionales de los candidatos con los miembros de la Academia que deben evaluarlos aumenta considerablemente su probabilidad de ser elegidos.

Conclusiones

Los resultados de mi tesis doctoral, resumidos arriba, son relevantes en sí mismos y capaces también de estimular nuevas investigaciones en el futuro. Por un lado, dichos resultados confirman estudios anteriores según los cuales las decisiones de reclutamiento en las organizaciones académicas son influenciadas por el oportunismo de los reclutadores, especialmente cuando aquellos gozan de autonomía decisional (ej., Combes *et al*. 2008; Zinovyeva y Bagues 2015). Esto sugiere que en países en los que el Estado coordina activamente la actividad científica debería estudiarse cuidadosamente el problema del oportunismo de los reclutadores y explorarse posibles reformas en el gobierno de las agencias públicas de coordinación con el fin de corregir ese problema.

Por otro lado, los resultados del presente estudio sugieren que las variables normalmente utilizadas para medir la calidad científica—es decir, las citas y los demás índices bibliométricos—tienen un peso casi nulo en las decisiones de reclutamiento de la Academia Húngara de las Ciencias. Dicho resultado podría deberse o bien al oportunismo de los reclutadores, o bien a que siendo la Academia una organización que solamente recluta entre los estudiosos más destacados, diferencias en la cuantía de citas no reflejan diferencias reales en la calidad científica. Dado que medir la calidad científica es importante para asignar de manera eficaz los fondos de investigación, acreditar el personal investigador y diseñar sistemas de incentivos en las organizaciones científicas, un análisis adicional que complemente el *puzzle* empírico que los resultados de esta tesis ponen de relieve constituye un reto importante que podría perseguirse en el futuro, tanto incrementando la base de datos sobre la Academia Húngara como investigando organizaciones similares en otros países.

Summary of the Thesis

Title: Merit and Internal Politics in Public Organizations: The Case of the Hungarian Academy of Sciences

Introduction to the summary

IN the last decades, the scientific study of private organizations has received increasing attention and has expanded our understanding of how firms' employees and managers respond to rules and incentives. The success of this line of research is testified by the Nobel Prizes awarded to Ronald Coase, Oliver Williamson, and Jean Tirole, and by the growing importance of fields like Organization Theory (Cyert and March 1963), Transaction Cost Economics (Williamson 1985), Organizational Strategy (Nickerson and Silverman 2009), and Organizational Economics (Gibbons and Roberts 2013).

At the same time, and despite the size of the public sector in modern economies, less attention has been devoted to *public organizations* and to the peculiar features that may distinguish them from private ones. Most of the research on public firms has focused on the benefits of privatization and on their effect on performance (Hart *et al*. 1997; Shleifer 1998; Cuervo and Villalonga 2000; Megginson and Netter 2001; Cuervo 2003, 2004; Levin and Tadelis 2010). More recently, and building on the pioneering work of Weber (1921), a literature has developed in public policy and, to a smaller degree, in economics, which investigates the internal functioning of public agencies and the behavior of bureaucrats. However, Moe (2013) notes that this literature is primarily theoretical. This urgently calls for empirical analysis to help us understand how public agencies

differ from private ones, how their employees and officers respond to rules and incentives, and how changes in the latter modify their behavior and performance.

Synthesis of the objective and results

This dissertation contributes to overcome the scarcity of empirical research on public agencies by providing detailed evidence on how the Hungarian Academy of Sciences recruits and renews its membership.

An important reason for adopting this international-case-study approach is that, unlike most public organizations, the Hungarian Academy of Sciences makes data on the election of its new members publicly available, thus enabling the empirical analysis of the elections' determinants.

Even more crucially, however, studying recruitment in a scientific public organization may inform future research and policy because of the central role of recruitment in the functioning of public agencies, and the key contribution of scientific research to growth in modern economies. Regarding recruitment, it is key in public agencies because their employees enjoy substantial decision discretion and are subject to weak incentives and loose control, which makes the selection of competent and intrinsically motivated candidates paramount (Weber 1921; Williamson 1999). Regarding scientific research, it has been shown to significantly affect economic growth in the globalized and digital economies (e.g., Stephan 1996; Mora-Valentin et al. 2004; Acemoglu et al. 2006; Montoro-Sánchez et al. 2006)—a point that is also reflected in the centrality of research in the European Union's "Lisbon Agenda" and "Europe 2020" development plans. Finally, the study conducted here has potential policy relevance because the Hungarian Academy of Sciences is the main public agency coordinating research in Hungary. Thus, understanding the strengths and weaknesses of its recruitment practices may offer important lessons to "cousin" public agencies in Spain (CSIC and ANECA) and in the rest of Europe.

Two major patterns emerge from the empirical analysis of recruitment policies at the Hungarian Academy of Sciences. First, candidates' objective quality, as measured by their citations, has a marginal effect on their chances to be elected as Academy members. Second, the existence of professional relationships between candidates and the Academy members in charge of evaluating them considerably enhances the former's chances to be elected.

Conclusions

The results of this dissertation, which are summarized below and presented in the subsequent chapters, seem both informative and capable of stimulating future research. On one hand, they confirm previous findings that when recruiters in academic public agencies enjoy discretion and autonomy, their decisions are partially affected by opportunism and the pursuit of private interests (e.g., Combes et al. 2008; Zinovyeva and Bagues 2015). This suggests that policymakers in countries where the State plays an important role in coordinating research should pay close attention to recruiters' opportunism, and they should explore governance reforms that may correct or at least mitigate it.

On the other hand, the results presented here suggest that widely accepted measures of how new members can contribute to a scientific organization—namely, citations and other bibliometric indexes—carry a small, if any at all, weight in recruiters' decisions. The latter result may be due to the opportunism of recruiters, but also to the fact that in an organization that recruits among top-tier scholars, differences in citations may not reflect real differences in scientific quality. Given the importance of measuring scientific quality for the efficient assignment of research grants, the accreditation of scholars, and the creation of incentive and reward systems and governance rules in scientific organizations, elucidating this empirical puzzle seems important, and constitutes an exciting topic for future research that may be pursued by augmenting the database used in this dissertation, or by collecting similar data on related organizations in different countries.

Introduction

IN the last decades, the scientific study of private organizations has received increasing attention and has expanded our understanding of how firms' employees and managers respond to rules and incentives. The success of this line of research is testified by the Nobel Prizes awarded to Ronald Coase, Oliver Williamson, and Jean Tirole, and by the growing importance of fields like Organization Theory (Cyert and March 1963), Transaction Cost Economics (Williamson 1985), Organizational Strategy (Nickerson and Silverman 2009), and Organizational Economics (Gibbons and Roberts 2013).

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The rest of the dissertation is organized as follows. Chapter 1 presents the theme of this dissertation within its broader context, and it reviews the main related literatures. Chapter 2 describes the history, structure and functions of the Hungarian Academy of Sciences. Chapter 3 develops a simple analytical model of recruitment in public agencies, which generates testable predictions to guide the empirical analysis. Chapter 4 describes the database on the Academy's elections, the empirical methodology used to analyze it, and the results. Finally, Chapter 5 investigates idiosincrasies in the Academy's recruitment policies across research fields by conducting separate empirical analyses for each of its scientific divisions.

Chapter1. Governance and Performance in Public Organizations

1.1. Theoretical background: the tradeoff between expertise and authority in public organizations

Nearly a century ago, Max Weber initiated the scientific study of public administration. In his seminal 1921 essay, *Bureaucracy*, he argued that a distinctive feature of modern states, as opposed to feudal ones, is that public bureaus are run by independent and specialized experts, rather than by rulers' loyalists.

Weber subsequently outlined the tenets around which an efficient, competence-based bureaucracy should be organized. Among those, he assigned a key role to three principles. First, bureaucrats should be selected meritocratically from a pool of professionals. Second, a combination of ex ante formal rules and ex post control by hierarchical superiors should govern their actions. Third, bureaucrats should be motivated by a sense of duty and loyalty to their office, rather than by the pursuit of personal enrichment or compensation, and they should be granted high social status and a secure career in the administration.

More recent analyses of public bureaucracies grounded in transaction cost economics and agency theory, such as McCubbins *et al*. (1987) and Williamson (1999), basically concur with Weber in that the adherence to formal rules, combined with a *civil servant*, tenure-based employment model, may be optimal governance principals for public bureaucracies. In their analyses, the primary goal of both formal rules and the civil servant employment model seems to be that of preventing bureaucrats from shirking, or pursuing personal goals, instead of the public interest—that is, from engaging in the type of behavior that modern agency theory calls *moral hazard* (Holmstrom 1979), and transaction cost analysis calls *opportunism* (Williamson 1985). In particular, formal rules may limit the ability of bureaucrats to direct their attention to the wrong tasks (Holmstrom and Milgrom 1991, 1994), while holding a prestigious, and tenured, public office may discourage them from opportunistic behavior by creating intrinsic motivation (Benabou and Tirole 2006), reputational concerns (Ostrom 1990; MacLeod 2007), and *efficiency wage* effects—that is, the fear of losing a highly fulfilling job if caught shirking (Shapiro and Stiglitz 1984).[1] In the public sector, these indirect motivational tools

[1] In efficiency wage models, agents are concerned with losing the salary attached to their position. In public bureaucracies, civil servants cannot normally be dismissed, but they may be suspended from their functions, so the *efficiency wage* effect would depend on the loss of a fulfilling professional function, rather than on the loss of a *wage.*

may be preferable to explicit, output-based incentives because, as argued by Moe (1990, 2013), Tirole (1994), and others, public agencies, unlike private firms, often produce goods and services that are not traded in competitive markets, so disciplining and motivating bureaucrats through output-based incentives may be difficult.

Building on these insights, decades of research and practice have generated the so called *merit system model*—a cornerstone of modern Public Administration—which essentially reaffirms Weber's principle of a rule-based, meritocratic bureaucracy employing civil servants. For instance—and restricting attention to the recruitment of new employees, which is the main focus of this study—the Spanish Constitution prescribes that public employees be selected based on criteria of merit and impartiality (art. 103), and the Spanish Law regulating the status of public employees (*Ley 7/2007, de 12 de abril*) mandates that civil servants be tenured employees (art. 14 (a)) who pursue the public interest and act according to principles of integrity and austerity (artt. 52-53), that they must be selected based on objective merits by professional recruiters endowed with independence and discretion (art. 55), and that they be suspended from their functions (art. 96) upon serious violations of their duties as formally listed by law (art. 94). Similarly, the Merit System Principles followed by the US Federal Government, and recorded in the US Code, state that:

> Recruitment should be from qualified individuals from appropriate sources in an endeavor […] and selection and advancement should be determined solely on the basis of relative ability, knowledge and skills, after fair and open competition which assures that all receive equal opportunity.
>
> (5 USC § 2301)

The Merit System Principles also include a set of rules aimed at preventing opportunistic or corrupt recruitment practices, such as bans on discrimination and the acceptance of recommendations not based on candidates' merits.[2]

Building a competence-based bureaucracy governed by verifiable rules and intrinsic motivation, as recommended by the merit system model, seems an attractive goal for modern states, whose functions are increasingly complex and multi-faceted. But is it also a feasible goal? Is it possible to simultaneously limit the

[2] The US Federal government also maintains a Merit System Protection Board, which oversees compliance with the Merit System Principles. See the Board's website, www.mspb.gov, for more details.

discretion of bureaucrats via rules and control mechanisms—thus insulating them from politics, corruption, and opportunism—while inducing them to collect the relevant information, and to make appropriate use of it in performing their tasks? In other words, is bureaucratic expertise compatible with authority and control?

A significant body of research in public administration, organizational theory, and political science, suggests that reconciling expertise and control may indeed be difficult. At the roots of such difficulty lies the fundamental informational problem highlighted by Hayek (1945), and further elaborated by Jensen and Meckling (1992), Aghion and Tirole (1997), and others. While formal rules are centrally designed, monitored, and enforced by legislators, political leaders, and courts, the information necessary to perform productive tasks, and to adapt them to changing circumstances, is locally dispersed, and it can only be collected, and often even interpreted, by specialized agents. Hence, dictating non-opportunistic behavior to bureaucrats via ex ante rules without forcing them to sacrifice relevant information or make inefficient decisions under some contingencies, seems an impossible task (Epstein and O'Halloran 1994)—pretty much like it has been proved to be impossible to design *complete contracts* that force the members of an organization to take the appropriate actions in all possible circumstances (e.g., Williamson 1979; Grossman and Hart 1986; Hart and Moore 1988). In other words, if ex ante rules are to govern the behavior of bureaucrats, those rules will necessarily be rigid, and hence inefficient. Moreover, and related, as emphasized by the literature on delegation, control and interference by hierarchical superiors may reduce the motivation of bureaucrats to take the initiative and be proactive in using their specialized knowledge to solve unforeseen problems (Aghion and Tirole 1997; Baker *et al*. 1999).

As a result of the informational problems discussed above, and given the weakness of market-based incentives in the provision of many public services, a tradeoff seems to arise between bureaucratic expertise, which is enhanced by delegating responsibilities and discretion to bureaucrats, and opportunism, which is minimized by reducing the bureaucrats' discretion and by forcing them to follow rigid rules. In fact, as emphasized by Simon (1946) and Simon *et al*. (1950), the balance observed in practice seems to often favor delegation and discretion at the expense of control:

> It does not go too far to say that unity of command […] never has existed in any administrative organization.
>
> (Simon 1946, p. 56)

As a result, public bureaucracies are usually perceived as having—sometimes optimally so, at least in a *second best* sense—considerable autonomy and power (Niskanen 1971; Hammond and Miller 1985; Wilson 1989; Bawn 1995; Epstein and O'Halloran 1994). Indeed, Weber himself, and some prominent Weberian sociologists after him (e.g., Parsons 1947), recognized the tradeoff, and argued that in a complex society, the theoretical model of rule-based, rationally designed bureaucracy may well drift towards a *de facto dictatorship* of bureaucrats.

1.2. Research question: the behavior of public agencies' recruiters under a delegated governance structure

1.2.1. Recruitment in public agencies

This thesis is primarily concerned with a specific dimension of the operation of public agencies—namely, the recruitment of their employees and officers. Recruitment is particularly important because, as emphasized by Weber (1921), an expertise-based bureaucracy requires that its personnel be selected based on merit, rather than on political or personal loyalty. But if recruiters are biased or motivated by private interests other than the agency's mission, there is no guarantee that they will select experts. Hence, if an efficient, Weberian public bureaucracy is to exist, its recruiters must be themselves properly motivated and governed. Unfortunately, the governance of a public recruitment system suffers from the same tradeoff between expertise and authority that plagues all functions of public bureaucracies. Recruiters are, perhaps more than any other bureaucrat, specialized experts, so any attempt to centrally guide them or control them in their choices will tend to make those choices less efficient. On the other hand, excessively loose rules and control may tempt the recruiters to make nepotistic, or otherwise opportunistic selection choices, unless they are intrinsically motivated and driven.

In practice, recruitment systems in public bureaucracies attempt to balance the two elements of this tradeoff. On the expertise side, selection is usually delegated to specialized committees—either internal to the agency or constituting permanent or ad hoc agencies of their own—rather than being *remotely* micro-managed by legislators via rules. This is especially the case if the bureaucrats to be recruited must possess specialized and technical knowledge that can only be assessed by their peers, as in academic and scientific organizations, the judiciary, or the diplomatic corps. Recruiters in these types of public agencies are typically themselves civil servants, so they have little explicit incentives to align their recruitment choices

with the agency's mission. For instance, in most European countries, judges and public university professors are chosen by their peers, while civil servants in regulatory agencies are chosen by committees that may include sitting officers of the agency as well as members proceeding from other branches of the public administration.

On the authority side of the tradeoff, the discretion of public recruiters is to some extent constrained by rules that may require them to give specific weights to certain objective characteristics of candidates—such as their education titles, or in academic recruitment, the quantity and citation impact of their publications—as well as to treat similar candidates equally, and to produce written, and hence verifiable, reports describing and justifying the criteria they have followed in the process. Overall, however, it seems fair to argue that recruiters in public agencies enjoy considerable discretion, and the more so the more the agency rests on specialized, technical knowledge.

1.2.2. Empirical questions

Despite the abundance of theoretical analyses, there is remarkably little evidence on how recruiters in public agencies actually behave. This question could be addressed empirically in two ways. On one hand, one may investigate what drives the recruiters' choices, given the public agency's organizational rules and incentive system. On the other hand, one could study how changes in the agency's organizational rules and incentives affect the behavior of otherwise similar recruiters.

This thesis adopts the first approach. Specifically, I focus on a setting—which as discussed above, is fairly representative—where the public agency's recruitment system is characterized by delegation of selection tasks to specialized experts, limited ex ante and ex post control via rules and monitoring, and the granting of a civil servant status to recruiters, who have therefore weak explicit incentives to align their selection choices to the agency's mission. Given this governance structure, I ask the following question: do the public agency's recruiters select new members who are likely to reciprocate them by providing favors and private benefits, or do they choose members who have the best qualifications to accomplish the agency's mission?

This question is important for both research and policy, as any reform of governance in public bureaucracies that aims to improve the selection and retention of employees should be based on a sound assessment of how recruiters behave under a given governance structure. Yet, the answer to this question is far from

obvious. While the modern *rational choice* theory of public bureaucracy, as pioneered by Tullock (1965) and Downs (1967), and developed by many of the authors cited in this chapter, assumes the bureaucrat behaves like a *homo oeconomicus*—that is, as a selfish maximizer of his own utility—behavioral economists, psychologists and sociologists alike, have emphasized and documented the existence of intrinsic motivation, which may induce individuals in an organization to pursue the organization's goal even in the absence of explicit incentives and control mechanisms (e.g., Benabou and Tirole 2006). Relatedly, as mentioned before, social norms and concerns for one's reputation and good standing within the community of reference (e.g., Ostrom 1990; MacLeod 2007), as well as the fear to lose a secure career and salary in case of clear misconduct (Shapiro and Stiglitz 1984; Williamson 1999), may also suffice to deter opportunism even in the absence of tight rules, monitoring, and control systems.

If recruiters in public agencies are willing to serve the public interest or the goals assigned to them by people's representatives in the legislature and government, due to intrinsic motivation or reputational concerns, we may achieve an efficient and meritocratic selection without sacrificing information and quality—that is, without constraining the autonomy of recruiters through rules, authority, and incentives based on explicit performance goals. On the other hand, if recruiters in public bureaucracies are opportunistic, or if reputational concerns are too weak to significantly affect their behavior, the aforementioned tradeoff between recruitment effectiveness (fostered by the delegation of authority) and opportunism (also enhanced by delegation) arises, and any attempts at policy reform will need to address it.

1.2.3. Empirical methodology

While the theoretical scope of the research questions outlined above is broad, the empirical strategy adopted here is deliberately specific. Instead of studying the behavior of recruiters across similarly organized public agencies—a task that would force me to resort to anecdotal analysis, due to the impossibility of collecting detailed information on such a scale—I analyze in depth the recruitment processes and the behavior of recruiters in one public organization for which I had access to comprehensive data—namely, the Hungarian Academy of Sciences (hereafter, the HAS).

An important reason to focus on the HAS is data availability. As we will see in the next chapters, testing empirically for the behavior of recruiters in public agencies requires detailed information on candidates to agency positions, on

recruiters, on the recruiters' selection choices and on the criteria that drive them. Most of these data are normally proprietary, and they are regarded by public agencies as confidential. In contrast, the HAS makes personal information on its members (who also serve as recruiters), on candidates to membership (nominees), and on the outcome of the selection process (which nominees are elected as members), available to the public. This information, combined with public data on the scholarly quality of candidates and recruiters and on their scientific and workplace relationships, allows me to conduct a systematic empirical study of the HAS's recruitment practices and to assess, at least in part, its consistency with the received theoretical explanations.

Besides data availability, the HAS is also a relevant setting for empirical analysis because of its multi-faceted and important tasks as a public scientific organization, as well as its original organizational structure. I will elaborate more on these points in Chapter 2 of this thesis, which describes and discusses the HAS, and its historical and current functions and features.

1.3. Preview of the results and their implications

To address my research question using the HAS data, I proceed in two steps. First, in Chapter 3, I develop a simple formal model that captures the most salient features of recruitment at the HAS (and in many other public bureaucracies)—namely, recruiters' discretion and the absence of explicit incentives. In the model, a representative recruiter decides whether to select a candidate or not by maximizing his own utility, which is a function of the candidate's observed characteristics. In particular, the model allows for both opportunism and intrinsic motivation/reputation/social norms to affect the recruiter's choices, by allowing the recruiter's utility to depend, on one hand, on observable signals of the candidate's quality (publications, past performance as a coauthor or colleague), and on the other hand, on the candidate's ability, if elected, to compensate the recruiter at the expense of public agency via private favors. While the model abstracts from many other real features of public bureaucracies and of the HAS (for instance, by assuming only one recruiter and one candidate), it clarifies in a simple way the mechanisms through which a rational recruiter may articulate his choices, and thus it allows me to derive precise testable predictions that will guide the subsequent empirical analysis.

The model predicts that a recruiter characterized by (some degree of) both motivation and opportunism will tend to select candidates whose quality is higher and easier to measure but, also, who are more capable of privately favor him. Moreover, the model predicts that a recruiter who is mainly driven by opportunism should place greater weight in his evaluation on the candidates' ability to privately favor him, whereas a recruiter whose interests are primarily aligned with those of the public agency should place greater weight on the candidates' observed quality.

As a second step in my analysis, in Chapters 4 and 5, I test the model's predictions using a comprehensive dataset of elections of new HAS members between 2004 and 2013. Thanks to the HAS public database (which is described in detail in Chapter 4), I can observe the identity of candidates, recruiters—who are members of the HAS scientific division to which candidates are assigned—and nominators (candidates can only be elected if they are nominated by a minimum number of HAS members established by the HAS President before the election[3]), as well as the outcome of elections—that is, which candidates become members of the HAS and which ones do not. Moreover, by matching the information on candidates provided by the HAS with the Web of Science database on scholars' bibliometric indicators and with biographic information on the candidates as reported in their CVs and other public sources, I construct measures of the candidates' observable quality (cumulative citations to their articles) and of whether the candidates are personally connected with their recruiters (the number of candidates' coauthors and colleagues who are members of the HAS relevant division, and hence are entitled to vote on the candidates' election). Importantly, while being a candidate's coauthor or colleague may increase both the recruiter's information on the candidate's quality and his ability to extract private benefit from him, the effect is clearly asymmetric: coauthorship improves quality assessment more than it enhances the potential for benefit extraction, and vice versa, a colleague relationship enhances the potential for benefit extraction more than it improves quality assessment.

The empirical analysis reveals two important patterns. First, I find that after controlling for various candidate characteristics such as the number of times he has been up for election, the number of HAS members endorsing his nomination and his age, as well as year-specific and field-specific fixed effects, a candidate's observable quality, as proxied by his citations, has a positive but very small impact

[3] In the past three election cycles, the minimum number of endorsers has been set at three.

on the HAS members' decision to elect him. Second, I find that, while being a colleague of his recruiters (either at the institution level or at the department level) has a positive and significant effect on a candidate's chances to be elected, being their coauthor has a negligible, and if anything negative, effect.

The above results are consistent with the rational choice model of public bureaucracies, according to which recruiters with decision discretion and low-powered incentives will tend to select candidates who benefit them privately but do not necessarily benefit the organization. The results do not rule out the possibility that intrinsic motivation, reputational concerns and social norms may mitigate the opportunism of recruiters—first, because I cannot observe the strength of these implicit incentives and whether opportunism co-varies with it, and second, because there may be unobserved dimensions of candidates' quality that are not captured by my bibliometric citation measures and yet affect their election chances. Nevertheless, my empirical results clearly do not support a theoretical model where implicit incentive mechanisms are strong enough to fully neutralize recruiters' opportunism—a finding that should be taken into account in thinking about reforms of the HAS and of similarly organized public agencies. The results are also consistent with recent evidence on recruitment in different but related organizations, such as the Econometric Society (Hamermesh and Schmidt 2003), and public universities in France (Combes *et al.* 2008) and Spain (Zinovyeva and Bagues 2015).

1.4. Relation to the literature

Because the study of public organizations is inherently interdisciplinary, it is not surprising that this thesis makes contact with several and heterogeneous literatures, spanning fields as diverse as sociology, organization theory, political science, and economics. I briefly review below these literatures, and their relation to this thesis, organizing my discussion by topic.

1.4.1. Public bureaucracies

As discussed earlier, the modern science of public administration and bureaucracy can be traced back to Weber (1921). The Weberian idea that a well-organized bureaucracy should simultaneously rest on bureaucrats' expertise and civil servant status on one hand, and on control by legislators and hierarchical superiors on the other, has been criticized by some of Weber's students and

followers, such as Parsons (1947), Gouldner (1954), and Bendix (1971), on the grounds that the two principles appear to be often in conflict. More forcefully, Herbert Simon and his coauthors noted that not only there is a tradeoff between expertise and authority/control, but also that the tradeoff is often resolved in practice in favor of expertise and against authority—in other words, bureaucrats have *de facto* power over their hierarchical superiors due to their superior information on the content and context of bureaucratic tasks (Simon 1946; Simon *et al*. 1950; see Wilson 1989 for related empirical work). More recently, Hammond and Miller (1985) have used the tools of social choice theory, as developed by pioneering scholars such as Arrow (1950) and Sen (1970), to formally demonstrate the impossibility for a bureaucracy to simultaneously satisfy all the efficiency principles invoked in the earlier Weberian literature.

The tradeoff between expertise and authority has been more thoroughly explored by political scientists using the tools of agency theory, transaction cost analysis and new institutional economics. In particular, Niskanen (1970), and after him Bendor *et al*. (1985) and Banks and Weingast (1992), formally analyzes the power of bureaucrats as stemming from their superior information on the costs and benefits of the services supplied by the bureau.

On the other side of the tradeoff, Weingast and Moran (1983) and McCubbins and Schwartz (1984) emphasize the ability of political leaders to control bureaucrats through ex post control mechanisms, such as oversight, the budget, and the threat of new legislation. A set of complementary articles emphasize instead ex ante rules and procedures as means of control over the bureaucracy (McCubbins *et al*. 1987). More critically, Moe (1990) stresses how the procedures designed to structure and control the bureaucracy are often not guided by efficiency criteria, as they respond to the strategic, self-interested calculus of political leaders. Williamson (1999) emphasizes both ex ante procedures and ex post control, and within ex post control, he argues that implicit motivation mechanisms, such as the creation of reputational concerns linked to the civil servant status, and efficiency-wage-like contracts linked to tenure, are especially relevant in public bureaucracies.

Finally, Bawn (1995) and, most importantly, Epstein and O'Halloran (1994, 1999) study the optimal level of delegation of discretion to bureaucrats as resulting from the tradeoff between expertise and authority, showing that delegation should be greater the stronger the informational advantage of bureaucrats and the lower their interest conflict with political leaders and legislators. A more comprehensive and up-to-date review of the public policy literature on bureaucracies can be found in Moe (2013).

1.4.2. Delegation of authority in organizations

The tradeoff between expertise and authority, central to the literature on public bureaucracies reviewed above, has also been analyzed by economists within the frameworks of agency theory and incomplete contracting. While much of the analysis of delegation and authority in modern organizational economics focuses on private firms, many of its insights can be applied, and are often applied to understand governance and incentives in public agencies.

The themes of delegation, discretion and autonomy are at the center of the classic agency literature (Holmstrom 1979; Holmstrom and Milgrom 1991, 1994), where agents are assumed to be so autonomous—either due to their unique expertise or to the overwhelming costs of monitoring their performance—that the only way to reduce their moral hazard, and the consequent shirking and opportunistic behavior, is to link their compensation to some measure of their output (see Gibbons 1998, 2005a for comprehensive reviews of the agency literature on incentive contracts). As we saw, this solution seems less easily applicable in public bureaucracies, where reliable measures of the agents' output are often missing due to the lack of competitive markets for the supplied services (Moe 1990).

In his seminal analysis of the nature of the firm, Coase (1937) argues that, unlike market transactions, transactions within firms (one could generalize and say *within organizations*) are not based on autonomy but rather, on authority—that is, on the power of bosses to dictate decisions to their subordinates, to ratify the decisions initiated by the latter, and to inflict sanctions in case of non-compliance. This perspective is shared by Simon's (1951) authority-based analysis of the employment relationship, Williamson's analysis of the differential organization of markets and hierarchies (Williamson 1975, 1985; see also Masten 1988), and by the taxonomy of firms' decision-making rules proposed by Fama and Jensen (1983).

Building on the insights of the above classic theories, recent formal models have attempted to analyze the costs and benefits of the delegation of authority in organizations more precisely. The starting point in these models is that once an agent is given authority, he may be able, and motivated, to use his expertise and information to develop decisions and policies according to his superiors' desires, but he may also be tempted to recommend to his superiors decisions that are biased towards his own private objectives (Aghion and Tirole 1997; Crawford and Sobel 1982). Building on these observations, Aghion and Tirole (1997), Baker *et al.* (1999), and Dessein (2002), argue that giving the authority to ratify the agent's decisions to a boss (i.e., separating the initiation and ratification phases of decision-

making)—via formal centralization of decision rights or access to information—may produce less biased, but also less effective and innovative decisions.[4] If applied to public bureaucracies, the conclusions from this literature are not dissimilar from those one can draw from the public policy literature—namely, that bureaucrats may have *de facto* decision power due to their superior information and to the costs of constraining it via hierarchical control, and may use that power opportunistically.

An important observation on the literature on delegation and on the tradeoff between expertise and authority, both in economics and in public policy, is that most contributions to it are primarily theoretical. Besides case studies (e.g., Aguilar and Bahmbri 1986; Foss 2003) and a few cross-country empirical studies (e.g., Bloom *et al*. 2012), there is little empirical evidence on how agents and their bosses behave in a decentralized or centralized organization, be it a private firm or, as in this thesis, a public agency. In this sense, the empirical investigation conducted here provides a novel contribution to the literature.

1.4.3. Personnel recruitment

Because of its focus on recruitment decisions in public agencies, this thesis relates to the broader recruitment literature in personnel economics and human resource management. This literature has been primarily concerned with two problems that are not analyzed here—namely, the optimal matching between employees' skills and firms' needs (e.g., Jovanovic 1979), and the firm's problem of assessing the employees' skills in the presence of incomplete information (e.g., Spence 1973; Salop and Salop 1976; Lazear 1986).

Since the theoretical literature on recruitment is only tangentially related to this thesis, I will not discuss it in detail here, referring instead interested readers to the recent survey of both theory and evidence by Lazear and Oyer (2013). One point, however, is worth emphasizing. None of the theoretical analyses of recruitment policies in the personnel literature discusses the problem of recruiters' opportunism. This omission is perhaps best understood by noticing that while recruiters' opportunism appears relevant in public bureaucracies, where recruiters have low-powered incentives, it seems less of a concern in private firms—the main object of analysis in the personnel literature—where recruiters' incentives are

[4] Another possible cost of centralizing ratification authority is that it may create an incentive for subordinates to engage in unproductive, rent-seeking lobbying activities aimed at influencing the boss' decisions. See Milgrom and Roberts (1988) and Gibbons (2005b) for models in this spirit.

generally more aligned with those of the firm, either because or direct ownership stakes or because of output-based incentives and career concerns.

While the theoretical literature on recruitment has largely abstracted from the problem of recruiters' opportunism, a few empirical studies have focused on one particular form of recruiter opportunism in private firms—namely race and sex discrimination. For instance, Neumark *et al*. (1996) study sex discrimination in restaurant hiring, Goldin and Rouse (2000) study sex discrimination in the recruitment of musicians at symphony orchestras, Petersen *et al*. (2000, 2005) study both sex and race discrimination in high-tech and services companies. All of these papers find some evidence that even in private firms and organizations, gender and race identity do affect the chances of job seekers. Fernandez and Weinberg (1997) analyze the retail banking industry, focusing on social ties more broadly, and they find a significant effect of referrals on candidates' likelihood to be hired.

More related to this thesis, there is a small but significant empirical literature that studies recruitment in the context of scientific and academic organizations. This literature, and the broader literature on the governance of scientific institutions, is discussed in the next, and final, paragraph of this literature review.

1.4.4. Governance and recruitment in scientific organizations

Given its focus on recruitment as the task delegated to bureaucrats, and on a scientific organization—the Hungarian Academy of Sciences—as the context of analysis, this paper relates to the economic literature on academic governance and, in particular, to the strand of this literature that investigates empirically the recruitment of academics and scientists in public institutions.

Building on the insights of organization theory, as summarized above, a number of authors have analyzed the governance of academic institutions, particularly universities. Early theoretical work highlighting the motivational role of up-or-out, tenure-based promotion systems in academia are Carmichael (1983), Kahn and Huberman (1988), and Prendergast (1993). More recently, Masten (2006, 2013) discusses the differential roles of democratic, voting-based decision-making procedures in universities as opposed to firms, and provides empirical evidence on the temporal evolution and cross-sectional patterns in the allocation of decision authority in universities. Lach and Shankerman (2004, 2008), and Belenzon and Shankerman (2009), analyze the effect of intellectual property rights and performance incentives on universities' innovativeness. Aghion *et al*. (2010) investigate the effect of organizational practices on universities' outputs, and find that output is generally increased by a combination of competitive research funding

and autonomy from governmental control. Haeck and Verboven (2012) study the internal human resource management practices of a European public university, and find evidence of the existence of internal labor markets. Ytsma (2014) provides evidence that the introduction of pay-for-performance for academics in Germany increased assortative matching—that is, the tendency of high quality candidates to accrue to high quality departments. References to earlier works on academic governance can be found in these papers.

More related to this thesis, a few empirical papers have studied the relative effect of candidates' quality and their connection to recruiters on the selection choices in academic and scientific institutions. Hamermesh and Schmidt (2003) examine the determinants of elections of Fellows of the Econometric Society. They notice that a *fair* system would select candidates based solely on their scientific quality, and they subsequently ask whether candidate characteristics other than quality matter in the Society's elections. They find that indeed, quality measures such as citations and editorial activity in the Society's journal, *Econometrica*, increase a candidate's chances to be elected. However, they find that characteristics not directly related to quality, such as being affiliated to a North American university or being an economic theorist rather than an empiricist, also positively affect a candidate's election chances. While informative, the empirical analysis in Hamermesh and Schmidt (2003) is deliberately illustrative and descriptive, as they do not attempt to explain the organizational or political mechanisms underlying the observed patterns.

Combes *et al*. (2008) study the determinants of success at the national examination for associate professor positions in French public universities.[5] They ask to what extent measures of a candidate's quality (namely, his publications) and measures of a candidate's connections with members of the selection committee (mainly, having a coauthor, a PhD advisor, or a colleague in the committee) affect his/her chances of success at the exam. They find that while both observed quality and connections positively affect the chances of success, the effect of connections—particularly, having a PhD advisor or colleague in the committee—is significantly stronger. The empirical results in Combes *et al*. (2008) are consistent with the basic theoretical idea that recruiters in a public selection committee, whose members have weak incentives to pursue the public goal of merit-based selection, may behave

[5] Perotti (2002) conducts a related study for recruitment in Italian public universities.

opportunistically. However, one could also interpret their connection variables as indicators of the amount of *soft* information on the candidate that is available to committee members (as opposed to the *hard*, objective information represented by publications). For instance, committee members may be in a better position to evaluate the scientific quality of a coauthor. Relatedly, professor positions do not only involve research, but also teaching and administrative activities, and a candidate's potential in those dimensions can be arguably better assessed by a colleague. These identification concerns have been addressed by Li (2012) and Zinovyeva and Bagues (2015), to whose discussion I now turn.

Li (2012) studies the differential roles of connections (measured by cross-citations between application reviewers and applicants) and applicant quality (measured by application-related publications) in the allocation of grant funds by the U.S. National Institutes of Health. Her strategy for disentangling the opportunism dimension of connections from their informational dimension is based on the theoretical proposition that holding the size of connections constant, the interaction of an applicant's connections with his observed quality would measure the informational role of connections, whereas the level effect of connections would measure their opportunism role. Moreover, Li (2012) controls for the potential correlation between an applicant's connections and unobserved dimensions of his/her quality by focusing on the effect of connections with full-time members of the review committee (see the paper for details on this), while holding the total number of connections constant. Relying on this empirical strategy, Li (2012) finds that reviewers exhibit both superior information and opportunistic bias towards connected applicants.

Finally, Zinovyeva and Bagues (2015) study the determinants of success at the Spanish national accreditation examination for associate and full professors. Similarly to Combes *et al*. (2008), they find that not only candidates' objective quality, but also their connections with members of the selection committee, positively affect their chances of success. At the same time, Zinovyeva and Bagues (2015) make substantial progress over Combes *et al*. (2008) and earlier related works, under two key respects. First, the assignment of committee members to candidates is randomly determined in their dataset, which enables them to identify the causal effect of candidate characteristics on success. Second, they develop a credible strategy for disentangling the informational role and the opportunistic role of connections. In particular, they notice that if connections with candidates improve the committee's soft information on their quality, successful candidates connected to the committee should have on average better quality, and hence they

should perform better after the exam compared to successful but non-connected candidates. The reverse should be true if connections with candidates primarily enhanced the ability of committees to opportunistically exchange favors with them. They test these competing hypotheses and find that, consistent with connections being related to opportunism, but not with soft information, the post-examination performance of successful candidates decreases when they were strongly connected to the committee that selected them.

The empirical investigation conducted in this thesis contributes to the above literature in several ways. Like Combes *et al*. (2008) and Zinovyeva and Bagues (2015), I have access to comprehensive data on all candidates to a given position—both those who are successful and those who are not. Two unique features of my database distinguish it from the aforementioned studies on recruitment in public universities. First, membership of the Hungarian Academy of Sciences does not involve ongoing professional and personal interactions between its scholars. Second, the tasks of members are quintessentially scientific—they must represent the nation at the highest scientific level, advise the government, coordinate research institutes, and participate to the accreditation of researchers (see Chapter 2 of this thesis for more details on the HAS's functions and structure). Taken together, these features imply that, unlike in the case of universities, soft information on a candidate's fit to the HAS can be more easily gathered by recruiters who know him as a coauthor than by recruiters who know him as a colleague, as coauthorship is a far more direct vehicle of scientific interaction whereas the type of information that could be more easily assessed by a colleague—for instance, on teaching or administration skills—does not seem relevant in the case of the HAS. As discussed before, and as further clarified in Chapter 4, this feature of my dataset allows me to devise a strategy to test for the presence of opportunism in recruiters' choices.

A disadvantage of my dataset, compared to that of Zinovyeva and Bagues (2015), is that the match of recruiters to candidates at the HAS is non-random, as all the sitting members of a scientific division of the HAS act as recruiters, and therefore their identity is known from the outset to both candidates and their endorsers. While the lack of random matching does not allow me to rule out that the estimated effects may be at least partially biased by endogeneity, the observable quality of candidates is not systematically correlated with their connections to HAS members in my database, suggesting that the empirical results are unlikely to be primarily driven by endogeneity.

Chapter 2. The Hungarian Academy of Sciences: History, Role, and Organization

2.1. A brief history of the HAS

In this section, I briefly summarize the most salient aspects of the HAS's history. More details on it can be found in Hargittai and Hargittai (2015), as well as on the dedicated page of the HAS's website (http://mta.hu/articles/history-of-the-hungarian-academy-of-sciences-129195).

The HAS was created in 1825, as a non-governmental foundation, upon the initiative of a group of enlightened aristocrats led by count István Széchenyi, who contributed financially to the enterprise with one year of his estates' income. The original purpose of the HAS was to consolidate and propagate the Hungarian language, particularly as a vehicle to diffuse humanistic and scientific knowledge, at a time when the country's official language was still Latin. Since its foundation, the HAS has counted the country's intellectual elites among its members. Some early members, including Széchenyi, the poets Arany and Vörösmarty, and jurist Déak, also had major political and governmental roles, and importantly contributed to the revival of the Hungarian national sentiment and to the country's negotiation of an autonomous kingdom status within the Austrian Empire—a goal that was eventually achieved in 1867.

In its early years, the HAS was supervised by the Monarch, who authorized its meetings and activities and appointed its officers and governing Board. In 1867, in parallel with Hungary's increased autonomy from Austria, new bylaws were passed, which granted the HAS members the right to autonomously elect part of the Board. The following decades were characterized by an intense development and intellectual activity of the HAS and by the enrollment of prestigious international scholars, such as Santiago Ramón y Cajal, John Stuart Mill, and Charles Darwin, as honorary members.

In the years between the two World Wars, the HAS was once again subjected to governmental control, and in accordance with the country's authoritarian political regime and its alliance with the Axis powers, many non-aligned members and Jewish members were ostracized. In the brief democratic period following World War II, the HAS gained back, and even increased, its independence from governmental and political control, as the 1946 new bylaws gave its members, for the first time in the Academy's history, the right to elect the entire governing Board.

In the Communist period (1949-1990), governmental control of the HAS was once again restored, as the Communist Party saw the HAS as an important vehicle to create and propagate a research policy in line with the country's new Marxist-

Leninist ideology. Consistent with this strategic goal, and following the organizational model adopted in the Soviet Union, the Party considerably expanded the HAS's tasks. In particular, the HAS was now in charge of directing a network of research institutes—a task it still maintains today—where most of the country's scientific research was conducted.[6] In addition, during Communism the HAS was in charge of organizing scholars' postgraduate training, developing a centralized system of academic degrees, and crediting academic institutions. During the Communist years, humanities were des-emphasized relative to the natural and social sciences, and several HAS members nominated in the pre-communist years were ostracized.

Following the end of Communism and the restoration of democracy in Hungary, new HAS bylaws were passed in 1994, and as a consequence of the end of the Communist Party's control, the HAS acquired its current form of a scholarly public body founded on self-government. The current structure and tasks of the HAS are discussed in greater detail in the next section.

2.2. Current tasks and organization of the HAS

Currently, the HAS is an academic institution, whose broad mission is to foster scholarly excellence and scientific research in Hungary. As further discussed in the following sections of this chapter, the HAS is in charge of curating publications, awarding scholarly grants, advising the government on technical aspects of legislation, awarding a special academic degree called *Doctor of the HAS*—which greatly helps scholars being certified as eligible for full professorship in Hungary's public university system and obtaining a full professor position in the country's major public universities—and directing a capillary network of research centers and institutes across the country.

From an administrative viewpoint, the HAS is a public entity regulated by an *ad hoc* law and funded by the Hungarian State.[7] Its budget in 2014 was about 46 billion forints, equivalent to 146 million euros.

[6] A significant amount of research was also conducted in universities, which like the HAS, where *de facto* controlled by the Communist Party.

[7] In addition to the State's endowment, which constitutes its primary source of funding, the HAS receives additional financing via grants and private donations.

The HAS can have a maximum of 365 members and to guarantee that those members are accomplished and prestigious scholars, the law establishes that no more than 200 among them be less than 70 years old. Elections of new HAS members are held every three years, and the number of new members to be elected is based on the number of members that have passed away since the previous election cycle. Members are elected as *Corresponding Members* and later promoted to *Full Members*, conditional on their scholarly achievements being worthy of such status. Promotion to full membership usually occurs after six years. The HAS members are appointed for life, and they receive a monthly stipend that is comparable in magnitude to, and can be combined with, a professional salary.[8] As a result, reaching the HAS membership does not only constitute an honor, but also a significant professional and financial advancement for scholars who intend to work and live in Hungary. Indeed, one major reason for granting a stipend to HAS members is to motivate them to conduct their research in Hungary rather than seeking well payed positions in foreign universities.

The HAS is articulated into eleven scientific divisions, each of them directed by a chair elected by the division's members. The divisions are: Linguistics and Literary Studies, Philosophy and Historical Studies, Mathematical Sciences, Agricultural Sciences, Medical Sciences, Engineering Sciences, Chemical Sciences, Biological Sciences, Economics and Law, Earth Sciences, and Physical Sciences.

Despite being a public organization, and unlike in much of its past history, the HAS currently enjoys full autonomy in selecting its membership, governing its activities, and allocating its budget. Regarding selection, new HAS members are nominated and elected by existing members, and neither the government nor other political institutions have formal powers to intervene in the process. The actual election procedure is described in detail in Chapter 4, which analyzes empirically the determinants of HAS elections' outcomes, so I will not discuss it further here.

Regarding governance, The HAS's supreme body is the General Assembly, which is composed by all the HAS members, as well as the representatives of affiliated non-members, and has the power to elect officers, approve the budget, and modify the HAS statutes. In practice, the Assembly delegates most of its governance tasks to the Presidium, a 25 person council composed by the HAS

[8] The monthly stipend of Corresponding Members of the HAS is 300,000 Forints, or 960 euros, while the stipend of Full Members is 400,000 Forints, or 1,280 euros. Hungary's average monthly wage in 2014 was 532 euros.

officers, the chairs of the various scientific divisions, and additional members elected by the Assembly. In turn, the Presidium delegates executive and administrative tasks to the HAS officers—namely, the President, three vice Presidents, the Secretary General and the Secretary's deputy. All the officers are elected by the General Assembly.

Finally, regarding financial autonomy, the HAS's budget is voted every year by the Hungarian Parliament, based on a proposal submitted by HAS. Once the budget is approved, the HAS has discretion to allocate it among its various activities.

2.3. Relation of the HAS to other organizations and empirical relevance

2.3.1. Relation of the HAS to other academic institutions

Partly due to its unique historical heritage and evolution, the HAS performs both tasks that are typical of other Academies around the world (promoting scientific excellence, curating publications, advising the government on technical aspects of legislation) and tasks that are elsewhere performed by governmental organizations or universities (namely, directing and funding research centers and institutes nationwide, and releasing an academic title that is crucial for professors' public accreditation).[9] This accumulation of tasks, together with its independence from the government, makes the HAS a remarkably powerful institution in the governance of Hungary's academic and scientific life, compared to its counterparts in other European countries. For instance, in Spain, research coordination is performed by an agency called *Consejo Superior de Investigaciones Científicas (CSIC)*, whose chief officers and a numerous Board members are chosen and appointed by the Government. Moreover, unlike the HAS, the Spanish CSIC does not have the power to release an academic degree crucial to obtaining full professor accreditations from ANECA, the national academic accreditation agency. Similarly

[9] In the course of an interview, the Vice President of Hungary's academic certification agency, Magyar Felsooktatasi Akkreditációs Bizottság (Hungarian Accreditation Committee, or HAC), reported to me that among candidates seeking the university professor accreditation, those who hold the *Doctor of the Academy* degree normally receive 100% of the points that the HAC is allowed to assign to research activity. The HAC Vice President also reported that, even though the law does not allow public universities to formally request the Doctor of the Academy degree as a pre-condition for obtaining a professor position, this degree often acts as an informal, *de facto* requirement, as nearly all full professors in Hungary's major public universities (Budapest ELTE and BME, Szeged, and Debrecen) are Doctors of the HAS. Indeed, most HAC members are themselves Doctors of the HAS.

to the Spanish case, and in contrast with the Hungarian case, research coordination is handled by public agencies subject to significant governmental supervision in other major European Union countries such as France and Italy.[10] In Germany, the main research coordination institution, the Max Planck Society, is more independent from public oversight than its Spanish, French or Italian counterparts, but it is less independent than the HAS, as governmental representatives sit in its supreme governing body.[11]

In light of the above, studying the functioning and performance of the HAS seems relevant and instructive for understanding the public governance of scientific research and academia in Europe more generally. In particular, since the organization of the HAS—based on self-governance, internal cooptation of members and officers, and independence from political oversight—is significantly different from that of the public agencies that coordinate and accredit research in much of Central and Western Europe, assessing the performance of the HAS's organizational model may inform public policy and reforms at the continental level.[12] The insights gained from analyzing the Hungarian model are all the more relevant if one considers that despite its relatively small size (the total population is around ten million), Hungary has a long and consistent history of academic and scholarly excellence, as testified by its 13 Nobel laureates—which place Hungary 17th in the inter-country ranking of Nobel Prizes per capita, and 14th in the ranking of Nobel Prizes per capita in Science (that is, excluding the Literature and Peace awards), above the European Union as a whole and just one per capita prize below the United States—and its 4 equivalent laureates in Mathematics (3 Wolf Prizes, 1 Abel Prize). Many of these laureates were, or are, members of the HAS.[13]

[10] In France, research coordination activities are primarily performed by the *Centre National de la Recherche Scientifique* (CNRS). In Italy, research coordination is assigned to the *Consiglio Nazionale delle Ricerche* (CNR). The chief officers and several Board members of these institutions are chosen and appointed by the government.

[11] More information on the structure and governance of the public agencies in charge of coordinating research across Europe can be found on the website of the European Science Foundation (www.esf.org), an international association federating these agencies.

[12] As discussed above, the HAS's current combination of functions and organizational structure was developed during Hungary's Communist period, and it is similar to that in other European countries that belonged to the Eastern Bloc, such as Slovakia and Bulgaria.

[13] Many Hungarian laureates were professors in foreign universities, mostly in the United States, at the time of the award, but most of them received their scientific education in Hungary.

2.3.2. Relation of the HAS to non-academic organizations

Another reason why the empirical study of the HAS conducted in this dissertation may have broad relevance is that some aspects of the HAS's organizational structure are shared by important public organizations outside the academic and scientific arena. In terms of the general theoretical discussion of public bureaucracies provided in the first chapter of this thesis, the HAS is characterized by a rather extreme form of delegation, as it is unconstrained both in the way it performs the tasks assigned to it by the law and in the way it selects and renews its members. The only direct constraints on the HAS are the few ones established by its constitutive law—for instance, on the number and age distribution of members.[14]

Important institutions, either public or performing public duties, are similarly organized in many European countries. For instance, in public universities the governing bodies are typically elected internally by faculty members, students and staff, rather than being appointed by public authorities.[15] The judiciary selects its members through examinations primarily conducted by sitting judges (Bagues and Perez 2012), and elects its own governing council, in major civil law countries such as Spain and Italy. Similarly, in those countries, the associations empowered by the law to regulate the access to liberal professions such as those of attorney, notary or auditor, autonomously select their members and governing bodies. While there are important differences between the HAS on one side, and public universities, the judiciary, and professional associations on the other—in terms of their functions as well as of their size—some of the insight from the empirical analysis of the HAS's organizational performance may usefully extend to those institutions.

[14] Of course, as in any public organization, the Parliament and the Government may indirectly influence the HAS by threatening to modify its constitutive law or its budget. Neither threat would be easy to carry though: changing the constitutive law would require to gather the necessary political consensus, which may be challenging due to the HAS's high reputation in the country, and as discussed before, the budget is based on a proposal formulated by the HAS.

[15] Unlike at the HAS, the selection of new members in European public universities is supervised and constrained by the law, either by requiring that new professors be pre-certified by public agencies like the Spanish ANECA, or that they be selected by an external committee following a publicly regulated formal procedure.

2.3.3. Relevance of the HAS as a means to test theories of public bureaucracies

Finally, given its organizational structure, the HAS seems an ideal setting to empirically assess some of the theoretical analyses of public bureaucracies reviewed in Chapter 1 of this dissertation. On one hand, as discussed above, the HAS combines specialization and expertise of its members in carrying their functions with an extraordinary degree of autonomy from governmental and political control, as reflected both by the loose ex ante constraints on its operation (the constitutive law) and the absence of ex post supervision mechanisms. This combination of expertise and loose control is inconsistent with Weber's (1921) emphasis on the need for detailed rules and procedures in the governance of public bureaucracies, whereas it is consistent with the tradeoff between expertise and authority posited by much of the recent literature.

At the same time, many of the organizational features of the HAS seem to configure an informal incentive system for its members, in the spirit of some of the Weberian principles and, above all, of the transaction cost analysis of public bureaucracies in Williamson (1999). In particular, as proposed by both Weber and Williamson, members of the HAS are tenured for life, are awarded a salary that guarantees them economic security and independence, and are defined and perceived by society as an elite group with high prestige and honor.[16] On the other hand, neither the compensation nor the career of HAS members is conditional on the achievement of explicitly defined performance objectives like those that are frequently used in private firms and organizations. The absence of clear performance incentives is particularly evident in the task of HAS members that is analyzed more closely in this thesis—namely, the selection of new members. In particular, since HAS members do not normally conduct their work, or otherwise interact on a systematic basis, within the Academy's premises, and they do not perform scholarly teamwork as HAS members, their incentives to select excellent and capable new members are not enhanced by a concern for improving pool of future HAS colleagues.

[16] In a poll conducted in 2007 by the Medián Public Poll and Market Research Institute to assess Hungarian citizens' trust in various institutions, and available at http://www.median.hu/object.e257fe7d-1311-4a7a-86d4-d3dbd6a3fd48.ivy, the HAS ranked first, ahead of political institutions as well as the Police, the Army, and the Catholic Church. Similarly, the HAS ranked first in polls conducted in 2009 and 2013 by the TÁRKI Social Research Institute as part of an empirical study on the social and cultural conditions of economic growth in Hungary. The TÁRKI polls are available at http://www.tarki.hu/en/publications/ESR/2009/index.html.

According to Williamson (1999), the combination of flat salaries, tenured employment and the award of a *quasi-aristocratic* status to employees, which may be lost following an egregious miscarriage of duties, may create efficient incentives in public bureaucracies, where measuring output, and hence relying on explicit performance-related incentives, is generally more difficult than in business firms.[17] Understanding how the HAS members operate and perform, given the HAS's hyper-decentralized and autonomous organizational structure and its lack of explicit incentives, may shed some light on whether this *Weberian-Williamsonian* theoretical model of public bureaucracy generates efficient or opportunistic behavior.

[17] In a similar vein, Weber (1921) insists on the fact that public bureaucrats should not perceive their office as a means to make money, or as the supply of labor services in exchange for compensation, but rather as a vocation.

Chapter 3. A Formal Model of Recruitment in Public Bureaucracies

3.1. Environment, definitions, and assumptions

In this section, I present a simple mathematical model of how motivation and opportunism determine the way recruiters in a public agency assess candidates. The model captures the most salient features of public bureaucracies modeled in the literature, and of the HAS in particular—namely, delegation of decision authority to the recruiter, the absence of output-based incentives, and the potential presence of implicit incentives due to intrinsic motivation, reputational concerns, and the like. As such, the model is a useful theoretical tool to guide the empirical analysis of the HAS's recruitment patterns, which is developed in Chapters 4 and 5 of this thesis.

Consider a representative recruiter, R, who must decide whether to select a candidate, C, as member of a public agency. While the model applies more generally, for the purposes of this dissertation I encourage readers to think of C as a scholar, and of R as a representative member of the HAS's scientific division for which C is being nominated. I assume R is rational and risk-neutral, so that in making his selection decision, he maximizes his expected payoff, conditional on C's observed characteristics. Consistent with the absence of explicit incentives for recruiters, I assume R receives from the public agency a fixed salary, which is high enough for R to be willing to work at the agency.

Formally, R's utility from working at the agency, net of the salary, is given by:

$$U \equiv \phi q + (1 - \phi)\pi + \eta \text{ if he selects C, and} \tag{3.1}$$

$$U_0 \equiv \eta_0 \text{ if he does not select C.} \tag{3.2}$$

The variable q denotes the contribution C may make to the public agency if selected, which I label *quality*. For instance, in the HAS case, q might be the long-term influence and prestige accruing to the HAS from C's scholarship. In contrast, π denotes the private benefit that selecting C may generate for R. Typically, π will be large if R and C have an implicit, self-enforcing agreement such that C will compensate R if elected, and the more so the greater C's potential ability to favor R. In the HAS context, this may be the case if outside the HAS, R and C are colleagues in a university where C has decision power or influence that he could use to favor R. Also, π may be large if selecting C benefits R directly. For instance, following the previous HAS-related example, π may be large if R and C are colleagues outside the HAS, so that R may want to make C a HAS member in order to boost

his university's reputation, irrespective of C's actual scientific quality. Both q and π are normally and independently distributed random variables with zero mean and unit variance.[18]

The variables η and η_0, which are also normally and independently distributed with zero mean and unit variance, denote R's satisfaction from working at the agency with or without a new member, respectively. I assume η and η_0 are independent on C's characteristics q and π, that is, they only depend on the size of the agency, not on its composition.

I assume R observes η and η_0, but does not observe C's realized quality, q, and the private benefit he could obtain by selecting C, π. Instead, R observes unbiased but noisy signals of q and π, denoted as $\tilde{q}$ and $\tilde{\pi}$, respectively, where:

$$\tilde{q} \equiv q + \varepsilon_q, \text{ and} \tag{3.3}$$

$$\tilde{\pi} \equiv \pi + \varepsilon_\pi. \tag{3.4}$$

Being an expert, R knows that the error terms in the two signals, ε_q and ε_π, are normally and independently distributed with zero mean and variances σ_q^2 and σ_π^2, respectively, so that the two signals' precisions are given by $h_q \equiv \frac{1}{\sigma_q^2}$ and $h_\pi \equiv \frac{1}{\sigma_\pi^2}$. To illustrate with the HAS example, one can think of $\tilde{q}$ as R's assessment of C's scientific quality resulting from his past publications or citations, while $\tilde{\pi}$ may reflect R's assessment of C's ability to favor him as resulting from his past relationship with C as a colleague or as a coauthor.

In studying R's selection decision, I assume that, consistent with the organizational structure of the HAS described in the previous chapter, the agency leaders delegate full recruitment authority to R. This implies that the agency commits to approve R's selection decision, whatever this is.[19] I also assume that the agency's utility, net of R's salary, is given by $q + \eta$ if C is recruited, and by η_0

[18] Assuming normality, zero mean and unit variance is not necessary for the model's results, but it greatly simplifies its notation and exposition.

[19] A number of theoretical models in the literature show that, under certain conditions, fully delegating decision authority to an informed *expert* is optimal from the organization's viewpoint. For instance, Aghion and Tirole (1997) show that delegation may optimally increase the expert's incentives to acquire information on the available productive decisions. Dessein (2002) shows that even when the agent can credibly communicate some of his information to superiors, full delegation is often more efficient than allowing the superiors to approve or reject the agent's recommendations.

otherwise.[20] Then, for given η and η_0, if R sought to pursue the agency's mission, he should select C if, and only if:

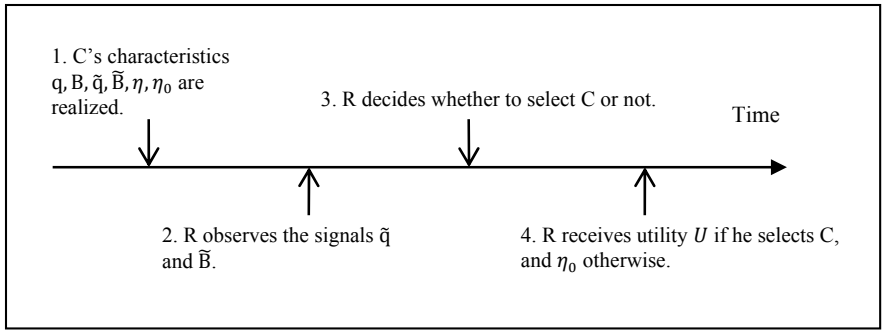
$$E[q|\tilde{q}] > \eta_0 - \eta. \tag{3.5}$$

Given the above assumptions on the agency's mission and organization, parameter $\phi \in [0,1]$ in R's utility function measures, in reduced form, the extent to which R's incentives are aligned with those of the agency. For instance, ϕ may be large if R is compelled to fulfill the agency's objectives by his own ethical norms (intrinsic motivation), or by the fear that if he does not pursue the agency's mission, he may lose status and reputation within his social or professional community.[21] When $\phi = 1$, R is fully motivated, whereas when $\phi = 0$, R is fully opportunistic.

The timing of the recruitment process, summarized in Figure 3.1, is as follows:

1. C's characteristics, q, $\tilde{q}$, π, and $\tilde{\pi}$, and the agency's characteristics, η and η_0, are realized.
2. R observes $\tilde{q}, \tilde{\pi}, \eta$ and η_0.
3. R decides whether to select C or not.
4. R receives utility U if he selects C, and utility U_0 otherwise.

Figure 3.1. Timeline of events



[20] Implicitly, I am assuming that the satisfaction of the agency's leaders from working with or without a new member is the same as R's satisfaction.

[21] Typically, this will be the case if the social status of R, conditional on acting in accordance with the agency's mission, is high, as implied in Weber's (1921) and Williamson's (1999) view of *civil service*, and if R does not discount future payoffs or their loss too heavily.

3.2. Analyzing the recruiter's selection decision

R selects C if, and only if his expected utility from doing so, conditional on the observed characteristics, is higher than the expected utility from not selecting C. Formally, R selects C if, and only if:

$E[U|\tilde{q},\tilde{\pi}] + \eta > \eta_0$, which given the independence of the two signals, can be rewritten as

$$\phi E[q|\tilde{q}] + (1-\phi)E[\pi|\tilde{\pi}] > \eta_0 - \eta. \quad (3.6)$$

Notice that unless $\phi = 1$, R's decision will be different from the agency's preferred decision implied by condition (3.5), as R will assign some weight to the private benefits he can obtain by recruiting C.

It follows from the normal learning model (DeGroot 1970), applied to (3.6), that:

$$E[q|\tilde{q}] = \frac{h_q\tilde{q}}{1+h_q}, \text{ and} \quad (3.7)$$

$$E[\pi|\tilde{\pi}] = \frac{h_\pi\tilde{\pi}}{1+h_\pi}. \quad (3.8)$$

Expressions (3.7) and (3.8) denote the two signals' contributions to R's assessment of C, and they have an intuitive interpretation: the higher a given signal's precision, the higher that signal's weight in R's assessment. Substituting from (3.7) and (3.8) above, we can rewrite the selection condition (3.6) as:

$$\frac{\phi h_q\tilde{q}}{1+h_q} + \frac{(1-\phi)h_\pi\tilde{\pi}}{1+h_\pi} > \eta_0 - \eta. \quad (3.9)$$

Since the purpose of this model is to guide the empirical analysis of the determinants of HAS elections, it is useful at this point to take the perspective of an econometrician who observes the two signals, $\tilde{q}$ and $\tilde{\pi}$, but does not observe any other characteristics of C (including η_0 and η), and given these informational restrictions, wants to study how changes in $\tilde{q}$ and $\tilde{\pi}$ and in their precisions, h_q and h_π, affect C's probability of being recruited by R.

Since η_0 and η are normally distributed with zero mean and unit variance, their difference, $\eta_0 - \eta$, is also normally distributed with zero mean and unit variance. Let $\Phi(\cdot)$ be the standard normal cumulative distribution function. Then,

from condition (3.9), the probability that R selects C, as assessed by the econometrician, can be written as:

$$p(\tilde{q}, \tilde{\pi}, h_q, h_\pi) \equiv Pr\left(\eta_0 - \eta < \frac{\phi h_q \tilde{q}}{1+h_q} + \frac{(1-\phi) h_\pi \tilde{\pi}}{1+h_\pi}\right) = \Phi\left(\frac{\phi h_q \tilde{q}}{1+h_q} + \frac{(1-\phi) h_\pi \tilde{\pi}}{1+h_\pi}\right). \quad (3.10)$$

3.3. Testable predictions on the Determinants of Recruitment Decisions

By differentiating condition (3.10) above, we obtain testable predictions on how R's choice depends on the observed signals, $\tilde{q}$ and $\tilde{\pi}$.

Proposition 1: The probability that recruiter R selects candidate C increases in the realized values of the quality signal $\tilde{q}$ and of the private benefit signal $\tilde{\pi}$.

Proof: In appendix.

Similarly, by differentiating (3.10), we obtain testable predictions on how R's choice depends on the precisions of the two signals, h_q and h_π.

Proposition 2: Conditional on recruiter R observing positive signals ($\tilde{q} > 0$, $\tilde{\pi} > 0$), the probability that R selects candidate C increases in the precision of the quality signal (parameter h_q), and in the precision of the private benefit signal (parameter h_π).

Proof: In appendix.

Intuitively, since R potentially cares both about C's quality and about private benefits, R's evaluation of C will be higher as R observes larger signals of these two variables, and as the observed signals become more precise.

Another interesting question that can be answered by using the model developed above is whether R will on average place more weight on C's quality signal or on the private benefit signal in making his selection decision. The proposition below shows that the answer to this question importantly depends on R's degree of opportunism—that is, on the extent to which R's interests are aligned (high levels of ϕ) or misaligned (low levels of ϕ) with those of the agency.

Proposition 3: Conditional on recruiter R observing positive signals ($\tilde{q} > 0$, $\tilde{\pi} > 0$), the probability that R selects candidate C increases more in the precision of the private benefit signal, h_π, than in the precision of the quality signal, h_q, if, and only if R is sufficiently opportunistic (that is, if ϕ is low enough).

Proof: In appendix.

The intuition behind Proposition 3 is simple. If the recruiter is motivated to fulfill the public agency's goals, he will primarily base his decision on quality-related information. On the other hand, if the recruiter is opportunistic, he will place little weight on quality-related information, and great weight on information that relates to the candidate's ability to generate private benefits for him. As we will see in the next chapter, Proposition 3 above is especially useful to test empirically for the presence of opportunism in the choices of HAS recruiters.

Appendix to Chapter 3: Mathematical proofs

Proposition 1: The probability that recruiter R selects candidate C increases in the realized values of the quality signal $\tilde{q}$ and of the private benefit signal $\tilde{\pi}$.

Proof: Recall that the probability of C being selected, given by condition (3.10), is

$$p(\tilde{q}, \tilde{\pi}, h_q, h_\pi) \equiv \Phi\left(\frac{\phi h_q \tilde{q}}{1+h_q} + \frac{(1-\phi)h_\pi \tilde{\pi}}{1+h_\pi}\right). \quad \text{(A1)}$$

Suppressing the argument of $\Phi(\cdot)$ for simplicity, the marginal effects of increases in h_q and h_π on the selection probability are then given by the following partial derivatives:

$$\frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial \tilde{q}} = \Phi'(\cdot)\frac{\phi h_q}{1+h_q}, \text{ and} \quad \text{(A2)}$$

$$\frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial \tilde{\pi}} = \Phi'(\cdot)\frac{(1-\phi)h_\pi}{1+h_\pi}. \quad \text{(A3)}$$

The expressions in (A2) and (A3) are both non-negative because the normal cumulative distribution function is monotonically increasing ($\Phi'(\cdot) > 0$), ϕ is non-negative, and the signals' precisions, h_q and h_π, are positive numbers.

Q.E.D.

Proposition 2: Conditional on recruiter R observing positive signals ($\tilde{q} > 0$, $\tilde{\pi} > 0$), the probability that R selects candidate C increases in the precision of the quality signal (parameter h_q), and in the precision of the private benefit signal (parameter h_π).

Proof: The marginal effects of increases in h_q and h_π on the selection probability are then given by the following partial derivatives:

$$\frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial h_q} = \Phi'(\cdot)\frac{\phi \tilde{q}}{(1+h_q)^2}, \text{ and} \quad \text{(A4)}$$

$$\frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial h_\pi} = \Phi'(\cdot)\frac{(1-\phi)\tilde{\pi}}{(1+h_\pi)^2}. \quad \text{(A5)}$$

Conditional on $\tilde{q} > 0$ and $\tilde{\pi} > 0$, the expressions in (A4) and (A5) are both non-negative because the normal cumulative distribution function is monotonically increasing ($\Phi'(\cdot) > 0$), ϕ is non-negative, and the signals' precisions, h_q and h_π, are positive numbers.

Q.E.D.

Proposition 3: Conditional on recruiter R observing positive signals ($\tilde{q} > 0$, $\tilde{\pi} > 0$), the probability that R selects candidate C increases more in the precision of the private benefit signal, h_π, than in the precision of the quality signal, h_q, if and only if R is sufficiently opportunistic (that is, if ϕ is low enough).

Proof: From (A4) and (A5), $\frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial h_\pi} > \frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial h_q}$ if, and only if:

$$\frac{(1-\phi)\tilde{\pi}}{(1+h_\pi)^2} > \frac{\phi\tilde{q}}{(1+h_q)^2}. \qquad \text{(A6)}$$

When $\phi = 0$, condition (A6) holds for all sets of parameters. When $\phi = 1$, condition (A6) does not hold for any set of parameters. Moreover, a marginal increase in ϕ reduces the left-hand side of (A6) while increasing the right-hand side, thereby making condition (A6) tighter. Hence, there must be a critical threshold $\underline{\phi}$ such that $\frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial h_\pi} > \frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial h_q}$ for $\phi < \underline{\phi}$, whereas $\frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial h_\pi} < \frac{\partial p(\tilde{q},\tilde{\pi},h_q,h_\pi)}{\partial h_q}$ for $\phi > \underline{\phi}$.

Q.E.D.

Chapter 4. The Determinants of Recruitment Practices at the Hungarian Academy of Sciences

4.1. Description of the database

I begin the empirical investigation of recruitment at the HAS by describing my dataset, with particular emphasis on how the relevant measures have been constructed.

As discussed in Chapter 2 the HAS consists of 11 scientific divisions. A scientific division is a unit of the HAS, and it reflects a branch of science that embraces related scientific fields. Members of the HAS divisions can be elected among Hungarian citizens who: 1) are distinguished scholars in their field, 2) hold a *Doctor of the Academy* degree or another equivalent scientific degree, and 3) are nominated by a minimum number of domestic HAS members[22]. While domestic HAS members can nominate candidates across scientific divisions, as we will see in a moment, they have the right to vote only in the election of candidates that belong to their own division. For instance, a HAS member belonging to the Medicine division can nominate candidates for the Biology division, but he/she cannot affect the election of Biology candidates. Nominations are published in the Fall preceding the election year by the journal *Magyar Tudomány* (Hungarian Science), and they are also posted on the HAS website (www.mta.hu).

In the election's first phase, HAS members in each scientific division pre-select nominees by casting a secret ballot for each one of them, with possible votes of "yes", "no", or "abstain." Nominees are then ranked based on the share of "yes" votes received. If two or more nominees receive exactly the same "yes" votes, then the one with the lowest share of "no" votes is ranked first. Only nominees who obtain a share of at least 50% "yes" votes in this pre-selection round can be elected as HAS members. The HAS Presidium then announces the maximum number of new members that can be assigned to each division (on average, two to three), after which a final vote of all the HAS members determines the candidates who are actually elected. While all HAS members participate to the final vote, there is an informal agreement whereby the ranking of candidates decided in the first phase by

[22] Detailed information on nomination requirements can be found in the HAS's bylaws (http://mta.hu/data/cikk/10/52/51/cikk_105251/Aggregate_Academy_Law_20120803.pdf, p. 13). The necessary number of nominations for membership and the number of nominations any one domestic member can make is determined by the Presidium before the nomination process starts. In the past three cycles the necessary number of nominations for corresponding membership has been set at three. Further detail can be found in the document of the Academy´s 184th General Assembly (http://mta.hu/data/MTA_tagjai/akademikusvalasztas_eljarasi_szabalyzata_vegl_2013.pdf).

the scientific divisions is not reversed by the plenum, so that new members are *de facto* elected by the scientific division for which they have been nominated.

My empirical analysis covers all the candidates nominated for HAS membership in 8 scientific divisions (Mathematics, Medicine, Engineering, Chemistry, Biology, Economics and Law, Earth Sciences, and Physics), and across four election cycles (2004, 2007, 2010, and 2013). Three scientific divisions (Linguistics and Literature, Phylosophy and History, and Agronomics) were excluded from the analysis because the bibliometric measures of scholarly output that I use to proxy for candidates' objective quality are either unavailable there (Linguistics and Literature, Philosophy and History) or, according to representative scholars I have interviewed, they are unreliable due to the high heterogeneity of publication and citation patterns across multiple subfields (Agronomics). This results in a total number of 476 candidate-year-division observations, which constitute the basis for my empirical analysis.

4.2. Description of the measures

4.2.1. Introduction

For the set of candidates described above, I have used data from heterogeneous sources to construct variables that can be grouped into three categories, depending on their intended use in the empirical analysis: 1) measures of a candidate's observed scientific quality (the $\tilde{q}$ signal in the model); 2) measures of a candidate's personal and professional connections with voting members of his HAS division (as we shall see in a moment, these may relate to both the quality signal, $\tilde{q}$, and the private benefit signal, $\tilde{\pi}$); and 3) measures of a candidate's other characteristics that may affect his election prospects, and hence can be used as control variables in regression analysis.

To choose the measures to be included in each category, I have used the related empirical literature as a guideline whenever possible. In addition, I have asked distinguished members of the HAS to confirm the validity of the chosen measures in my empirical setting. To this purpose, I have conducted in-depth individual interviews with at least 2 HAS members for seven of the eight scientific divisions included in this study, amounting to a total of 25 interviews. Since there are 264 HAS members in those divisions, my interviews cover about 10% of the relevant HAS membership.

I describe the chosen measures in the next paragraph, below. A detailed discussion of the methodology I have followed to construct these measures from my database is provided in section 4.3. Descriptive statistics and pairwise correlations for the variables used in the empirical analysis are shown in tables 4.1 and 4.2.

Table 4.1. Measures and descriptive statistics

Variable	Description	Mean	S.D.	Min.	Max.
$Election_{it}$	*Selection* = 1 if candidate *i* selected into the Academy in election cycle *t*; *Selection* = 0 if candidate not selected	0.19	0.39	0	1
$Citations_{it}$	Cumulative citations of candidate *i*'s articles in the Web of Science at the beginning of election cycle *t*	889.27	1307.3	0	13158
$Coauthors_{it}$	Total number of candidate *i*'s coauthors who are sitting in his selection committee in election cycle *t*	2.16	1.94	0	12
$Colleagues_{it}$	Total number of selection committee members in election cycle *t* who work in the same institution as candidate *i*	7.05	7.24	0	30
$D\text{-}Colleagues_{it}$	Total number of selection committee members in election cycle *t* who work in the same institution and department as candidate *i*	3.73	4.10	0	18
Age_{it}	Age of candidate *i* at the beginning of election cycle *t* (years)	57.01	6.69	38	83
$Times\text{-}Candidate_{it}$	Number of times candidate *i* has been nominated as a candidate before election cycle *t*	1.96	1.03	1	6
$Endorsers_{it}$	Total number of candidate *i*'s endorsers at the beginning of election cycle *t*	3.81	1.48	2	12
$Field\text{-}Endorsers_{it}$	Total number of candidate *i*'s endorsers at the beginning of election cycle *t* who belong to candidate *i*'s scientific field	1.93	1.43	0	6

Number of observations = 476.

4.2.2. Measures of scientific quality

As my baseline measure of candidates' observed quality, I use $Citations_{it}$, the total number of cumulative citations to publications of candidate *i* up to election year *t*. Cumulative citations are widely used in the literature as a measure of scientific quality (e.g., Hamermesh and Schmidt 2003; Combes et al. 2008; Zinovyeva and Bagues 2015; Azoulay et al. 2014). While some of the HAS members I have interviewed expressed skepticism on the validity of citations indicators, and even of bibliometric measures in general, most of them concurred in that bibliometric indices are overall an acceptable, if partial, measure of scientific achievement, and that if a bibliometric measure is to be used, the number of citations is probably the most appropriate one.

Table 4.2. Correlations table

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	*Election*	–											
2	*Citations*	0.10	–										
3	*Colleagues*	0.08	0.05	–									
4	*Coauthors*	0.04	0.14	0.12	–								
5	*Endorsers*	0.26	0.08	0.06	0.21	–							
6	*Age*	-0.15	-0.07	-0.07	-0.04	-0.06	–						
7	*Times-Candidate*	0.14	0.002	-0.009	0.02	0.28	0.29	–					
8	*Field-Endorsers*	0.23	0.08	0.04	0.16	0.47	-0.13	0.19	–				
9	*D-Colleagues*	0.14	0.02	0.60	0.15	0.15	-0.08	0.09	0.30	–			
10	*L-Citations*	-0.11	-0.35	-0.05	-0.09	-0.03	0.13	-0.10	-0.15	-0.02	–		
11	*H-Citations*	0.01	0.76	0.06	0.07	0.02	-0.05	-0.03	-0.04	0.01	-0.11	–	
12	*H-Index*	0.11	0.88	0.04	0.16	0.11	-0.10	0.04	0.13	0.04	-0.44	0.60	–

At the same time, some interviewees pointed out that since most candidates are distinguished scholars in their fields, marginal differences in their cumulative citations may be a noisy measure of quality differences, and hence may have a tenuous effect on the election outcomes. To take this consideration into account, I use as complementary measures of observed scientific quality *H-Citations*$_{it}$, a dummy for whether candidate *i* in year *t* is in the top 10% citation percentile, and *L-Citations*$_{it}$, a dummy for whether candidate *i* in year *t* is in the bottom 10% citation percentile.

In addition, some of the interviewed HAS members argued that because most candidates to the HAS membership are fairly established scholars with extensive publication records, it may be useful to use a measure of scientific achievement that takes both citations and publication volumes into account. Based on this recommendation, I also use *H-Index*$_{it}$, the h-index of candidate *i* in year *t*, as an alternative measure of scientific quality. The h-index is the highest number *x* of a scholar's publications such that each of those publications has at least *x* citations.

4.2.3. Measures of connections

Following Combes et al. (2008) and Zynovieva and Bagues (2015), I use as measures of connections *Coauthors*$_{it}$, the number of coauthors of candidate *i* who are voting members of his scientific division in election year *t*, and *Colleagues*$_{it}$, the number of voting members who work in the same institution as candidate *i* in election year *t*. As an additional, and related, measure of connections, I also use *D-Colleagues*$_{it}$, the number of voting members who work both in the same institution *and* in the same department as candidate *i* in election year *t*.

4.2.4. Control variables

As in previous empirical works (e.g., Hamermesh and Schmidt 2003; Combes *et al*. 2008; Zinovyeva and Bagues 2015), I include in my analysis the following candidate characteristics as control variables: *Endorsers*$_{it}$, the number of Academy members who are endorsing candidate *i* in election year *t*, *Field-Endorsers*$_{it}$, the number of Academy members from the same scientific field as candidate *i* who are endorsing him in election year *t*, *Times-Candidate*$_{it}$, the number of times *i* has been a candidate in election years prior to *t*, and *Age*$_{it}$, the age of candidate *i* in election year *t*.

According to the interviewed HAS members, controlling for the number of endorsers is relevant because candidates with many endorsers may be (or perceived by voting HAS members to be) more established within the scientific community

and hence they may stand higher chances to be elected. This is all the more likely if the endorsements come from scholars in the candidate's same research field. A similar reasoning applies to candidates who have been repeatedly up for election, and hence have managed to consistently mobilize endorsements despite their ultimate failure at the election ballot. Some of the interviewed HAS members also pointed out that within a given scientific division, candidates who receive more endorsements from their subfield of research stand higher chances of being elected, because voting members from other subfields interpret support from within the field, or lack thereof, as a signal of quality. Finally, the interviewees pointed out that controlling for age is important, because elderly scholars are less willing or less capable to invest effort in the more time-consuming activities performed by the HAS, such as coordinating research institutes or assigning the Doctor of the Academy degree, and this may lead voting members to prefer younger candidates, even at the cost of sacrificing the extra prestige that a more senior scholar may bring to the HAS. Moreover, younger scholars may have the additional advantage of being more acquainted with up-to-date techniques in fields, such as physics and chemistry, where research methodologies change at a fast pace.

4.3. Construction of the measures

4.3.1. Introduction

I have tracked the research life trajectory of candidates, endorsers, and voting members of the HAS from the time they obtained their Master degree until the year 2013, which is the most recent election cycle in my database. To identify candidates' relevant characteristics—namely, their institution and department affiliation and their research fields—I have relied on their CVs and biographic notes as published on the HAS website, as well as on targeted Google searches.

To measure citations, as well as to identify coauthorship between candidates and the HAS's voting members, I have collected publication records from the ISI Web of Science (hereafter, the WOS), which is the most widely used and credited international repository of bibliometric data, and from the Hungarian Scientific Bibliography (hereafter, the *Academy Database*)—a comprehensive national database of scientific publications and citations of Hungarian scientists maintained by the HAS.

An attractive feature of the Academy Database is that, unlike the WOS and other international databases, it employs a quality control system that

unambiguously links publications to authors by checking the validity of the uploaded publications. Unfortunately, the information reported in the Academy Database is incomplete because prior to 2007, candidates and HAS members were not obliged to upload their publications into the Academy Database. Properly reporting publications is in the interest of candidates irrespective of whether it is mandatory, and in fact, publication records as complete as those in the WOS are available for 95% of candidates in the four election cycles I analyze. However, publication records for HAS members, which are essential to assess their coauthorship relations with candidates, are far less complete, especially for those who have been members for more than 15 years. For these reasons, I have chosen to rely on the WOS citation data, using the Academy Database data, whenever possible, to check that the WOS citations are correctly attributed to authors, as explained below.

Before turning to the empirical analysis, I conclude this section by discussing in greater detail the procedures I have used to attribute affiliations, research subfields, and citations to scholars.

4.3.2. Assigning affiliations and research subfields to scholars

I have considered up to three institutional affiliations per scholar. I have restricted attention to institutions with extended periods of full-time affiliation, excluding short research stays. While a few scholars in the database have changed workplace over time, work mobility for scientists is overall quite limited, and as a consequence, most scholars have only one institutional affiliation. When constructing the *Colleagues* variable, I have summed up the members of a candidate's HAS scientific division who have the same affiliation as the candidate across all of the candidate's affiliations, counting each colleague only once. Formally, let candidate i be affiliated in any given year to M institutions, and let N_j be the set of i's colleagues from institution $j \in M$ who are members of the HAS's section for which i is a candidate. Then, i's total number of colleagues in the relevant year is given by:

$$Colleagues_i = \sum_{j \in M} \sum_{\substack{k \in N_j \\ k \notin N_{j-1}}} k.$$

Regarding research subfields, I have assigned them to each scholar based on the following procedure. First, I have assigned HAS members to subfields based on their HAS Scientific Committee affiliation as reported in the biographic notes on the HAS webpage. Scientific committees are groups within the HAS's scientific

divisions, which represent one or more subfields of science.[23] A minimum of one and a maximum of three committee affiliations are reported in the webpage. I have relied on the individual interviewees with HAS members to check whether my classification of subfields reflects scientific conventions, and I have adjusted the assignment of scholars to subfields based on their recommendations.

4.3.3. Assigning WOS citations to authors

Identifying publications in the WOS, and in publication databases more generally, is not an easy task. For each publication and author, the WOS provides information on the surname, on the first name's initial and, in some cases, on the middle names' initials. Problems with homonymity may thus arise in the quite frequent case of common surnames. In particular, as discussed by Azoulay *et al*. (2014), one should worry about *Type I* errors, whereby a scientist is erroneously classified as the author of a journal article actually written by a namesake, and T*ype II* errors, whereby legitimate articles are excluded from a scientist's publication list. These errors mainly arise because certain scholars' surnames are highly common, because scientists often use middle initials, as well as suffixes, inconsistently, and also, because multiple patronyms are sometimes used due to changes in marital status. In this study, I have addressed these concerns by relying on a fairly complex matching procedure, whose steps are summarized below.

First, I have used the WOS search engine to download references to all the publications under a given author's name. For authors whose first name has more than one letter (by far the majority), the WOS only allows to include in the search engine the initial letter of the first name, followed by a star. This procedure results in too many publications being attributed to the author under study, and therefore it requires some filtering. Let me illustrate the problem and the filtering with an example. For author "Kovacs Peter", the search was performed by issuing query "Kovacs P*" in the search engine. The resulting output was given by references to the articles published by all scholars whose surname is "Kovacs" and whose first name begins by "P". Ideally, one would want, at this point, to download each article and check whether the author's first name is "Peter". However, adopting this procedure for all authors would be prohibitively time-consuming given the high total volume of articles. Instead, as a first filtering, I have excluded from the

[23] Detailed information on Scientific Committees can be found in the HAS's bylaws (http://mta.hu/data/cikk/10/52/51/cikk_105251/Aggregate_Academy_Law_20120803.pdf, p. 44).

"Kovacs Peter" reference list all publications where the author's first name, as abbreviated in the reference returned by the WOS search engine, included the initial letter "P" followed by any letter other than "e". As a result, references where the author is abbreviated as "Kovacs P." were included in the list, but references where the author's name is abbreviated as "Kovacs Pa." were excluded.

As a second step, I have compared the titles of publications tentatively attributed to a given scholar based on the above procedure, with that scholar's publications as reported in the Academy Database, and I have excluded the publications that did not match from the list. Since the title of a given publication is sometimes reported with slightly different wording in the WOS and the Academy databases, I have assessed matching between titles by applying a correction procedure known as *fuzzy matching* or *approximate string matching*.[24] According to such procedure, I have computed the share of matching words in any pair of titles over the total number of words in the two titles, and I have considered titles that were 90 percent matching according to this criterion as referring to the same publication.

In the final step, I have downloaded from the list of WOS references attributed to an author, as filtered in the previous two steps, some additional, author-specific information provided by the WOS reference output—namely, the author's affiliation, WOS research field, and reported research address. I have then used this additional information to identify WOS publications that were not reported in the Academy Database, but whose referred author affiliation, address and research field, matched those in the scholar's list of references constructed in the previous steps.

4.3.4. Self-citations

My *Citations* variable includes all the citations to a scholar's WOS articles that appear in other WOS articles, including the focal scholar's ones—that is, the variable includes self-citations. While excluding self-citations may provide a better measure of a scholar's scientific contribution, it may also magnify the classification errors discussed above. Moreover, some studies have shown that self-citations do

[24] A brief explanation on fuzzy matching can be found here https://www.melissadata.com/deduplication/what-is-fuzzy-matching.htm and sample program coding can be found here https://pypi.python.org/pypi/fuzzywuzzy.

not significantly influence analyses based on bibliometric measures, provided that a large enough number of publications is explored (Glänzel 2003, p. 57).

As a partial robustness check, I have explored the correlation between total citations and independent citations (that is, total citations minus self-citations) in the Academy's public database, where the two citation counts are separately reported. The observed correlation is above 0.90. Based on these considerations and findings, I have decided to measure scholars' citations by the total number of WOS citations in my study, without attempting to correct for self-citations.

4.3.5. Validity of the WOS citation data

The WOS database includes over 10,000 high-impact, peer-refereed journals in Science, Engineering, Medicine, and Social Sciences, as well as international proceedings that cover over 100,000 conferences. While using the WOS database to construct measures of the objective quality of scholars seems reasonable given its selectivity, the WOS bibliometric indicators also suffer from a number of shortcomings, which members of the HAS have pointed out in the course of our interviews.

First, publication and citation trends, as well as coauthorship, vary sharply across fields (e.g., Economics vs. Management) and subfields (e.g., Industrial Organization vs. Development Economics, or Strategic Management vs. Operations Research). Second, a given scientist's research may span multiple subfields, each characterized by different publication and citation patterns. Finally, there are fields, such as Law and Earth Studies, where publications that are not listed in the WOS database, such as books with national or regional relevance, are considered important.

In the light of these considerations, one would ideally want to construct indices of publication quality that include local books and give the appropriate weight to each publication type (journal articles, books, and conference proceedings), depending on the scholar's field. This would require to augment the WOS data with citation databases that include local books and, most importantly, it would require to establish field-specific weights that may introduce some degree of subjectivity into the analysis. For these reasons, I have decided to rely on the unweighted WOS data in the analysis of election outcomes across all scientific divisions, which is the focus of this chapter. In Chapter 5, I complement the analysis conducted here by investigating how more customized citation data that have been suggested by the interviewed HAS members separately affect the analysis of election outcomes within each division.

4.4. Empirical strategy

4.4.1. Testable hypotheses

The dataset described in the previous section includes a widely used measure of the scientific output of academic scholars—namely, their cumulative number of citations at the time they are being considered for election into the HAS. In terms of my theoretical model, citations can be interpreted as an observable signal of a candidate's scientific quality. Proposition 1 in the model predicts that a recruiter who cares, at least partially, about candidates' quality is more willing to select a candidate the higher the observed signal of his quality. Based on this proposition, I formulate the following testable hypothesis.

> **Hypothesis 1**: *The probability that a nominated candidate is elected as a member of the HAS increases in his cumulative number of citations.*

Proposition 2 in the theoretical model also predicts that a candidate's probability of being selected should increase when the recruiter's signals of the candidate's quality, and of his ability to generate private benefits for the recruiter, become more precise. My dataset includes measures of the extent to which a candidate and his evaluators in the HAS are connected—in particular, whether they are coauthors or colleagues in the same institution or department. As discussed in the literature (Combes *et al*. 2008; Li 2012; Zinovyeva and Bagues 2015), high levels of connection may indicate that the evaluators are biased towards the candidate because of private and opportunistic reasons, that they have precise information about the candidate, or both. Thus, my model predicts that whichever their interpretation, connections should increase a candidate's probability of being elected into the HAS.

> **Hypothesis 2**: *The probability that a nominated candidate is elected as a member of the HAS increases in the number of that candidate's coauthors and colleagues who belong to the HAS at the time of the election.*

Evidence consistent with Hypothesis 2 would indicate that non-verifiable, *soft* characteristics of a candidate, and not only objective quality, affect his chances to be elected. However, such evidence would not be informative on which soft characteristics of a candidate—unobservable quality or his private value for the evaluator—matter more. From a governance viewpoint, this is an important issue, because if recruiters' choices can be attributed, at least in part, to bias and opportunism, it may be desirable to prevent them from voting on those candidates,

or to enact other reforms of the HAS organizational rules that reduce the discretion of recruiters.

To test for the presence of opportunism in the behavior of HAS recruiters despite the potentially ambiguous interpretation of connections, I exploit the different nature of the two types of academic connections measured in my database—namely, coauthorship and common workplace. Coauthors repeatedly interact and coordinate on scholarly and scientific matters that are relevant to their joint projects. As a result, coauthors are likely to develop a fairly precise opinion on each other's scientific quality and depth, research skills, and potential scholarly influence in their common fields. In contrast, the scientific interaction between colleagues is typically less frequent and direct than that between coauthors: even within the same academic department, colleagues may belong to different subfields or research groups, and hence they may have more limited chances to share and discuss the specifics of their research projects, or to question each other in seminars. At the same time, colleagues are more likely than coauthors to interact along non-scholarly dimensions such as university or departmental internal politics and recruitment decisions. Importantly, these non-scholarly dimensions of the relationship between colleagues can create the potential for exchanges of favors, or the expectation of such exchanges to occur in the future. For instance, one influential colleague may help another to be elected Department Chair, Dean or Rector, to have his preferred job market candidates hired, to be assigned desired courses to teach, or to get an expensive research project approved and funded by the organization. Moreover, as discussed before, a HAS member who benefits from his university's reputation may be more willing to elect a colleague from the same university as HAS member, irrespective of his quality, simply because being HAS member is a honor that positively affects the parent university's reputation.

In terms of my theoretical model, the above discussion suggests that a HAS member: 1) can less precisely assess the scientific quality of a colleague than that of a coauthor (that is, coauthorship implies a higher precision of the quality signal, h_q); 2) can more precisely assess the private benefits he may obtain from electing a colleague than those he may obtain from electing a coauthor (that is, coauthorship implies a lower precision of the private benefit signal, h_π); and 3) is more likely to obtain private benefits from electing a colleague than from electing a coauthor (that is, coauthorship implies a lower value of the private benefit signal, $\tilde{\pi}$). To derive testable hypotheses from these observations, it is convenient to formalize the analysis using the notation of the theoretical model from Chapter 3.

Let $A \in \{0,1\}$ be an indicator for whether recruiter R is a coauthor of candidate C (in which case $A = 1$), and let $W \in \{0,1\}$ be an indicator for whether R is a workplace colleague of C (in which case $W = 1$). Let Δ_q^A and Δ_q^W be the increases in h_q when R is C's coauthor or colleague, respectively. Let Δ_π^A and Δ_π^W be the increases in h_π when R is C's coauthor or colleague, respectively. Finally, let $\Delta_{\tilde{\pi}}^A$ and $\Delta_{\tilde{\pi}}^W$ be the increases in $\tilde{\pi}$ when R is C's coauthor or colleague, respectively. Observation 1) corresponds to assuming that $\Delta_q^A > \Delta_q^W > 0$. Observation 2) corresponds to assuming that $\Delta_\pi^W \geq \Delta_\pi^A > 0$. Finally, observation 3) corresponds to assuming that $\Delta_{\tilde{\pi}}^W > \Delta_{\tilde{\pi}}^A \geq 0$. Then, being C's colleague increases R's probability to select C more than being C's coauthor if, and only if:

$$p(W = 1) - p(W = 0) > p(A = 1) - p(A = 0),$$

where $p(\cdot)$ is the probability that C is selected, with the arguments from Chapter 3 dropped for notational simplicity. Substituting from condition (3.10) in Chapter 3, the above condition can be rewritten as:

$$\Phi'(\cdot)\left[\frac{\partial E[U|\tilde{q},\tilde{\pi}]}{\partial h_\pi}\Delta_\pi^W + \frac{\partial E[U|\tilde{q},\tilde{\pi}]}{\partial h_q}\Delta_q^W + \frac{\partial E[U|\tilde{q},\tilde{\pi}]}{\partial \tilde{\pi}}\Delta_{\tilde{\pi}}^W\right] > \Phi'(\cdot)\left[\frac{\partial E[U|\tilde{q},\tilde{\pi}]}{\partial h_\pi}\Delta_\pi^A + \frac{\partial E[U|\tilde{q},\tilde{\pi}]}{\partial h_q}\Delta_q^A\right],$$

or

$$\frac{\partial E[U|\tilde{q},\tilde{\pi}]}{\partial h_\pi}(\Delta_\pi^W - \Delta_\pi^A) + \frac{\partial E[U|\tilde{q},\tilde{\pi}]}{\partial \tilde{\pi}}\Delta_{\tilde{\pi}}^W > \frac{\partial E[U|\tilde{q},\tilde{\pi}]}{\partial h_q}\left(\Delta_q^A - \Delta_q^W\right).$$

Substituting the partial derivatives computed in the proofs of Propositions 1 and 2 (see the appendix to Chapter 3), the above condition can be further rewritten as:

$$\frac{(1-\phi)\tilde{\pi}[\Delta_\pi^W - \Delta_\pi^A + (1+h_\pi)\Delta_{\tilde{\pi}}^W]}{(1+h_\pi)^2} > \frac{\phi\tilde{q}[\Delta_q^A - \Delta_q^W]}{(1+h_q)^2}. \qquad (4.1)$$

Proposition 3, together with the assumptions that $\Delta_\pi^W \geq \Delta_\pi^A$, $\Delta_q^A > \Delta_q^W$ and $\Delta_{\tilde{\pi}}^W > 0$, implies that condition (4.1) above holds if, and only if R is sufficiently

opportunistic—that is, if ϕ is small enough. This observation allows me to formulate the following two testable hypotheses:

> **Hypothesis 3**: *Suppose the HAS recruiters are sufficiently opportunistic (low enough ϕ). Then, the probability that a nominated candidate is elected as member of the HAS increases more in his number of HAS colleagues than in his number of HAS coauthors.*

> **Hypothesis 4**: *Suppose the HAS recruiters are not too opportunistic (high enough ϕ). Then, the probability that a nominated candidate is elected as member of the HAS increases less in his number of HAS colleagues than in his number of HAS coauthors.*

Evidence consistent with Hypotheses 2 and 3—and hence inconsistent with Hypothesis 4—would indicate that, even though connections may increase both the HAS recruiters' ability to act opportunistically (a destructive effect) and their ability to assess candidates (a productive effect), at least part of the observed effect of connections on the HAS election outcomes should be attributed to recruiters' opportunism.[25]

4.4.2. Identification

To test the hypotheses discussed above, I alternatively estimate the following two regression equations:

$$Election_{it} = \alpha + \beta Citations_{it} + \gamma_1 Coauthors_{it} + \gamma_2 Colleagues_{it} + \boldsymbol{\psi}' \boldsymbol{Z}_{it} + u_{it}. \quad (4.2)$$

$$Election_{it} = \alpha + \beta Citations_{it} + \gamma_1 Coauthors_{it} + \gamma_2 D\text{-}Colleagues_{it} + \boldsymbol{\psi}' \boldsymbol{Z}_{it} + v_{it}. \quad (4.3)$$

The dependent variable, $Election_{it}$, is a dummy that takes value 1 if candidate *i* is elected as a HAS member in year *t*, and value zero if the candidate is not elected. $Citations_{it}$, the cumulative number of WOS citations received by candidate *i* up to election year *t*, is my measure of candidates' observable quality signal. Since different disciplines may exhibit different citation patterns, I normalize the citation count by subtracting from it the sample mean of the HAS's scientific

[25] See Bagues and Perez (2013) for a comprehensive model of the relationship between recruiters' similarity to candidates in terms of expertise and their evaluation of those candidates.

division to which the candidate is assigned, and dividing it by the standard deviation.

$Coauthors_{it}$, $Colleagues_{it}$ and $D\text{-}Colleagues_{it}$ are the measures of coauthorship and colleague relationships described in the previous sections of this chapter. I alternatively measure relationships between colleagues at the institution level (equation 4.1) and at the department level (equation 4.2) to account for the possibility that working in the same university may not imply significant personal interactions when the university is large. $\boldsymbol{Z}_{it}$ is the vector of the candidate's characteristics that are used as control variables—namely, the candidate's number of endorsers ($Endorsers_{it}$) and endorsers from the same field ($Field\text{-}Endorsers_{it}$), the cumulative number of times the candidate has been up for election in previous years ($Times\text{-}Candidate_{it}$), the candidate's age ($Age_{it}$), as well as fixed effects for the HAS's scientific division for which the candidate is nominated, and for the relevant election year. Finally, u_{it} and v_{it} are random error terms, which are assumed to be i.i.d. and normally distributed with zero mean, and α, β, γ_1, γ_2, and $\boldsymbol{\psi}$, are coefficients to be estimated. Notice that Hypotheses 1 and 2 predict $\beta > 0$, $\gamma_1 > 0$, and $\gamma_2 > 0$, Hypothesis 3 predicts $\gamma_2 > \gamma_1$, and Hypothesis 4 predicts $\gamma_1 > \gamma_2$.

One potential concern in estimating equations (4.1) and (4.2) is endogeneity. As in Combes *et al*. (2008), Hamermesh and Schmidt (2003), and other related studies—and unlike in Zinovyeva and Bagues (2015)—potential candidates and their endorsers know the identity of evaluators before nominations are advanced, which implies that evaluators are not randomly assigned to candidates. Moreover, even if candidates were nominated by their endorsers independently of the evaluators' identity, it could be that candidates of higher quality have higher-level academic connections, and hence are more likely to have coauthors and colleagues among the HAS members. If this were the case, the variables $Coauthors_{it}, Colleagues_{it}$ and $D\text{-}Colleagues_{it}$ might be correlated with the error terms in equations (4.1) and (4.2), leading to potentially inconsistent estimates of the coefficients of interest (Wooldridge 2010).

A priori, these potential endogeneity problems seem less severe in the HAS elections than in the public universities' examinations studied by Combes *et al*. (2008) and Zinovyeva and Bagues (2015). First, since HAS members are elected for life and few new members (on average, two to three) are added in each election cycle, a candidate in a given election year is likely to face a very similar pool of evaluators in the following election year, in case he, or his endorsers, decides to postpone the candidacy. This implies that nominations of candidates are unlikely to

change strategically across election years in response to marginal changes in the composition of the evaluators' pool. In contrast, in the public university examinations studied in the literature, evaluation committees can change drastically from one exam to another, either because they are randomly selected (Zinovyeva and Bagues 2015) or because they are selected by changing political figures, like education ministers (Combes *et al*. 2008). As a result, strategic nominations and candidacies are likely to arise in those contexts, unless the identity of evaluators is kept secret until the candidates are registered.

Second, while in public university examinations a substantial portion of candidates is composed by junior or non-famous senior scholars, all candidates to the membership of the HAS are distinguished scholars in their fields and within their age cohort. This implies that the status of candidates in the scientific community, and hence their unobserved quality, are unlikely to increase systematically in the numbers of HAS members to whom they are connected.

To test the above arguments empirically, I investigate below whether conditional on the characteristics used in (4.1) and (4.2) as controls, and on the scientific division and election cycle of reference, candidates' observable quality at the time of their nomination is systematically correlated with the number of colleagues and coauthors of those candidates in the HAS scientific division for which they are being considered. Since observable and unobservable dimensions of quality should be correlated, if candidates' nominations were orthogonal to the composition of their evaluators' pool, and if there were no systematic relationship between a candidate's connections with HAS members and his unobservable quality, then conditional on the controls, we should find observable quality to be uncorrelated with the evaluators' pool composition. In order to conduct this test, I estimate the following equations:

$$Citations_{it} = a + b_1 Coauthors_{it} + b_2 Colleagues_{it} + \boldsymbol{r}'\boldsymbol{Z}_{it} + \eta_{it}. \qquad (4.4)$$

$$Citations_{it} = a + b_1 Coauthors_{it} + b_2 D\text{-}Colleagues_{it} + \boldsymbol{r}'\boldsymbol{Z}_{it} + \theta_{it}. \quad (4.5)$$

$\boldsymbol{Z}_{it}$ is the vector of controls used in regressions (4.1) and (4.2), η_{it} and θ_{it} are normally distributed i.i.d. error terms with zero mean, and b_1, b_2 and $\boldsymbol{r}$ are coefficients to be estimated. I estimate equations (4.4) and (4.5) above by OLS, with the standard errors clustered at the candidate's scientific division level to control for division-specific shocks and for potential heteroskedasticity. The results are presented in Table 4.3.

Table 4.3. OLS estimates for the correlation between candidates' observable quality and connections, conditional on the control variables

Dependent variable = *Citations*	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Connections in Committee						
Colleagues	0.003	0.003	0.002			
	(0.003)	(0.004)	(0.005)			
D-Colleagues				-0.005	-0.004	-0.005
				(0.01)	(0.02)	(0.02)
Coauthors	0.06**	0.07**	0.04	0.06*	0.08**	0.04
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Control variables						
Endorsers	0.02	0.04	-0.02	0.02	0.04	-0.02
	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)	(0.04)
Field-Endorsers	0.02	0.02	0.04	0.02	0.02	0.05
	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.02)
Times-Candidate	-0.00	-0.001	-0.009	0.001	-0.001	-0.008
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Age	-0.009	-0.009	-0.01	-0.009	-0.01	-0.01
	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
Division fixed effects	N	Y	Y	N	Y	Y
Cycle fixed effects	N	N	Y	N	N	Y
Constant	0.20	0.23	1.00	0.26	0.31**	1.08
	(0.41)	(0.45)	(0.56)	(0.41)	(0.44)	(0.57)
F-Statistic	2.45**	1.33	4.14***	2.43**	1.33	4.14***
Adjusted R^2	0.02	0.009	0.09	0.01	0.008	0.09

Number of observations = 476. Standard errors, clustered by scientific division, in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Columns (1) and (4) of Table 4.3 estimate equations (4.4) and (4.5) without controlling for cycle and division fixed effects. The remaining columns introduce various combinations of such fixed effects as controls. A first, striking result is that objective quality, measured by cumulative citations, seems to be distributed across candidates independently of whether these have colleagues in the relevant HAS division: the estimated coefficients of *Colleagues* and *D-Colleagues* are nearly zero and statistically insignificant in all specifications.

On the other hand, there seems to be a mild positive correlation between candidates' objective quality and their number of coauthors in the HAS. When cycle fixed effects are not controlled for, a candidate whose number of coauthors in

the relevant HAS division is one standard deviation higher than another candidate's, has 0.11 more normalized citations, corresponding to 10% of a standard deviation. While statistically significant, this correlation is rather small in size. Once election cycle fixed effects are included in the regression, the correlation falls drastically: a candidate who has a one standard deviation advantage over another in terms of HAS coauthors has a citations advantage of only 5% of a standard deviation. Moreover, the correlation is no longer statistically significant at conventional confidence levels.[26]

While the above results cannot fully rule out that certain connections—namely, coauthorship with HAS members—are somewhat correlated with candidates' unobserved quality, and hence with the error terms in equations (4.1) and (4.2), they suggest that such correlation is unlikely to be large and that, consequently, my estimations of the coefficients in (4.1) and (4.2) should not be driven by endogeneity. Bearing this in mind, I now turn to the main object of my empirical analysis—that is, how candidates' observable quality signals and connections affect their chances of being elected as HAS members.

4.5. Empirical results

Tables 4.4, 4.5, and 4.6 present the determinants of candidates' election resulting from the estimation of equations (4.1) and (4.2) by OLS. Tables A1, A2 and A3 in the appendix to this chapter present the results from estimating (4.1) and (4.2) as Probit models—namely, the marginal effects of changes in the independent variables on a candidate's election probability, conditional on all the independent variables taking their sample mean values.

In discussing the results, I will primarily refer to the OLS estimates. The Probit coefficients are entirely consistent, both in sign and in magnitude, with the OLS ones. Like before, in both the OLS and Probit regressions, I cluster the standard errors at the scientific division level.

Consistent with Hypothesis 1, candidates who are more cited relative to the norm in their discipline are more likely to be elected as HAS members. Depending on whether and which fixed effects are included, and irrespective of whether equation (4.1) or (4.2) is estimated, a one standard deviation increase in citations, or

[26] Identical results, available upon request, are obtained if controls for candidate characteristics are omitted from the regressions.

a one standard deviation increase in the h-index, increases a candidate's probability of being elected by two to three percentage points, which corresponds to a ten to fifteen per cent variation over the sample mean. The effect of citations on the election probability does not seem to be especially driven by extremely good or poor citation records. As shown by Table 4.5, belonging to the group of the 10% most cited raises a candidate's chances to be elected by 2-3 percentage points, while belonging to the group of the 10% least cited reduces a candidate's chances by 6-7 percentage points. None of these effects is statistically significant at the conventional confidence levels.

Table 4.4. OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as HAS members

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Explanatory variables						
Citations	0.02 (0.02)	0.02 (0.02)	0.03 (0.02)	0.03 (0.02)	0.02 (0.02)	0.03 (0.02)
Colleagues	0.003* (0.001)	0.007*** (0.001)	0.006** (0.002)			
D-Colleagues				0.006 (0.005)	0.01*** (0.003)	0.01*** (0.003)
Coauthors	-0.007 (0.008)	-0.01* (0.008)	-0.01 (0.007)	-0.007 (0.008)	-0.01* (0.007)	-0.01 (0.007)
Control variables						
Endorsers	0.04*** (0.007)	0.05*** (0.007)	0.06*** (0.007)	0.04*** (0.007)	0.05*** (0.008)	0.06*** (0.008)
Field-Endorsers	0.03 (0.01)	0.04** (0.01)	0.03* (0.01)	0.04* (0.02)	0.03* (0.01)	0.03* (0.01)
Times-Candidate	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.04*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Age	-0.009*** (0.001)	-0.009*** (0.001)	-0.009*** (0.002)	-0.009*** (0.001)	-0.009*** (0.001)	-0.009*** (0.001)
Division fixed effects	N	Y	Y	N	Y	Y
Cycle fixed effects	N	N	Y	N	N	Y
Constant	0.40** (0.13)	0.25* (0.13)	0.19 (0.13)	0.40** (0.12)	0.30** (0.10)	0.22* (0.10)
F-Statistic	9.37***	6.11***	5.43***	9.38***	6.20***	5.51***
Adjusted R^2	0.11	0.13	0.13	0.11	0.13	0.14

Number of observations = 476. Standard errors, clustered by scientific division, in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Table 4.5. OLS estimates for the effect of candidates' extreme observable quality (citations) and connections with recruiters on their probability to be elected as HAS members

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Explanatory variables						
High-Citations	0.02 (0.05)	0.01 (0.05)	0.03 (0.05)	0.02 (0.05)	0.02 (0.05)	0.04 (0.05)
Low-Citations	-0.07 (0.04)	-0.06 (0.04)	-0.08 (0.04)	-0.07 (0.04)	-0.06 (0.04)	-0.08 (0.05)
Colleagues	0.003 (0.001)	0.007*** (0.001)	0.007** (0.002)			
D-Colleagues				0.006 (0.005)	0.01*** (0.003)	0.01*** (0.003)
Coauthors	-0.007 (0.008)	-0.01* (0.008)	-0.01 (0.008)	-0.007 (0.008)	-0.01* (0.007)	-0.01 (0.007)
Control variables						
Endorsers	0.04*** (0.007)	0.05*** (0.007)	0.06*** (0.007)	0.04*** (0.007)	0.05*** (0.007)	0.06*** (0.008)
Field-Endorsers	0.03 (0.01)	0.03** (0.01)	0.03* (0.01)	0.02 (0.01)	0.03* (0.01)	0.03* (0.01)
Times-Candidate	0.04** (0.01)	0.05*** (0.01)	0.05** (0.01)	0.04** (0.01)	0.05** (0.01)	0.05** (0.01)
Age	-0.009*** (0.001)	-0.009*** (0.001)	-0.009*** (0.002)	-0.009*** (0.001)	-0.009*** (0.001)	-0.009*** (0.001)
Division fixed effects	N	Y	Y	N	Y	Y
Cycle fixed effects	N	N	Y	N	N	Y
Constant	0.38** (0.12)	0.23* (0.11)	0.18 (0.12)	0.39** (0.11)	0.28** (0.09)	0.22* (0.09)
F-Statistic	8.07***	5.61***	5.01***	8.09***	5.67***	5.08***
Adjusted R^2	0.10	0.12	0.13	0.10	0.12	0.13

Number of observations = 476. Standard errors, clustered by scientific division, in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Also, consistent with Hypothesis 2, having more colleagues in the relevant HAS division increases a candidate's probability of being elected. In particular, a one standard deviation increase in the number of institution colleagues raises the election probability by 5 percentage points when fixed effects are included, corresponding to a 26% variation over the mean election probability. A one

standard deviation increase in the number of department colleagues sitting in the HAS raises a candidate's election probability by 4 percentage points, corresponding to a 21% variation over the sample mean.

Table 4.6. OLS estimates for the effect of candidates' observable quality (h-index) and connections with recruiters on their probability to be elected as HAS members

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Explanatory variables						
H-Index	0.02 (0.01)	0.02 (0.01)	0.03 (0.02)	0.02 (0.01)	0.02 (0.01)	0.03 (0.02)
Colleagues	0.003* (0.001)	0.007*** (0.001)	0.007** (0.002)			
D-Colleagues				0.006 (0.005)	0.01*** (0.003)	0.01*** (0.003)
Coauthors	-0.007 (0.008)	-0.01 (0.008)	-0.01 (0.007)	-0.007 (0.008)	-0.01* (0.007)	-0.01 (0.007)
Control variables						
Endorsers	0.04*** (0.007)	0.05*** (0.007)	0.06*** (0.007)	0.04*** (0.007)	0.05*** (0.008)	0.06*** (0.008)
Field-Endorsers	0.03 (0.01)	0.04** (0.01)	0.03* (0.01)	0.02 (0.01)	0.03* (0.01)	0.03 (0.01)
Times-Candidate	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.04*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Age	-0.009*** (0.002)	-0.009*** (0.001)	-0.009*** (0.002)	-0.009*** (0.001)	-0.009*** (0.001)	-0.009*** (0.001)
Division fixed effects	N	Y	Y	N	Y	Y
Cycle fixed effects	N	N	Y	N	N	Y
Constant	0.40** (0.13)	0.25 (0.13)	0.18 (0.14)	0.40** (0.12)	0.30** (0.10)	0.22 (0.11)
F-Statistic	9.28***	6.05***	5.40***	9.28***	6.12***	5.46***
Adjusted R^2	0.10	0.13	0.13	0.10	0.13	0.13

Number of observations = 476. Standard errors, clustered by scientific division, in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Interestingly, having colleagues in the HAS affects a candidate's chances of election substantially more than being a highly cited scholar, both economically and statistically—none of the citation coefficients is significant at the conventional

confidence thresholds, whereas the colleague coefficients are mostly significant, either at the 1% or 5% confidence levels.

In contrast to Hypothesis 2, having more coauthors in the HAS *does not* help a candidate to be elected—if anything, it reduces his chances. In most specifications, and irrespective of whether citations are measured through the citation count, the h-index or the extreme citation percentile dummies, a one standard deviation increase in the number of a candidate's HAS coauthors in the relevant division reduces his probability of being elected by almost 2 percentage points, corresponding to a 10% variation over the sample mean. However, this effect is generally not statistically significant.

The above results on the differential effect of having colleagues or coauthors in the HAS on the candidates' election probability are consistent with Hypothesis 3, and strikingly inconsistent with Hypothesis 4. The difference between the effect of a one standard deviation increase in a candidate's HAS colleagues and the effect of a one standard deviation increase in his coauthors on the election probability is about 7 percentage points when institution colleagues are considered, and 6 percentage points when department colleagues are considered, corresponding to 36% and 31% of the mean election probability, respectively.

These results are consistent with evaluators' opportunism playing a significant role in the election process. In other words, the empirical findings suggest that when voting on candidates, HAS members do not value what seems from a theoretical viewpoint the most informative source of soft information on their quality—namely, the existence of a coauthorship relation. Instead, HAS members seem to give substantial weight to a candidate being their colleague. As discussed before, while the relationship with a colleague is less informative on scientific quality than that with a coauthor, electing a colleague is more likely to generate direct or indirect private benefits for the recruiter. Moreover, it should be easier for a HAS member to assess a colleague's ability to provide private benefits and favors in the future, as the HAS member will be typically well informed on his colleague's status and role in the institution or department where they both work, and hence on the colleague's ability to affect the institution's policies to his benefit.

More broadly, the empirical results are consistent with the view of public agencies in the rational choice literature, according to which the cost of delegating decision authority to an agency's members is that they will use, at least in part, their discretion to pursue private goals, possibly at the expense of the agency's interests. Symmetrically, the results cast some doubts on the idea that implicit incentive mechanisms such as intrinsic motivation and reputational concerns are strong

enough to eradicate opportunism and turn public agents into efficient Weberian bureaucrats. This conclusion seems especially appropriate in the case of the HAS, where the social status and prestige of agency members, and hence the power of implicit incentives, should be at its highest.

Besides being theoretically interesting, the above results may also have policy implications. If the HAS aims to design election rules and procedures that are consistent with its goal of boosting academic excellence, the fact that its members tend to elect their own colleagues more than the candidates with higher objective quality, or whose scientific depth they are better positioned to evaluate, suggests that it may be worthwhile experimenting with a reformed election rule that prevents HAS members from voting on their colleagues in the first place.

The fact that having coauthors in the HAS not only does not increase, but even slightly reduces a candidate's chances of being elected, is somewhat surprising from a theoretical viewpoint. A possible explanation suggested by some of the HAS members I have interviewed, but which cannot be tested econometrically on my dataset, is that long-term coauthorship often generates competition and conflicts, especially when the coauthors are distinguished scholars and hence are less likely to compromise on divisive issues. While this explanation may be plausible, more investigation is definitely needed to fully elucidate the puzzle.

It is also instructive to briefly analyze the control variables. In all the specifications, being endorsed by a larger number of scholars increases a candidate's chances of being elected, and more so if the endorsers belong to the same research field as the candidate. If we focus (for the sake of brevity) on Table 4.4, a one standard deviation increase in the number of endorsers increases a candidate's election chances by a minimum of 6 and a maximum of 9 percentage points, depending on which fixed effects are controlled for. Moreover, holding the total number of endorsers constant, a one standard deviation increase in the number of endorsers from the candidate's same field increases his election chances by 4 to 5 percentage points. These results make sense: if a candidate has many endorsers that may indicate a strong consensus on his scholarly merits. Alternatively, a large number of endorsers may reflect the candidate's power and (possibly political) influence in his academic reference group, which may be valued, or feared, by his evaluators.

Having been an unsuccessful candidate in the past also significantly raises the probability of being elected in any given year: a one standard deviation increase in past nominations raises a candidate's chances of success by 5 percentage points.

Again, the persistence of nominators in proposing a candidate may reflect his high scientific quality, his *political* influence, or a mixture of the two.

The data also indicate that older candidates have a much lower probability of being elected as HAS members, compared to younger ones. A one standard deviation increase in a candidate's age reduces his chances of success by 6 to 7 percentage points, corresponding to 31% to 36% variations over the mean probability. The HAS members I have interviewed agree in that elderly scholars are less willing or less capable to invest time and effort in the more time-consuming activities performed by the organization, and this leads the HAS members to often prefer younger candidates, even at the cost of sacrificing the extra prestige that a more senior scholar may bring to the Academy. This argument is fully confirmed by the empirical results discussed above.

A final, general remark suggested by the above empirical results is that characteristics of candidates other than their objective quality play an overwhelmingly important role in determining their chances of being elected as HAS members. First, as we have seen, the objective quality measure *per excellence* in academia and science—citations—has a modest, albeit positive effect on the elections, compared to the less objective candidate characteristics that may be detected by connected evaluators or signaled by endorsers. Second, while the econometric models estimated here have predictive power (the F-statistic is highly significant across specifications), they leave a large portion of the variation in candidates' election probability unexplained (the highest R^2 among all specifications is 0.14).

These findings suggest that numerous factors other than the candidates' objective quality, or other easily measurable characteristics such as age, importantly affect their chances of success. Since the primary goal of the HAS, as specified in its bylaws and mission statement, is to select top scholars and scientists in a country that is not short of them, and given that academic institutions around the world emphasize objective citation and publication metrics as the proper way to measure scientific quality, these results are puzzling.

One possible explanation for the observed patterns is that the evaluators' opportunism and private networking dominate the election process, relegating the assessment of candidates' quality to a marginal role. If this is the case, improvements may be obtained by modifying the HAS election rules and its internal control systems to control and des-incentivize opportunism. Another possible explanation is that citations and other standardized bibliometric indicators are not appropriate measures of candidate quality in all scientific fields, and therefore they

are rightly disregarded by some of the HAS evaluators. In the next chapter, I will attempt to shed some light on this second explanation by separately examining the determinants of the HAS elections within each scientific division.

Appendix to Chapter 4: Probit Estimates

Table 4.A.1. Probit estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as HAS members

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Explanatory variables						
Citations	0.02 (0.02)	0.02 (0.02)	0.03* (0.02)	0.02 (0.02)	0.03 (0.02)	0.03* (0.02)
Colleagues	0.003** (0.001)	0.008*** (0.002)	0.009*** (0.002)			
D-Colleagues				0.006 (0.005)	0.01*** (0.003)	0.01*** (0.003)
Coauthors	-0.006 (0.008)	-0.01* (0.007)	-0.01 (0.006)	-0.007 (0.008)	-0.01** (0.006)	-0.01* (0.006)
Control variables						
Endorsers	0.30*** (0.007)	0.04*** (0.008)	0.04*** (0.007)	0.03*** (0.008)	0.04*** (0.008)	0.04*** (0.008)
Field-Endorsers	0.03* (0.01)	0.04** (0.01)	0.04** (0.01)	0.02 (0.01)	0.03*** (0.01)	0.03** (0.01)
Times-Candidate	0.05*** (0.01)	0.06*** (0.01)	0.06*** (0.01)	0.05*** (0.01)	0.06*** (0.01)	0.06*** (0.01)
Age	-0.01*** (0.001)	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.001)	-0.01*** (0.001)	-0.01*** (0.001)
Division fixed effects	N	Y	Y	N	Y	Y
Cycle fixed effects	N	N	Y	N	N	Y
χ^2	58.44***	80.20***	86.18***	58.39***	80.44***	86.11***
Pseudo R^2	0.12	0.17	0.18	0.12	0.17	0.18

Number of observations = 476. Marginal effects evaluated at the mean values of the independent variables. Standard errors, clustered by scientific division, in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Table 4.A.2. Probit estimates for the effect of candidates' extreme observable quality (citations in top and bottom 10%) and connections with recruiters on their probability to be elected as HAS members

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Explanatory variables						
High-Citations	0.008 (0.04)	0.008 (0.04)	0.02 (0.04)	0.01 (0.04)	0.01 (0.05)	0.02 (0.04)
Low-Citations	-0.12 (0.10)	-0.15* (0.09)	-0.19** (0.09)	-0.13 (0.09)	-0.15 (0.09)	-0.19** (0.09)
Colleagues	0.003* (0.001)	0.009*** (0.002)	0.009*** (0.002)			
D-Colleagues				0.006 (0.004)	0.01*** (0.003)	0.01*** (0.003)
Coauthors	-0.005 (0.008)	-0.01** (0.006)	-0.01* (0.006)	-0.006 (0.008)	-0.01** (0.006)	-0.01** (0.006)
Control variables						
Endorsers	0.03*** (0.007)	0.04*** (0.007)	0.04*** (0.007)	0.03*** (0.008)	0.04*** (0.007)	0.05*** (0.007)
Field-Endorsers	0.03* (0.01)	0.03*** (0.01)	0.03** (0.01)	0.02 (0.01)	0.03*** (0.01)	0.03** (0.01)
Times-Candidate	0.04*** (0.01)	0.06*** (0.01)	0.05*** (0.01)	0.04*** (0.01)	0.05** (0.01)	0.05*** (0.01)
Age	-0.01*** (0.001)	-0.01*** (0.001)	-0.01*** (0.001)	-0.01*** (0.001)	-0.01*** (0.001)	-0.01*** (0.001)
Division fixed effects	N	Y	Y	N	Y	Y
Cycle fixed effects	N	N	Y	N	N	Y
χ^2	58.97***	81.61***	88.47***	59.16***	81.63***	88.08***
Pseudo R^2	0.12	0.17	0.18	0.12	0.17	0.18

Number of observations = 476. Marginal effects evaluated at the mean values of the independent variables. Standard errors, clustered by scientific division, in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Table 4.A.3. Probit estimates for the effect of candidates' observable quality (h-index) and connections with recruiters on their probability to be elected as HAS members

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Explanatory variables						
H-Index	0.02 (0.01)	0.02 (0.01)	0.03** (0.01)	0.02 (0.01)	0.02 (0.01)	0.04* (0.02)
Colleagues	0.003** (0.001)	0.009*** (0.002)	0.009** (0.002)			
D-Colleagues				0.005 (0.004)	0.01*** (0.003)	0.01*** (0.003)
Coauthors	-0.006 (0.008)	-0.01* (0.007)	-0.01 (0.006)	-0.007 (0.008)	-0.01** (0.006)	-0.01* (0.006)
Control variables						
Endorsers	0.03*** (0.007)	0.04*** (0.007)	0.04*** (0.007)	0.03*** (0.008)	0.04*** (0.007)	0.05*** (0.007)
Field-Endorsers	0.03* (0.01)	0.04*** (0.01)	0.03** (0.01)	0.02 (0.01)	0.03*** (0.01)	0.03** (0.01)
Times-Candidate	0.05*** (0.01)	0.06*** (0.01)	0.06*** (0.01)	0.05*** (0.01)	0.06*** (0.01)	0.06*** (0.01)
Age	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.001)	-0.01*** (0.002)	-0.01*** (0.002)
Division fixed effects	N	Y	Y	N	Y	Y
Cycle fixed effects	N	N	Y	N	N	Y
χ^2	58.25***	79.86***	86.35***	58.21***	80.01***	86.15***
Pseudo R^2	0.12	0.17	0.18	0.12	0.17	0.18

Number of observations = 476. Marginal effects evaluated at the mean values of the independent variables. Standard errors, clustered by scientific division, in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Chapter 5. Determinants of Recruitment Decisions at the Scientific Division Levels

5.1. Defining division-specific measures

5.1.1. Why customize?

In the previous chapter I have investigated the determinants of the HAS elections by treating each candidate in each year as an observation. A clear advantage of this approach is that it allows the empirical analysis to rest on a larger number of observations, and to include fixed effects that account for division-level and year-level idiosyncrasies in the election process. At the same time, the approach followed in Chapter 4 cannot shed light on what these idiosyncrasies are. Echoing this limitation, in some scientific divisions, interviewed HAS members and expert scholars have argued that because of important division-specific publication patterns and other specificities, customized measures for observed scientific quality and control variables may be introduced at the division level.

5.1.2. Weighting citations by subfield and coauthors

First of all, some HAS members argued that citation practices differ across subfields within the same scientific division, so a citation index normalized by subfield may better capture a candidate's scientific achievement. Unfortunately, the HAS members also agreed that normalization may introduce a subjective element into the empirical analysis, and as such, they were unable to provide clear recommendations as to what normalization practices should be used. To nevertheless construct subfield-normalized, division-specific citation indexes, I have taken advantage of the fact that candidates to the HAS membership are required to hold a *Doctor of the HAS* degree. One of the requirements to apply for this degree is to have a minimum number of citations. All the scientific divisions in my study, except for Mathematics, Physics, and Economics and Law, provide separate definitions of the minimum mandatory number of citations for each of the division's subfields. I interpret a large minimum citation requirement as an indicator that the subfield in question has a high-citation practice, and vice versa. Accordingly, I have constructed a weighted citation count, $W\text{-}Citations_{it}$, whereby the citations of candidate i in year t are divided by the minimum citation requirement in his subfield.[27]

[27] For candidates with multiple subfields, the citation count was divided by the average minimum requirement across those subfields.

Members of the Physical Sciences HAS division also pointed out that it is not uncommon for journal articles in Physics to have extraordinarily high numbers of coauthors, sometimes in the order of multiple hundreds. This practice is primarily due to the fact that scientific research in Physics often involves labor-intensive laboratory work. To account for the fact that citations to papers with significantly different numbers of coauthors may not have the same value as signals of the authors' scholarly excellence, the interviewed HAS members recommended to weigh citations to an article by the number of coauthors.

Accordingly, I have created a fractionalized citation index for the Physics division, $F\text{-}Citations_{it}$, which is given by the number of cumulative citations of candidate i in year t, multiplied by the coauthorship weights used to assign the Doctor of the HAS degree in Physics. According to the Doctor of the HAS rules, citations to articles with 1-5 coauthors are weighted 100%. Citations to articles with 6-10 coauthors are weighted 75%. Citations to articles with 11-20 coauthors are weighted 50%. Citations to articles with 21-100 coauthors are weighted 25%. Finally, citations to articles with over 100 coauthors are given zero weight. To illustrate, the fractionalized citations index computed according to these weights implies that for an article with 21 coauthors that has been cited 80 times, a candidate is attributed 80*0.25 = 20 citations instead of 80 citations.[28]

5.1.3. Accounting for the differential value of journal articles as a quality indicator across divisions

A member of the Chemical Sciences scientific division pointed out that in chemistry, in addition to journal articles, patents are also considered important indicators of scientific achievement. I have therefore constructed a patents indicator for the chemistry division, $Patents_{it}$, which is given by the citations to all the patents registered by candidate i up to year t. I consider citations to patents rather than the mere patent count, because highly cited patents are typically the more successful ones in terms of licensing, industrial use, and revenue creation.

Members of the Engineering scientific division suggested that their members generally belong to three broad areas—civil, mechanical, and electrical engineering—and that citations may be less relevant as a measure of quality in civil engineering, given the greater importance of professional practice, relative to

[28] More detailed information on these weights can be found at http://mta.hu/.

scientific scholarship, in that field. Accordingly, I have included in the engineering division's regressions an indicator for whether the candidate is a civil engineer, and interaction terms between the civil engineering indicator and the candidate's citation measures (namely, total citations, normalized citations, and the h-index).

Finally, members of the Earth Sciences division pointed out that in their research fields, and particularly in geography, publications in international outlets are limited, and national or even regional books may be considered important indicators of scientific achievement. Hence, I have included in the Earth Sciences division's regressions an augmented citation measure that also includes those books. Since national and regional books are not indexed by the WOS, this augmented measure has been constructed using the Academy Database described in section 4.3.

5.2. Empirical results

I now turn to investigate whether within each of the 8 scientific divisions included in my database, the customized quality measures suggested by HAS members and described above perform better than the *one-size-fits-all* measures used in Chapter 4 to estimate the determinants of election outcomes.

First, I present for each division a table that compares the predictive power of the one-size-fits-all measures with that of the customized measures. For the divisions where no customized measures have been suggested, I simply present the regression with the one-size-fits-all measures estimated at the division level. This allows one to assess to what extent the econometric model used in Chapter 4 for all the divisions together is a good predictor of election outcomes in division in question.

After presenting the division-specific econometric results, I compare them to the pooled results from Chapter 4, and I draw some general conclusions.

5.2.1. Mathematics division

In Mathematics, the only customization that was suggested by the interviewed HAS members was to normalize citations by subfields. However, the minimum citation requirements are not disaggregated at the subfield level in the Mathematics division. Since I had no objective and consistent basis to construct a subfield-normalized citation index, I simply report in Table 5.1 the results of regressing candidates' election probabilities on the one-size-fits-all measures used in Chapter

4, as an assessment of how accurately my general econometric model predicts the Mathematics division's outcomes.

Table 5.1. Division-specific analysis—OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as members of the HAS Mathematics division

Dependent variable = *Election*	**(1)**	**(2)**
Explanatory variables		
Citations	-0.06 (0.05)	-0.06 (0.05)
Colleagues	0.01 (0.01)	
D-Colleagues		0.01 (0.01)
Coauthors	0.01 (0.03)	0.01 (0.03)
Control variables		
Endorsers	0.07*** (0.02)	0.07*** (0.02)
Times-Candidate	0.04 (0.04)	0.04 (0.04)
Age	-0.005 (0.007)	-0.005 (0.007)
Constant	-0.13 (0.43)	-0.13 (0.43)
F-Statistic	3.54***	3.54***
Adjusted R^2	0.21	0.21

Number of observations = 58. Standard errors in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

The results suggest that neither cumulative citations, nor having colleagues or coauthors among the evaluators, significantly affect a candidate's chances to be elected as a member of the HAS Mathematics division.

The only variable from the general econometric model that seems to have a substantial impact on elections in the Mathematics division is the candidates' number of endorsers: a one standard deviation increase in this variable raises the chances of election by 16 percentage points, nearly 100% of the mean election

probability. This may indicate that in Mathematics, endorsers coordinate quite well on the preferred candidates, so that the number of endorsements is a good predictor of the election's outcome. Consistent with that, the number of endorsers has a much higher variance and range of variation (given by the difference between the maximum and the minimum) in the Mathematics division than in all the other HAS divisions, suggesting that endorsers are quite careful in differentiating among candidates. Of course, one cannot tell from this finding whether the endorsers in Mathematics coordinate on candidates of higher unobservable quality, or simply, well organized groups of endorsers collude on their preferred candidates. However, the high prestige and awards records exhibited by members of the HAS Mathematics division, suggests that coordination on quality may be a more plausible explanation for the observed effect of endorsements on election outcomes.

5.2.2. Physics division

Like in Mathematics, no subfield-normalized citations index is available in Physics. Columns (1) and (2) in Table 5.2 report the results of regressing candidates' election probabilities on the one-size-fits-all explanatory variables. In columns (3) and (4), the number of citations is replaced by the fractionalized citation index weighted by the number of coauthors, which was recommended by the interviewed HAS members as a more appropriate measure of the value of citations in Physics.

The results suggest that in the Physics division, not only citations and connections are not significantly correlated with the election outcomes, but more generally, none of the variables from the general model used in Chapter 4 has predictive power. Moreover, and despite the interviewees' conjecture, the correlation between candidates' citations and their election probability does not significantly increase after correcting for the number of coauthors.

5.2.3. Engineering division

Columns (1) and (2) in Table 5.3 report the results of regressing candidates' election probabilities on the one-size-fits-all explanatory variables. In columns (3) and (4), the number of citations is replaced by the citation index normalized by subfields. In addition, the indicator variable for civil engineer candidates, and its interaction with the citation index, are both included as additional explanatory variables.

Table 5.2. Division-specific analysis—OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as members of the HAS Physics division

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**
Explanatory variables				
Citations	-0.002 (0.07)	0.02 (0.07)		
F-Citations			0.01 (0.07)	0.02 (0.07)
Colleagues	0.001 (0.02)		0.000 (0.02)	
D-Colleagues		0.03 (0.02)		0.03 (0.02)
Coauthors	-0.05 (0.06)	-0.08 (0.05)	-0.05 (0.06)	-0.08 (0.05)
Control variables				
Endorsers	0.08 (0.05)	0.07 (0.05)	0.08 (0.06)	0.07 (0.05)
Times-Candidate	0.01 (0.07)	0.002 (0.07)	0.02 (0.07)	0.002 (0.07)
Age	-0.01 (0.01)	-0.008 (0.01)	-0.01 (0.01)	-0.007 (0.01)
Constant	0.54 (0.60)	0.44 (0.57)	0.56 (0.60)	0.41 (0.57)
F-Statistic	0.64	0.96	0.65	0.96
Adjusted R^2	-0.05	-0.006	-0.05	-0.005

Number of observations = 44. Standard errors in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

The results suggest that consistent with the general econometric model from Chapter 4, in the Engineering division candidates who have many colleagues among their evaluators stand greater chances to be elected as HAS members. A one standard deviation increase in the number of workplace colleagues sitting in the HAS engineering division raises a candidate's chances by 7 percentage points, or 57% of the mean election probability. In contrast with the results from the general model, there is no significant correlation in the engineering division between the number of a candidate's *department* colleagues and his probability of being elected.

Table 5.3. Division-specific analysis—OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as members of the HAS Engineering division

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**
Explanatory variables				
Citations	0.03 (0.03)	0.03 (0.03)		
N-Citations			0.04 (0.04)	0.05 (0.04)
Colleagues	0.006* (0.003)		0.005* (0.03)	
D-Colleagues		0.007 (0.01)		0.005 (0.01)
Coauthors	-0.05 (0.03)	-0.03 (0.03)	-0.04 (0.03)	-0.03 (0.03)
Control variables				
Endorsers	0.05 (0.04)	0.07 (0.04)	0.05 (0.04)	0.06 (0.04)
Times-Candidate	0.06 (0.04)	0.05 (0.04)	0.06 (0.04)	0.05 (0.04)
Age	-0.006 (0.006)	-0.007 (0.006)	-0.006 (0.006)	-0.007 (0.006)
Civil Engineer			0.28 (0.28)	0.34 (0.29)
*Civil Engineer*Citations*			0.36 (0.50)	0.44 (0.51)
Constant	0.18 (0.42)	0.26 (0.43)	0.16 (0.42)	0.23 (0.43)
F-Statistic	2.82**	2.15*	2.28**	1.89*
Adjusted R^2	0.12	0.08	0.11	0.08

Number of observations = 79. Standard errors in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Once again consistently with the general model, neither citations nor having coauthors among the evaluators seem correlated with the election outcomes in the engineering division.

Finally, and in contrast with what suggested by the interviewed HAS members, the effect of citations does not increase when these are normalized by citation patterns in different subfields, and it does not decrease for candidates in the civil engineering subfield.

5.2.4. Chemistry division

Columns (1) and (2) in Table 5.4 report the results of regressing candidates' election probabilities on the one-size-fits-all explanatory variables. In columns (3) and (4), the number of citations is replaced by the citation index normalized by subfields. In addition, the index of patent citations is included as an additional explanatory variable.

The results suggest that, consistent with the divisions analyzed so far and with the results in the general model, citations and coauthorship with the evaluators do not increase a candidate's election chances in the Chemistry division, whereas having colleagues among the evaluators, and above all, having many endorsers and having been a candidate in the past, all positively affect the probability of election. To illustrate, a one standard deviation increase in the number of a candidate's workplace colleagues sitting in the HAS raises his chances by 11 percentage points, or 46% of the mean election probability. A one standard deviation increase in the number of endorsers and in the past candidacies raises the election chances by 13 percentage points (51% of the mean) and 15 percentage points (58% of the mean), respectively.

As in the other divisions, the customizations suggested by the HAS members do not seem to improve our ability to predict the election outcomes in Chemistry. In particular, neither normalizing the citations by subfields nor including patents in the citation count significantly increase the correlation between a candidate's observed scientific quality and his/her probability of being elected as a member of the Chemistry division. One possible reason for the low explanatory power of patents in the Chemistry division is that I did not have access to patents' revenues, which may be a more accurate indicator of the patents' impact than their citations.

Table 5.4. Division-specific analysis—OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as members of the HAS Chemistry division

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**
Explanatory variables				
Citations	-0.007 (0.06)	-0.01 (0.06)		
N-Citations			0.04 (0.06)	
P-Citations				-0.001 (0.06)
Colleagues	0.02 (0.01)		0.03* (0.01)	0.02 (0.01)
D-Colleagues		0.02 (0.01)		
Coauthors	0.01 (0.02)	0.01 (0.02)	0.009 (0.02)	0.01 (0.02)
Control variables				
Endorsers	0.12** (0.06)	0.13** (0.06)	0.13** (0.05)	0.12** (0.06)
Times-Candidate	0.17*** (0.07)	0.16** (0.07)	0.16** (0.06)	0.17** (0.07)
Age	-0.007 (0.01)	-0.004 (0.01)	-0.007 (0.01)	-0.007 (0.01)
Constant	-0.31 (0.63)	-0.44 (0.63)	-0.31 (0.62)	-0.31 (0.63)
F-Statistic	2.80**	2.54**	2.80**	2.80**
Adjusted R^2	0.18	0.16	0.18	0.18

Number of observations = 48. Standard errors in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

5.2.5. Biology division

Columns (1) and (2) in Table 5.5 report the results of regressing candidates' election probabilities on the one-size-fits-all explanatory variables. In columns (3) and (4), the number of citations is replaced by the citation index normalized by subfields.

Table 5.5. Division-specific analysis—OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as members of the HAS Biology division

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**
Explanatory variables				
Citations	0.15*** (0.03)	0.16*** (0.03)		
N-Citations			0.14*** (0.03)	0.14*** (0.03)
Colleagues	0.02 (0.01)		0.01 (0.01)	
D-Colleagues		0.03** (0.01)		0.03** (0.01)
Coauthors	-0.02 (0.02)	-0.008 (0.02)	-0.02 (0.02)	-0.01 (0.02)
Control variables				
Endorsers	0.04 (0.03)	0.04 (0.03)	0.04 (0.03)	0.04 (0.03)
Times-Candidate	0.06 (0.04)	0.07* (0.04)	0.06 (0.04)	0.07 (0.04)
Age	-0.01** (0.006)	-0.01** (0.006)	-0.01** (0.006)	-0.01** (0.006)
Constant	0.79** (0.38)	0.67* (0.37)	0.79** (0.38)	0.68* (0.37)
F-Statistic	6.12***	7.30***	5.70***	6.65***
Adjusted R^2	0.28	0.32	0.26	0.30

Number of observations = 78. Standard errors in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Compared to the other HAS divisions analyzed so far, the Biology division is noteworthy under two respects. First, it is the only one where a candidate's citation record significantly enhances his chances of being elected as a HAS member. A one standard deviation increase in cumulative citations increases the election probability by 16 percentage points, nearly a 100% increase over the mean. The effect remains strong, though slightly smaller in scale, if the citation count is normalized to account for different citation patterns across subfields. In fact, a comparison of the correlation between citations and the election outcomes in Biology and in the other

divisions suggests that the mild positive correlation estimated for the general model is essentially driven by the Biology division, which is one of the ones with the highest number of candidates across the four election cycles in my database.

The second noteworthy feature of the Biology division is that it is the one where the general econometric model from Chapter 4 has by far the greatest predictive power. In particular, in addition to citations, a candidate's election probability is significantly increased by the number of his department colleagues sitting in the HAS and by the number of times he has been a candidate in the past, whereas it is decreased by the candidate's age. Overall, the general model explains about 30% of the variation in election outcomes in the Biology division.

5.2.6. Medicine division

Columns (1) and (2) in Table 5.6 report the results of regressing candidates' election probabilities on the one-size-fits-all explanatory variables. In columns (3) and (4), the number of citations is replaced by the citation index normalized by subfields.

As in the case of the Physics division, the standard model appears to have no predictive power in the Medicine division, as the election chances of candidates are uncorrelated with their citations (absolute or normalized by subfield), with their connections with the evaluators (number of colleagues and coauthors), and with the control variables (number of endorsers, age, and number of past candidacies).

5.2.7. Earth Sciences division

Columns (1) and (2) in Table 5.7 report the results of regressing candidates' election probabilities on the one-size-fits-all explanatory variables. In columns (3) and (4), the number of citations is replaced by a citation index that includes citations to books and is normalized by subfields.

In the Earth Sciences division, consistently with the general model, a candidate's number of endorsers positively affects his election chances, whereas his age decreases those chances. In particular, a one standard deviation increase in the number of endorsers increases the probability of election by 18 percentage points, or 90% of the mean, whereas a one standard deviation increase in a candidate's age decreases his election chances by 8 percentage points, or 41% of the mean.

On the other hand, the general model's main explanatory variables—citations and connections—do not seem to have much predictive power in the Earth Sciences division. If anything, having more colleagues among the evaluators decreases a

candidate's election probability, rather than increasing it. For instance, a one standard deviation increase in the number of HAS department colleagues reduces the election probability by 12 percentage points, or 64% of the mean.

Table 5.6. Division-specific analysis—OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as members of the HAS Medicine division

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**
Explanatory variables				
Citations	0.03 (0.04)	0.03 (0.04)		
N-Citations			-0.007 (0.04)	-0.005 (0.04)
Colleagues	0.008 (0.009)		0.008 (0.009)	
D-Colleagues		0.05 (0.06)		0.05 (0.06)
Coauthors	0.000 (0.02)	0.002 (0.02)	0.005 (0.02)	0.005 (0.02)
Control variables				
Endorsers	0.05 (0.03)	0.05 (0.03)	0.05 (0.03)	0.05 (0.03)
Times-Candidate	-0.008 (0.05)	-0.003 (0.05)	-0.005 (0.05)	-0.000 (0.05)
Age	-0.009 (0.008)	-0.01 (0.008)	-0.01 (0.008)	-0.01 (0.008)
Constant	0.49 (0.51)	0.52 (0.51)	0.51 (0.51)	0.52 (0.51)
F-Statistic	0.96	0.92	0.85	0.86
Adjusted R^2	-0.003	-0.007	-0.01	-0.01

Number of observations = 69. Standard errors in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

Table 5.7. Division-specific analysis—OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as members of the HAS Earth Sciences division

Dependent variable = *Election*	**(1)**	**(2)**	**(3)**	**(4)**
Explanatory variables				
Citations	-0.02 (0.06)	-0.03 (0.06)		
N-Citations			-0.03 (0.06)	0.03 (0.06)
Colleagues	-0.10 (0.06)		-0.10 (0.06)	
D-Colleagues		-0.12* (0.06)		-0.12 (0.06)
Coauthors	-0.02 (0.03)	-0.03 (0.03)	-0.02 (0.03)	-0.03 (0.03)
Control variables				
Endorsers	0.21** (0.09)	0.23** (0.09)	0.22** (0.09)	0.23** (0.09)
Times-Candidate	0.10 (0.07)	0.11 (0.07)	0.10 (0.07)	0.11 (0.07)
Age	-0.01 (0.008)	-0.01* (0.008)	-0.01 (0.008)	-0.01* (0.008)
Constant	0.30 (0.59)	0.41 (0.58)	0.30 (0.58)	0.41 (0.58)
F-Statistic	2.45**	2.80**	2.47**	2.81**
Adjusted R^2	0.17	0.20	0.17	0.20

Number of observations = 43. Standard errors in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

5.2.8. Economics and Law division

For this division no customizations of the standard model were implemented resulting from the difficulty to find a customization that would suit highly different fields of study (including sociology, law, and political science). Nevertheless, as for Mathematics, I report in Table 5.8 the results of regressing candidates' election probabilities on the one-size-fits-all measures used in estimating the general model, as an assessment of how accurately these variables predict the Economics and Law division's outcomes.

As in Physics and Medicine, the standard model seems to have no predictive power in the Economics and Law division: the election chances of candidates are uncorrelated with their citations, with their connections with the evaluators (number of colleagues and coauthors), and with the control variables (number of endorsers, age, and number of past candidacies).

Table 5.8. Division-specific analysis—OLS estimates for the effect of candidates' observable quality (citations) and connections with recruiters on their probability to be elected as members of the HAS Economics and Law division

Dependent variable = *Election*	**(1)**	**(2)**
Explanatory variables		
Citations	-0.03 (0.05)	-0.02 (0.05)
Colleagues	0.01 (0.02)	
D-Colleagues		0.000 (0.02)
Coauthors	-0.06 (0.07)	-0.05 (0.07)
Control variables		
Endorsers	0.07 (0.05)	0.07 (0.05)
Times-Candidate	0.04 (0.06)	0.04 (0.06)
Age	-0.006 (0.01)	-0.006 (0.01)
Constant	0.26 (0.58)	0.28 (0.58)
F-Statistic	0.48	0.48
Adjusted R^2	-0.05	-0.05

Number of observations = 57. Standard errors in parentheses. *** significant at 1% confidence level; ** significant at 5% confidence level; * significant at 10% confidence level.

5.3. Patterns in the Division-Level Regressions

Overall, the division-level regressions presented in this chapter reveal a number of patterns, which I discuss in some more detail below.

5.3.1. The weak effect of candidates' citations on the election outcomes

First, the cumulative WOS citations of candidates have a positive and significant effect on their probability to be elected as HAS members only in one scientific division out of eight—namely, the Biology division. This is consistent with the overall weak effect of citations on the election outcomes observed in Chapter 4. However, the division-level regressions also suggest that the mild positive correlation between citations and election probabilities observed in Chapter 4 may be driven by the isolated strong effect of citations in the Biology division. This seems more decidedly inconsistent with Hypothesis 1 as derived from the theoretical model, and it calls for further investigation to uncover the empirical puzzle.

One potential explanation is that the various HAS divisions differ in terms of their scientific quality, and also in terms of their leadership's willingness to boost quality and/or their trust in bibliometric quality indicators. If that were the case, it could be that in divisions with very high scientific quality and prestige, such as Mathematics, candidates are homogeneously good, so that marginal differences in citations do not reflect quality differences, and hence do not affect their chances to be elected. In less prestigious divisions one would expect more variance in candidates' quality, and hence potentially a positive effect of citations on election probabilities. However, it is possible that in lower-quality divisions whose leaders are not interested in, or even opposed to, raising the division's scientific profile, selected candidates would not be those with the best qualifications, but rather those who have better relationships with the sitting members.

Clearly, none of the above hypotheses can be tested using the database employed here, so further data need to be collected, and additional research conducted, to explore their explanatory power. This is an exciting agenda that I aim to pursue in future empirical work.

5.3.2. The role of connections

Having colleagues among the evaluators has a positive effect on candidates' election chances in all but one scientific division, and the effect is economically and statistically significant in 3 of those divisions. This result is consistent with the

general result from Chapter 4. If one interprets increases in the number of a candidate's colleagues among the HAS members as an increase in both the candidate's ability to privately benefit his evaluators and in the evaluators' ability to assess the candidate's qualifications, the observed pattern is also consistent with Hypotheses 1 and 2 from the theoretical model.

At the same time, the division-specific regressions reveal that having coauthors among the evaluators is negatively correlated with candidates' election chances in 5 out 8 divisions, and that the correlation is nowhere significant. If one interprets an increase in a candidate's coauthors among the HAS members as an increase in the evaluators' ability to assess his qualification, this result is inconsistent with Hypothesis 2. As discussed before, this inconsistency is puzzling and should be further investigated. On the other hand, the fact that a significant and positive difference between the effect of having colleagues and coauthors among the evaluators on the election probabilities is observed in most divisions is consistent with Hypothesis 4, and inconsistent with Hypothesis 3, confirming that the evaluators' opportunistic pursuit of private benefits does play a role in their recruitment choices.

5.3.3. Division-specific idiosyncrasies

The observed cross-divisional differences in the effects of certain variables on the election outcomes—for instance, the stronger effect of citations in Biology, or the stronger effect of candidates' endorsements in Mathematics—suggest that the elections are affected by division-specific idiosyncrasies. This is consistent with the significance of the divisional fixed effects in the general regressions from Chapter 4.

However, another message that emerges from analyzing the division-specific regressions, is that these idiosyncrasies are not easy to measure. In particular, it is striking that none of the division-specific, customized measures of scientific quality suggested by the interviewed HAS members improves the explanatory power of the general econometric model, despite the interviewees' presumably in-depth knowledge of their divisions. This suggests that division-specific idiosyncrasies should be further investigated, as a better understanding of what lies beneath them would provide valuable information on how to tailor the HAS electoral rules to divisional specificities and thus make the organization's overall governance more efficient.

Conclusion

IN this dissertation, I have investigated the functioning of recruitment processes in public organizations, with particular emphasis on the interplay between recruiters' loyalty to the organizational mission and their temptation to opportunistically select their own preferred candidates. To tackle this topic, I have developed a simple formal model of recruitment in public agencies and I have tested its predictions on a database of membership renewal elections to the Hungarian Academy of Sciences, a public and independent organization that coordinates and finances most of Hungary's scientific research activity, and plays an important role in crediting the scientific quality of prospective university professors. The organizational structure of the Academy—similarly to, but more so than, many other public organizations—delegates considerable decision authority to recruiters and grants them a civil-servant-like status characterized by tenured employment and low-powered explicit incentives. Thus, the Academy can be seen as a useful paradigm to explore the functioning of recruitment in public agencies more generally.

My theoretical model predicts that both positive observable signals of scientific quality and connections with recruiters should facilitate a candidate's election, and that among connected candidates, opportunistic recruiters will favor those who can procure them private benefits. Consistent with these predictions, I have shown that members of the Hungarian Academy of Sciences are more likely to elect highly cited candidates and candidates who are their colleagues outside the Academy, and that among candidates connected to sitting Academy members, those who are their colleagues outside the Academy—and thus can more easily return favors via their influence on the common parent organization—stand a significantly greater chance to be elected than those who are the academicians' coauthors. This finding seems consistent with connections being more a means for recruiters to extract private benefits than a means to evaluate unobservable dimensions of candidates' quality. While my empirical setting and strategy is different, these results confirm recent evidence on the recruitment and accreditation of public universities' professors (Combes *et al.* 2008; Zinovyeva and Bagues 2015).

While pointing at the presence of opportunism in the behavior of public agencies' recruiters, the empirical results presented in this dissertation also highlight a puzzle, and leave a few open questions, which should be further investigated in future research on this topic. First, the observed positive correlation between candidates' citations and their chances to be elected as members of the Hungarian Academy of Sciences is mild, statistically insignificant, and apparently

driven by one single scientific division of the Academy—namely, Biology. One possible explanation for this puzzle, informally discussed in Chapter 5 of this thesis, is that citations are relevant for the election outcomes only in those divisions and fields where there is substantial variability in the quality of candidates—presumably those with a stronger reputation for scientific excellence. Another, possibly complementary explanation is that, irrespective of their true value as a measure of scientific quality, candidates' citations and other bibliometric indexes count for election only in units where there is a sufficiently strong consensus among members on their validity and reliability as a measure. One way to test these potential explanation for the empirical puzzle uncovered here would be to construct measures for the HAS divisions' reputation for research quality—for instance, by collecting recent data on their ability to obtain research grants from the European Union. One would expect that, if the informal explanation discussed in Chapter 5, and suggested by interviewed Academy members, is correct, citations should positively affect a candidate's election chances only in divisions of sufficiently high quality. While this information was not available to the present study, collecting it in the future seems potentially feasible.

Regarding the open research questions, it should be reiterated that this dissertation studies recruiters' behavior—and the role of opportunism therein—under a fixed organizational structure characterized by high delegation of authority and low-powered incentives. The main finding is that, consistent with much of the theoretical literature in both economics and public policy (e.g. Epstein and O'Halloran 1994; Aghion and Tirole 1997; Dessein 2002), some degree of opportunism is the *price* of delegation and low-powered incentives. While relevant, this empirical exercise and finding does not inform on whether the organizational structure of the organization under study is efficient or not (in a *second best* sense). Can recruiters' opportunism be reduced without compromising recruitment quality and the Academy's overall value added? And if yes, should opportunism be reduced by constraining the discretion of recruiters via ex ante procedural rules or by providing them with more explicit incentives? To address these important questions, it would be necessary to compare the behavior of recruiters in the Academy and in other public scientific organizations with similar mission but different organizational rules. Alternatively, one could compare the behavior of Academy members before and after changes in the organization's governance structure. One potential strategy to perform a comparative study along these lines would be to focus on a different function of the Hungarian Academy of Sciences—that of releasing a Doctor of the Academy degree that serves as an important step in

the accreditation of public universities' professors. It is not uncommon that professors who work in one country but are citizens of another and hope to eventually return there, or who have appointments in two different countries, seek accreditation in both. As we have seen in Chapter 2, the organizational structure of the Hungarian Academy of Sciences differs from that of other organizations involved in academic accreditation across Europe, most notably in its degree of autonomy and isolation from ex post governmental scrutiny, but also in terms of the prestige and status of its members. Hence, observed differences in the accreditation chances of the same candidates in Hungary and elsewhere may be attributed to changes in the organizational rules that regulate recruiters' behavior and incentives. Again, this seems a difficult, but by no means impossible, and potentially important empirical exercise that may be attempted in future research.

Finally, this dissertation has deliberately focused on the voting behavior of the Academy's members, abstracting from another important step in the organization's election process—namely, the nomination of candidates. An important question there would be whether being nominated by certain, more influential Academy members, plays a major and special role in favoring their election. Another important question would be whether nominators behave strategically in order to favor their preferred candidates—for instance, by appropriately choosing the timing of nominations—and whether they manage, in the process, to communicate valuable information relevant for their colleagues' voting decision, as emphasized by the *cheap talk* literature on the internal organization of firms (e.g., Crawford and Sobel 1982; Dessein 2002; Gibbons and Roberts 2013). These important research questions may be addressed in the future by collecting comprehensive data on candidates' nominators and relating their characteristics to election outcomes.

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