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The Demand for Science Funding

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Abstract

In the current funding environment, academic scientists face choices in seeking external funding for their research from either government or foundation sources. We elicit scientists' preferences between foundation and government funders over a number of dimensions related to the process of applying for, and using the grants requested, as well as in regard to possible implications for their research careers. Our analysis centered on three issues: researchers' grant experiences, researchers' perceptions of government and foundation funding bodies, and an experiment in which we randomly assigned respondents to make choices between potential research sponsors, under three scenarios which each had varied expected success rates. We provide evidence on the possible trade-offs made by scientists, and their responsiveness to changes in the availability of government funding.

The Demand for Science Funding

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I. Introduction

Scientific research requires funding. Over and above day to day operations, conducting any research project requires money to collect data, provide training stipends for graduate students, and pay for specialized equipment and materials. Such research funding is essential to advancing science. The responsibility to raise funds rests with the individual scientist or principal investigator, and involves competition by writing grant applications to different funding sources, such as government, industry, or foundations. Each of these sources has their own priorities and objectives, which affect the determination of which projects are worthy of support. Considerations of science funding typically focus on the supply of money from the various funding sources. These funding sources are typically studied in isolation, except for considerations of the degree of complementarity between sources (Lanahan, Graddy-Reed, and Feldman 2016).

Less is known about scientists' perceptions of different funding sources. There is a view that scientists are focused on securing funding from any available sources as they, "try to keep [the] lab going at the same level any way possible" (Grant, 2015, p. 71). This leads to a perception that science funding is completely interchangeable – all money is equally green. However, a larger literature finds that government funding results in more exploratory and fundamental science, while industry funds more applied research with applications closer to the market (Lee 1996; Nelson 2001; Verspagen 2006). Receiving funding from certain sources is perceived to carry greater prestige and to signal quality that can affect a scientist's career. Individual scientists are likely to have preferences that match their attributes—and the attributes of their research projects—to different funding sources and, in turn, affect behavior in terms of applying for, and creating demand for, funding.

In this paper, we map the demand for science funding in terms of scientists' preferences for different funding sources. We elicit scientists' preferences in relation to the process of applying for the grant, and post-award experience. We also ask about the possible implications of receiving funding from different funders on scientists' careers. We find that scientists view funding sources differently, based on important dimensions—in other words, not all money is seen as equally green. Our work considers the perceptions of different funding sources by individual scientists, and the trade-offs that they would make with a decrease in the probability of obtaining government funding. We report on an experiment that examines the possible trade-offs as perceived by the scientists. Moreover, the experiment is designed to mimic the effects of recent changes in government funding.

Our study is based in Denmark, where large foundations provide a viable funding alternative for scientists in the Science, Technology, Engineering, Mathematics, and Medicine (STEMM) fields.[1] These foundations accounted for about $1,400 million USD of grants to academic research in 2012-14, compared to $600 million USD from the Danish Council for Independent Research (DFF), the main government funder. Grants from foundations have increased: Novo Nordisk Foundation, for example, has increased its funding five-fold from 2014 to 2017. Over that same time period, government research funding decreased by about 30 per cent. In contrast to other countries, where foundations play a less significant role as competitive funders, Danish foundations offer a viable alternative to government or public research funding. In 2017, we administered an on-line survey to the whole population of Danish academic scientists (response rate of 38 per cent). This study focuses on a representative sample of 3,114 researchers in STEMM fields.

Our results establish significant differences in researchers' perceptions between government and foundation funding. Perception of the funding sources vary significantly by discipline and by researcher characteristics. Our experiment finds that changing a researcher's expected success rate with the government funder leads to significant changes in her choice of funder. Symmetric responses to changes in government funding, within an empirically relevant range of between 8 and 18 per cent success rates, indicate an elastic trade-off between government and foundation sources of science funding. An interesting aspect of our investigation relates the possible presence of compositional effects in our experiment. Overall, we find evidence of statistically significant treatment heterogeneity between different groups of scientists. Specifically, we find differences related to academic rank with untenured researchers being more sensitive to a government cutback than tenured ones. Also, the most productive scientists seem willing to stay with the public funder when facing a moderate decrease in the expected success rate, while they disproportionately move towards the private funder at the lowest expected success rate.

[1] We will use the term "foundation" irrespective of its actual legal status as a private industrial foundation, a public-benefit foundation, a non-profit medical charity or an association. These funders are distinct from industry funders, who have different motives and offer different trade-offs that are not the focus on this study.

The paper is laid out as follows: Section II discusses the general literature on the role of different types and sources of science funding. Section III narrows in on the funding of curiosity-driven research by government and foundations taking a supplier's perspective. Section IV proposes a framework to analyze the demand for science funding from the perspective of an individual researcher. Section V lays out the Danish research funding landscape. Section VI explains the methodology we have used for the survey and the experiment. Section VII reports two sets of results: The researchers' perceptions of benefits and costs associated with government and foundation funding, and the impact of cutbacks or increases in government funding on researchers' choice of funder. Section VIII concludes the paper.

II. The Color of Money

Most developed countries are characterised by a dual funding system for academic scientists, with varying degrees of importance of one type of funding compared to the other. The first type of funding source researchers can access is *recurrent funding*. Recurrent funding is provided by the academic institution with which the researcher is affiliated; in most cases, this consists of the scientist's salary, office and laboratory space, ICT infrastructure, and some provision of funds for basic equipment, materials, and technical staff. This funding is provided as a condition of employment. The second source is *external funding,* which refers to discretionary resources provided by external entities, such as public research councils, private companies, foundations or non-profits. This external funding is usually allocated through competitive grants or contracts. Recurrent funding is usually insufficient, and in many countries has decreased or become less generous, thus scientists are expected to finance specific research projects by seeking external funding.

Since the 1945 publishing of Vannevar Bush's *Science: The Endless Frontier,* research conducted in academic institutions has been the prime example of patronage, with the government providing the large majority of funding for academic research. The underlying assumption is that basic discoveries are needed to foster innovation and development, but will be underfunded by private firms because of inherent uncertainty and public good nature. However, government budgets for science are shrinking around the globe, while costs of research are rising, leading academic scientists to need to find alternative funding sources. Research contracts, either from industry or public entities, are usually linked to specific objectives designed by the funder, with pre-designated outcomes. Competitive grant funding is curiosity-driven and scientists can freely propose projects. Scholars have extensively analysed issues related to: industry funding of academic research (Perkmann et al. 2013), government agency contracts, and academic consulting projects. Government grant funding of the more fundamental curiosity-driven research projects, such as those from national Research Councils, is also well studied. The importance of philanthropic funding for fundamental researcher-proposed projects remains less explored, perhaps due in part to the relatively small amount of this funding in many countries where the philanthropic model is evolving (Feldman and Graddy-Reed 2014). There is limited knowledge about how government and foundation sources of discretionary funding for fundamental curiosity-driven research interact with one another—either from the perspective of the supply of funding for such projects, or from the demand-perspective of the individual scientist. We consider each in turn.

III. The Supply of Funding

The literature so far has mostly focused, either explicitly or implicitly, on the supply side of science funding. First, there is a literature looking at the complementarity between government and private funding of science, and at the potential impact of government retrenchment from a macro or institutional perspective (not looking at individual researchers). As a funding source, philanthropic foundations operate in between government and private firms (Bercovitz, Graddy-Reed, and Feldman 2019). Their tax status obligates them to serve the public interest; however, their funding priorities are defined by their charter and influenced by their board composition. Taking aside the much larger literature which examines the relationship between government funding and industry sponsored contract research (which, as argued above, does not allow scientists to freely determine the research topics and is therefore outside the scope of this work), there is some evidence that government funding crowds in funding from industry and philanthropic foundations (Lanahan, Graddy-Reed, and Feldman 2016). There are also some examples in which philanthropic foundations partner with government to tackle difficult research questions (Wolinsky 2011), for example in the Broad Institute of MIT and Harvard.

The effects of cuts in government funding to academic research is less researched. Economists have examined the effects of large increases in government funding, such as the doubling of NIH funding, or the increase in ARRA funding (Lerchenmueller 2018; Park, Lee, and Kim 2015). Decreases in government funding, on the other hand, tend to be smaller in magnitude and cumulative, rather than large, discontinuous, and exogenous. Geuna and Nesta (2006) examine the reduction in recurrent funding from government, and find that only a few mostly elite institutions would benefit. For most universities, revenues from research contracts and consultancies would be insufficient to compensate for the decrease in government funds, thus causing detrimental effects to the overall research enterprise. Strehl et al. (2007), in an extensive report on university funding systems in the OECD, find evidence of the negative effects of the new institutional strategies that involve the search for alternative resources to government funding, such as increasing consulting and marketing activities. The authors highlight that university stakeholders perceive that government cuts in university funding will result in the neglect of basic R&D, and lower quality of research. The greater reliance on private funding engenders concerns that we may be pushed back to the era of the "gentlemen scientists", who were funded by their benefactors, without the benefits of peer review (Wolinsky 2011).

Second, a body of work has focused on the preferences of different types of funders for scientists with certain characteristics or for specific kinds of projects. A large part of the scholarly conversation in this area revolves around the issue of, which funders are more willing to fund novel and risky research, or basic research that is further away from practical applications. On the one hand, there is a worry that moving away from government funding towards private funding (and especially towards disease-focused charities) will decrease the amount of funding available for basic, curiosity-driven research (Wolinsky 2011). For example, Janet Rowley, a geneticist at the University of Chicago, is quoted by Wolinsky (2011) to express worry that the changes in funding landscape will make it more difficult to obtain money for the kind of research that led to her 1970s discovery of the first chromosomal translocations that cause cancer. On the other hand, many observers are critical of the current state of the public funding system. In the US, many authors highlight a growing concern that the current funding system does not encourage enough novel research: public funding agencies, such as the National Institute of Health (NIH), are said to be increasingly risk adverse, favoring relatively safe projects at the expense of more novel (and risky) research (Alberts 2010; Petsko 2012; Stephan, Veugelers, and Wang 2017). Moreover, government agencies need to strictly justify their use of taxpayer money (especially in periods of recession), while foundations have the freedom to engage with projects where the return on investment is not immediate. As a result, philanthropic money plays a crucial role in getting early stage curiosity-driven projects started and validating ideas, which allows researchers greater legitimacy when applying for later government support. For this reason, many practitioner journals depict philanthropic funders as a substitute for traditional governmental funding, especially in the case of innovative and risky research (Grant 2017).

IV. The Demand for Funding

Researchers are compelled to complement recurrent funding with external funding. This is especially true for scientists in experimental disciplines that require expensive equipment and material: natural scientists, for example, are noted to be unlikely to continue research that does not obtain external funding (Cole, Cole, and Simon 1981). Moreover, applying for grants is a costly endeavour: a study on Australian scientists has estimated the time required to write a grant proposal to be, on average, 34 working days (Herbert et al. 2013). As scientists have limited time to perform all their activities (conducting research, teaching, administration, writing proposals), they need to devise a funding strategy and decide to which research sponsors they want to apply. In order to make this decision, given we believe scientists are rational economic agents, they will perform a cost-benefit analysis and select the research sponsors for which they expect the highest return (Grimpe 2012; Laudel 2006). Thus, analysis can consider the difference between the costs related to both the application and the administration of the grant (if successful), and the benefits, both in the short-term (such as the amount of funding received) and in the medium to long-run (such as the prestige attached to the grant and the follow-up possibilities in terms of funding). The net benefits will need to be weighted by the probability of receiving the grant from the sponsor.

Considering the cost side of the equation, the first cost element is the ease of preparing an application. Grant applications are highly idiosyncratic to the funding body: "*when you are writing your research proposal, you tune it according to who is going to be reading it*," (Associate Professor in Physics). This means that applying for grants comprises of the effort of gathering and understanding information about the rules and procedures, and familiarising oneself with the way a proposal needs to be written for a specific funder: "*I can read in their website what they like. But then beyond that it is a lot of footwork to walk around, and talk* *around with people who have experiences in what they [private foundations, Ed.] fund, and what not. Because I think there is a lot that is not said in the calls,*" (Associate Professor in Biology). This also means that previous experience with a funder may be important for the success of future applications either because you get to learn the "rules of the game" (Laudel 2006) or because a long term relationship facilitates follow up funding: "*the more you get, the easier it is to get more, that's how it is*." (Associate Professor in Psychology). Researchers need, however, to also consider the costs associated with the administration of the grant once it is awarded. Burdensome reporting is considered very costly by researchers as it detracts from the time spent actually doing research, and generally government funders are seen as highly bureaucratic. The flexibility allowed in the use of the funds is also an important element in the evaluation of a grant opportunity. If researchers are under pressure to deliver what they promised in their application in order to maintain a good track record with the funding body, then there is the risk that it may inhibit their creativity and limit their research freedom (Azoulay, Graff Zivin, and Manso 2011). For example, many philanthropic organizations try to adopt a less rigid process than the traditional governmental route, so that scientists can more easily alter plans or change course as their research develops (Grant 2017).

Looking at the benefit side, other than the obvious upside represented by the money a researcher may receive from a grant, there are also some medium to long-term advantages than researchers consider in their decision process. Different types of grants carry different degrees of prestige: examples of highly prestigious grants include the Howard Hughes Medical Institute (HHMI) Investigator Program (Azoulay, Stuart, and Wang 2013; Reschke, Azoulay, and Stuart 2018) and the ERC grants, which have the explicit aim to, "*confer status and visibility on the best brains in Europe*."[2] Moreover, different grants may also have long-term implications in terms of getting further funding from other sources. For example, in the US, philanthropic grants are often used by younger scientists for funding riskier pilot projects that provide data to write successful federal grant applications.

Researchers also take into account the career implications of obtaining a grant. Being able to attract funding is increasingly included in promotion criteria: "*people apply for very large grants because it is a sign of career success. You see people who do not do that kind of work [experimental physics, Ed.] getting millions of euros, and they spend it on hiring people they do*

[2] https://erc.europa.eu/about-erc/mission. Retrieved 12th January 2019

not work with. […] And it is essential for their career because you cannot become a professor without having a series of major grants." (Associate Professor in physics). The more prestigious grants also give extra visibility to the awardees: Azoulay et al. (2013) estimate the effect of a scientist becoming a HHMI Investigator based on citations to articles the scientist published before the prize was awarded, finding a small post-appointment citation boost. This is evidence that the award signals quality, even possibly indicating that there was uncertainty about the quality of the scientist's work conducted before receiving the grant.

The last element in the cost-benefit evaluation of applying for funding is the expected success rate. There are several components: all funding bodies claim to apply competitive and merit-based selection procedures. The probability of obtaining a grant is highly dependent on the researcher's past performance (Geuna 2001; Stephan 2010) and obviously the quality of the specific submitted proposal. The researcher's scientific discipline or even more specifically, the topic of investigation, may also play a crucial role in determining the expected success rate, as priorities and willingness to spend money on certain research themes change, both within governments and charitable organizations. Ian Mattaj, Director General of the European Molecular Biology Laboratory (EMBL), in a report for the European Molecular Biology organization reflects on how social priorities, such as Nixon's "war on cancer" and the fight against AIDS, affects funding possibilities for researchers (Wolinsky 2011). Success rate is the crucial variable holding the evaluation of the balance between costs and benefits together. An associate professor in physics notes, "*I never apply for a research grant unless I feel I have some reasonable prospect of getting the money*." These factors together suggest a more nuanced view of funding than the prevailing argument that all money is green.

V. The Danish Research Funding Landscape

The Independent Research Fund Denmark (DFF) is the primary Danish government agency that provides competitive research funding for curiosity-driven research projects. According to its mission, DFF "funds specific research activities within all scientific areas that are based on the researchers' own initiatives and that improve the quality and internationalization of Danish research" (DFF homepage). DFF offers a variety of programs mostly for small and medium-sized grants. In 2017, it granted a total DKK 988 million (USD $152 million) for 360 different projects, the 2017 average grant size was DKK 2.7 million (USD $420,000).

The budget of DFF has been generally declining over the past decade with significant year-to-year variation. Figure 1 shows the annual government budget allocated (in 2018 real prices). The 2016 cutback, in particular, was heavily debated. Figure 1 also provides the success rates for research grants submitted to DFF, both as a percentage of the requested amount and as a percentage of the number of applications. There was a significant drop of 5 percentage points in 2014, both in terms of the number of applications being granted and the amount requested. During recent years the success rates have ranged between 10 and 13 per cent (amount) and 12 to 14 per cent (number), with an uptick by both measures of 3 percentage points in 2017. The success rates follow the general amount of the DFF budget, but important dynamics are at play in terms of application numbers and grant sizes. Other Danish government sources of competitive research funding are the Innovation Fund Denmark (IFD) which supports thematic research as well as innovation projects, and thus has a more applied objective than the DFF. The Danish National Research Foundation (DNRF) funds, "frontline, curiosity-driven research of the highest quality in Denmark," (DNRF homepage) but mainly supports visiting professorships and larger centers-of-excellence.

Our main comparison is between the DFF and private alternatives for external funding. There are 12 major research-funding foundations in Denmark[3], which include private industrial foundations, public-benefit foundations, and disease-prevention associations. These foundations differ in a number of respects, including the size of their capital and their year of establishment, and the extent to which they focus exclusively on supporting research or have other funding priorities such as funding cultural, social or humanitarian activities. Foundations also differ widely in terms of the focus of their activities. Although grants from the 12 foundations cover all main fields of science, there is a strong emphasis on medical science (47 per cent of funding) and natural science (20 per cent of funding). In terms of success rates, most of the foundations publish this information in their annual reports. The available 2017 estimates vary between 10 per cent for Trygfonden and 37 per cent at the VELUX Foundations.

For our analysis it is important that the scientists in our sample include both a government funder and a foundation funding alternative. The foundations' funding policies differ in terms of grant sizes and supported academic fields, but collectively they cover all the STEMM

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[3]https://ufm.dk/publikationer/2016/private-fonde-en-kortlaegning-af-bidraget-til-dansk-forskning-innovation-og-videregaende-uddannelse. Regardless of legal status we group these organizations together as foundations.

fields. To validate this assumption, we asked survey respondents to list the relevant sources of funding for their research. The 12 foundations and the DFF were nominated as appropriate to support small- to medium-sized research projects (grants of up to DKK 10 million, or USD $1.5 million). Our experimental setup asks respondents to initially decide on the source of funding for a research project with a budget of DKK 3 million (USD $500,000).

A final observation on the Danish research funding landscape is the near parity of foundations with government funders. Over the period 2012-14, foundations awarded DKK 9.7 billion (USD $1.5 billion) to research, innovation and higher education. During the same period, eight government agencies, research councils and funding pools (including the DFF, IFD, and DNRF) awarded DKK 11.8 billion (USD $1.8 billion). Foundations are becoming more important with the recent expansions of several of their research-funding programs, e.g., the Lundbeckfonden and the Novo Nordisk Foundation. This contrasts with the general decline in funds for research provided by DFF. As confirmed by our interviews, academic researchers in Denmark must increasingly consider foundations for funding their research.

VI. Survey Methodology

We apply data derived from a survey of researchers in all eight Danish research universities. We conducted the survey in October 2017. The population targeted by the faculty survey were researchers who, by mid-2017, were employed by a Danish university in their capacity as researchers and who, within the last five years, had been doing research work for which a PhD or equivalent qualifications would usually be required. In total, the survey was administered by e-mail to 12,791 faculty members, of which 4,832 responded to the survey (38% response rate). We exclude PhD students, scientific assistants, research assistants, technicians, and people employed in administrative positions, who have done no research within the last five years. Postdocs are included while emeritus professors are excluded from this analysis.

We delimited our sample to STEMM field researchers. From previous literature and the interviews conducted before the survey was administered, we expected the external research funding to be of first-order importance in STEMM fields, whereas the social sciences and humanities were expected to generally put less emphasis on funding from researchers. A total of 3,114 STEMM researchers responded to our survey. The respondents are representative of the total population of Danish university researchers, in terms of university affiliation, gender, academic field, and academic position. Further details on the tests conducted to ensure the representativeness of the sample are reported in [*blinded for anonymity*].

Questions on External Research Funding

The external research funding component of the survey centered on three issues: researchers' actual grant experience, researchers' perceptions of government and foundation funding bodies, and an experiment in which we randomly assigned respondents to make choices between government and foundation sources for their external research funding, under three different scenarios.

First, we asked respondents for details about their actual grant experience and the type of funders they considered relevant to them as a researcher. Respondents who indicated only industry as relevant, or stated that they never considered applying for external research funding were not asked further questions about funding; if they considered any of the other three options—a public research council, a foundation, or the European Union—they were presented with the remaining questions of the external funding section. As discussed in section II, research contracts from private firms are very different from traditional funding as they generally do not allow the researcher to independently form a research question, but they are rather based on a problem posed by the industrial partner. A total of 2,896 STEMM researchers qualified by this criterion.

We asked the respondents to contrast two sources of funding: DFF and a foundation. In order to anchor their selection, we asked the respondents for the foundation that would be the most relevant for their research ("If you were to approach a Danish private foundation to request funding for your research, which would be your first choice?"). We decided to anchor respondents on a particular foundation so that they would produce more accurate, reliable responses in the following questions. As shown by Mussweiler and Strack (1999), if respondents are primed to think about a certain topic, they may recall more and more information about that topic through a selective memory search. Respondents were then presented with the list of:

- 11 major research funding organizations described in section V[4]
- "Other" (with a space to write the name of that organization),

[4] There were 11 options on the survey rather than 12 as the two related foundations Veluxfonden and Villumfonden were collapsed into one item.

– “Prefer not to tell” option, or
– “Don’t know.”

We hand-coded the organizations selected as “Other” to re-allocate answers actually belonging to an organization which was on the list and to look for organizations that received multiple nominations and should therefore conceivably also be included. The search resulted in some re-allocations and the inclusion of one further organization in our analysis, the Danish Heart Foundation.

Searching the “Other” nominations also provided us with a check on framing the respondents into thinking about sources of curiosity-driven research financing from foundation sources in Denmark rather than, for example, foreign organizations, government funders with narrow scopes, or contract research. Only a small number of respondents proposed foreign or government sources of funding. In total, 2,040 STEMM respondents made a valid choice of a foundation research funder.

In a second set of questions on research funding, we elicited the respondents’ perceptions of the characteristics of government and foundation funding bodies in terms of three types of funder characteristics:

– Benefits-related funder dimensions (prestige of receiving a grant from the focal funder, impact of obtaining a grant on possibilities for further funding, career implications of receiving a grant),
– Costs-related funder dimensions (ease of application, burden of reporting, flexibility of use of funds, importance of long-run relationship with the focal funder),
– Overall success rate associated with the focal funder.

We asked identical sets of questions about each type of funder.

In the final part of the survey, we conducted an experiment on researchers’ preferred source of external funding. We assign each respondent to a scenario at random. The scenarios differ in terms of the expected success rate of an application to the government funder, which is lowered drastically (8 per cent) or moderately (12 per cent) or moderately increased (18 per cent) as compared to the baseline (15 per cent). Specifically, the survey asks the respondent to choose between submitting a grant proposal to either the government public funder (PUB) or the focal foundation (PRIV). The narrative was that both funders could provide the same amount of funding, DKK 3 million, which is the average grant from the DFF. The three scenarios are presented in Appendix 1. Consistent with the idea that academics are required to acquire external funding in order to perform their research, respondents were asked to make a choice between the two funders, and they were not allowed to drop the application entirely. The following table (Table 1) shows the expected success rates for both funding sources in the baseline scenario and the three treatments.

A total of 1,677 STEMM researchers provided complete baseline and experimental choices along with a valid choice of focal foundation. For each respondent, we apply a within-person comparison between her baseline choice of funder—government funding versus foundation—and her choice of funder in one of three scenarios.

The individual respondents' subjective assessment of the expected success rate and other relevant features that apply to their preferred foundation are likely to vary between respondents even for the same preferred funder. Similarly, different foundations could be associated with different expected success rates. To analyse researchers' perceptions of government versus foundation funders, we introduce foundation fixed effects to take account of heterogeneity between foundations. For the analysis of experimental cutbacks or increases in government research funding, we critically assume that respondents' subjective assessments of the expected success rate of their focal foundation do not vary between the baseline and the scenario assigned to her.

VII. The Demand for Funding: Researchers' perceptions of benefits and costs

Overall within-person score differences

Table 2 records the mean difference between the government funder and the foundation funder for each dimension, as well as the mean sample scores for each funder. A positive score difference means that the government funder is on average rated higher than the foundation funder. Only respondents who rated both types of funders on a particular dimension are included and, by considering within-person score differences, any person-specific differences in the use of the scale underlying the scores ought to have been eliminated.

Looking at the potential benefits, a government funder grant is, on average, seen as being associated with significantly higher prestige than a foundation grant, and significantly more important both in terms of the likelihood of obtaining further funding from other sources, and in terms of the impact on a researcher's career. The actual differences remain moderate, corresponding to on average 0.11-0.19 scale points (as compared to standard deviations between 0.84 and 1.1). On three of the four dimensions related to potential costs, we find significant and numerically larger score differences (0.38-0.64 scale points; standard deviations 0.96-1.07) consistently favoring the foundation funder. In line with much of the practitioner-oriented literature discussing philanthropic funding, the mean differences suggest that the government funder is perceived as having less easy application procedures, a higher burden of reporting, and less flexibility associated with funds awarded. There is no appreciable perceived difference between the government and the foundation funder on the final dimension, the importance of building a long-run relationship with the funder. Finally, numerically most important is the difference between government and foundations in terms of their perceived overall success rates; this is significantly lower for the government funder (0.68 scale points; standard deviation 0.99).

Researchers do on average see important differences between the government and foundation funders. The differences are most significant in dimensions that relate to the processing of applications and grants. Perceptions also differ significantly in regard to potential benefits, although numerically less so. Overall, the government funder is viewed positively in terms of benefits derived from an awarded grant, although at the cost of less favorable perceptions of operational dimensions and lower perceived success rates. This means that a priori it is difficult to determine if one funder is considered more "efficient" than the other in terms of a cost-benefit analysis.

Within-person score differences decomposed

As a next step, we correlate the score differences with researcher characteristics in terms of the following demographics and academic performance indicators: Gender, academic field, academic rank, and publication record. The variables are summarized in Table 3. Then, we investigate if the perceived differences—in addition to demographics and performance—correlate with measures of the researcher's actual experience with different types of funders.

a) Researcher demographics and publication performance

Table 4 presents the results of eight regressions, one for each of the funders' dimensions. The sample consists of researchers of all academic ranks. The dependent variable is the within-respondent score difference. The basic demographics, gender and researcher's nationality, are generally not strong correlates of the perceived funder differences. Researchers with a domestic PhD have a negative view of the government funder success rates relative to their colleagues who trained abroad. Foreign-trained researchers, in turn, view the government funder more favorably in terms of the ease of application.

We include scientific disciplines as they are widely acknowledged as important in a range of faculty activities (Edler, Fier, and Grimpe 2011). There are prominent field differences in how researchers perceive government versus foundation research funders on some of the dimensions considered. Natural science is the reference for these comparisons. Medical researchers stand out as being more positive about government funders, relative to foundation funders, in regard to potential benefits, whereas their view of the government funder is less favorable when it comes to costs. Engineering researchers tend to rate the government funder as more prestigious, yet more burdensome in terms of reporting. Agricultural scientists share the view that the government funder is more prestigious. As for the perceived success rate, all fields are in line with the general perception that success rates are lower with government funders.

Interestingly, academic rank and researcher publication performance show quite different correlations with dimensions of funder perceptions. Tenured academics hold a more positive view on the relative prestige of the government funder, as compared to untenured researchers who are significantly less positive about the success rate of government funders. They also, on average, seem to attach less importance to building a long-term relationship with government funders, relative to foundation funders. This dimension is interesting as the scientist's position can have an impact on how important it is considered for her to apply for grants. If the scientist heads a research group, for example, she may experience a higher need to obtain funding in order to sustain her lab (Grimpe 2012). The publication performance of a researcher shows little correlation with the perception of potential costs, while it is significantly associated with holding a relatively less favorable view on the potential benefits—such as the relative prestige and career implications of obtaining grants from government, versus foundation, funders. As virtually all funding bodies claim to base their selection on merit, apparently the better-published researchers put more confidence in their *curriculum vitae* in applying for external research funding, irrespective of the identity of the potential funder.

Overall, variations across researchers in terms of the relative perceptions of government and foundation funders are strong and significant overall, but they are only to a limited extent explained by the personal characteristics considered here with R-squares below five per cent on all dimensions.

b) Career funding history

Our academic rank findings may suggest that a researcher's experience with Danish academia in general, and with the Danish research funding system more specifically, shapes her view on different types of funders. To investigate the role of actual funding experience in more detail, we will consider the subsample of tenured researchers who reported having experience as a Principal Investigator (more than 80 per cent of the sample of researchers in STEMM fields), and for whom we have information on their actual grant portfolio.

In Table 5, we add a set of controls for the actual career funding histories of our respondents. Specifically, we added indicators for having obtained external research funding from the government funder only (18 per cent of researchers), from a foundation funder only (10 per cent), or from neither of these funder types (2 per cent), treating the most numerous group of researchers, those who received grants from both government and foundation funders (70 per cent), as the reference group for this comparison. (All groups considered may additionally have had research funding from other sources, such as the European Union or from industry).

Having had only one type of funder is generally associated with viewing that particular funder more positively. Hence, researchers who lack experience with funding from a foundation are associated with a more positive view of government funders, in terms of more flexibility of grant use, when compared to researchers with a more balanced funding experience that includes both funder types. Similarly, researchers with no experience with government funders generally view government funding as less important for obtaining further funding, less easy to apply for, and less important to build a long-run relationship with. They also hold a more negative view of the government funder's overall success rate.

c) Foundation funder heterogeneity

Our approach to anchoring each respondent in terms of his or her perceptions of a particular foundation funder implies that there is potential heterogeneity within the foundation alternative to which the government funder is compared. In effect, the above correlations may be driven by shared perceptions specific to a particular foundation funder, rather than by the fact that the funder is a foundation, and not a government, source. To take this potential source of confounding into account, we add foundation fixed effects to the regressions in Table 6.

The foundation funder fixed effects are indeed highly significant on most dimensions, with the exception of the importance for further funding, and flexibility of funds use. With this correction, the basic demographics still have a limited effect, except for female researchers attaching more importance to building a long-run relationship with the government funder relative to the foundation funder, and for researchers with a Danish PhD being more positive towards the prestige of the government funder. Academic field differences are now confined to the medical field. The correlations established above, in terms of more prolific researchers having a less favorable view on the government funder as compared to foundations on potential benefits, remain valid when correcting for funder heterogeneity. Also, correlations with the actual funding experience of a researcher remain robust to accounting for funder heterogeneity.

VIII. Decline in Public Funding

As the decline in public funding for science is one of the major concerns of university scientists, we try to estimate the effects of cutbacks or increases in government science funding on scientist funding choices, by using a survey experiment. We compare the choice of funder in one of three scenarios as described in Section VI. By randomizing respondents across the three scenarios, we are able to gauge the impact of changes in the perceived success rate of government funders between the scenarios, on the respondents' preference for the government funder, vis-à-vis the foundation funder. We can estimate the impact without regard to other underlying determinants, as any difference in terms of respondent or funder heterogeneity is likely to be randomized out.

Experiment validity

Overall, the response rate to the experimental part of the survey is high. The sample included 2896 total respondents. We then dropped those that reported: exclusive reliance on industry funding, no relevant of external funding to their research, or being in an emeritus position. The resulting sample was then 2,214 respondents (76 per cent), who reported their baseline and scenario choices. In addition, to run our analysis, we also require a valid anchoring, meaning that the researcher had to name a valid foundation as their preferred foundation funder. This reduces the sample available for analysis to 1,687 respondents. In general, respondents seemed to understand correctly the scenarios, with only few respondents changing their preference towards the funder that in a given scenario becomes relatively less likely to award the grant (between 0.9% and 1.6% of the respondents switch in the "wrong" direction). We exclude these respondents (N=10) from further analysis.

Experimental sample

The final experimental sample has N=1,677 observations. In the baseline scenario, 42 per cent of respondents choose the government funder as their preferred choice, while 58 per cent choose the foundation. The randomization of the respondents into the three treatment groups works correctly and the above sample reductions do not introduce significant bias. Essentially, the same baseline split is present with small variations between all three scenarios (the preference for the government funders varies between 40.8 per cent and 42.3 per cent, and the differences are not statistically significant, p=0.87). The experimental treatment resulted in a significant number of respondents changing their funder preference between the baseline and the scenarios. In the "drastic cutback" scenario, 57 per cent (N=133) of the respondents who in the baseline preferred the government funder, switched to the foundation in the scenario. The equivalent figure was 27 per cent (N=61) in the "moderate cutback" scenario, while 24 per cent (N=85) of the respondents, who in the baseline preferred the foundation, switched to the government funder in the "moderate increase" scenario. This is consistent with our finding that the expected success rate is a characteristic that on average strongly differentiates the government and foundation funders.

The impact of changing the perceived success rate

Figure 2 shows the percentage of respondents (vertical axis) who preferred the government funder for the three different scenario treatments, against the expected success rate with the government funder (horizontal axis). The figure also shows the average government preference within all groups at baseline. A drop in the perceived government funder success rate of 4 percentage points, from 12 per cent to 8 per cent, is associated with a drop in the preference for the government funder of approximately 13 percentage points (from 31 per cent to 18 per cent). An increase in the perceived success rate of 6 percentage points—between the moderate cutback and moderate increase scenarios, from 12 per cent to 18 per cent—increases the average preference for the government funder by approximately 24 percentage points (from 31 per cent to 55 per cent). When comparing the scenario outcomes, the changes in the preference for the government funder are approximately proportional to changes in the perceived success rates. Hence, the experiment identifies a funding line which continues at approximately the same rate for a decrease or an increase in the perceived success rate, implying that the relationship is approximately symmetric in a range around the baseline value of 15 per cent. Both impacts are indeed strongly statistically significant ($p<0.01$). Moreover, the test of the linearity of the relationship cannot reject that this relationship is linear over the range considered ($p=0.35$). Hence, over the (empirically relevant) range considered for the perceived government success rate, the response to a cutback or to an increase in the perceived success rate with the government funder is approximately linear. Finally, there is a close-to-unity elasticity of the funding line at comparatively low perceived success rates with an elasticity of 1.23 for a drop from 12 per cent to 8 per cent. At higher levels, the elasticity increases somewhat and becomes 1.59 for the increase from the baseline value of 15 per cent to the "moderate increase" value of 18 per cent.

Subgroup analysis

Figures 3a-e split the experimental sample along the researcher characteristics listed Table3: gender, nationality of PhD, academic field, academic rank, and scientific productivity. As they are partial comparisons, they may well be confounded by differences in other dimensions, however, the overall test of interaction suggests significant treatment heterogeneity ($p<0.05$).

Looking at gender, there are generally only small and insignificant ($p=0.57$) differences between male and female researchers, in terms of the impact of changing the success rate of the government funder on their choice of funders. Hence, the impact of a cutback or an increase of government funding is similar across genders. Regarding the country of origin of researchers' PhD (Danish vs. foreign), the government funder preference increases more for foreign researchers (in terms of the nationality of their PhD) than for natives, when increasing the expected success rate at comparatively high values. At values below the baseline value, however, these groups appear equally affected by a cutback and, overall, the differences between groups are not statistically significant (p=0.18).

Turning to scientific disciplines, the differences across academic fields apparent from Figure 3c suggest that the government funder is generally most favored by researchers in natural science, and less favored by medical researchers. This is consistent with the fact established in Section V that most foundations in Denmark emphasize medical research, while other fields of science are more reliant on the public research council. The differences in terms of the impact of cutbacks or increases, however, are not statistically significant (p=0.14).

The preference for the government funder is higher for untenured (post-docs, assistant professors) than for tenured researchers (associate or full professors) at comparatively high values of the expected success rate at the government funder. With a cutback to values below the baseline success rate, however, these groups appear to make very similar choices of funder. By implication, the impact of an increase is larger for untenured researchers, and the difference is statistically significant (p<0.01).

Finally, for the productivity of researchers we find significant differences in terms of impacts between the researchers who are among the 10 per cent most productive within their field and academic rank and those who are not. Whereas the latter group of researchers follow the overall pattern of a continuously decline in their preference for the public funder as the expected success rate reduces, the more well-published scientists stay largely unaffected by moderate cutbacks (or increases). It is only when the expected success rate declines to 8 per cent in the experiment that an appreciable share of researchers turn to private foundations. This creates a "funding cliff" deviating from the general funding line. One interpretation of the cliff is that at the baseline, the productive scientists feel that they can rely on their CVs to be fairly securely within, say, the top 10 per cent of applicants and reasonably expect funding. If, however, the success rate drop to single-digits, their prospects are less secure and may not outweigh the efforts needed to apply. As a very productive young associate professor in physics put it: "*I never apply for a research grant unless I feel I have some reasonable prospect of getting the money. I mean, the early days of ERC, the success rate was something like two percent or two and a half percent or something for the first year or first two years. And I did apply, but I think I would never do that again because of the probability [...] When the probability is below about ten percent, it just isn't worth your time*."

IX. Discussion and Conclusions

The growth of the scientific enterprise, the rising costs of conducting science, and the shrinking government budgets have had a large impact on the funding of science. With the reduction of structural funding, academic researchers seek external funding for their projects. These funds come from a variety of sources: some funds are tightly linked to specific projects, such as in the case of research contracts from industry. Other external funding sources, government and many philanthropic foundations, however, substitute more closely recurrent funding as they leave academics with the freedom to determine their research agenda, which is a feature of academic work highly valued by scientists (Aghion, Dewatripont, and Stein 2008; Stern 2004). Recent calls to curtail government funding rely on an assumption that foundations will be able to provide funding (Wolinsky 2011, 772). It is not clear how the substitution of foundation funding for government's discretionary research spending on a large scale would be viewed by scientists. There is limited knowledge on the demand for science funding and how individual scientists' decisions would likely be affected.

Our results establish significant differences in researchers' perceptions of the attributes between government and foundation sources of funding for their research projects. These differences hold for both benefit-related and cost-related dimensions, indicating they are not perfect substitutes. The expected success rate is, on average, perceived as much lower for the government funder than for the researcher's self-identified focal foundation funder. Perception differences show significant association with researchers' characteristics, including their publication performance and their actual career funding experience.

We run an experiment by treating researchers to different expected success rate with the government funder to assess changes in their choices between funders. The overall results show symmetric responses to cutbacks and increases in government funding within an empirically relevant range of success rates between 8 and 18 per cent – the funding line. Indeed, there is an elastic aggregate trade-off between government and foundation sources of science funding.

An interesting aspect of our investigation relates the possible presence of compositional effects in our experiment. Overall, we find evidence of statistically significant treatment heterogeneity between different groups of scientists. Specifically, we find differences related to academic rank with untenured researchers being more sensitive to a government cutback than tenured ones. Also, the most productive scientists seem willing to stay with the public funder when facing a moderate decrease in the expected success rate (maybe in reliance on their better CVs), while they disproportionately move towards the private funder at the lowest expected success rate. By implication, the average publication performance of the pool of applicants remaining with the public funder drops off at very low success rates.

Somewhat surprisingly, we find little evidence of any difference in the pattern of behaviors among different groups of researchers. gender differences in the academic setting has often highlighted how women tend to draw fewer resources (Murray and Graham 2007) and to possess less rich and diverse social capital, and fewer bridging ties outside their local work contexts than their male colleagues (Etzkowitz . H Kemelgor .C and Uzzi 2000). This problem is particularly visible when looking at patterns of engagement of female academics with industrial partners, especially in STEM disciplines (Tartari and Salter 2015). One could therefore imagine that women in universities may be more favorably disposed towards the public sector as a possible funder. We do not find any statistical evidence supporting this claim: women and men's reactions to changes in the expected success rate for government awards are statistically identical. This suggests that women are not as disadvantaged in working with foundations as they are with industrial firms. Foundations employ a comparatively large number of women in managerial positions, breaking the pattern of the "double ghetto" that STEMM women face when they seek collaborative opportunities with private firms (Armstrong and Armstrong 1984). For example, of the 12 major foundations studied in this paper, four of them (33%) have female CEOs, a percentage well over the average for industrial firms. Additionally, there is some evidence that women find it more important than their male colleagues to establish a long-term relationship with the public funder for the chances of success of a grant application.

Another characteristic that may possibly differentiate researchers' responses to changes in funding conditions is their nationality. Natives may be more familiar with the funding landscape and more aware of all opportunities because they speak the local language and have potentially wider local networks. In this study, we do not measure nationality directly, but we use the country in which researchers obtained their PhD. The reasoning is similar to the one for nationality: researchers trained in Denmark may enjoy the same benefits as natives as they spent their formative years in the country. As in the case of gender, we do not see any difference in behavior between researchers trained inside or outside Denmark. This may be explained by the fact that foundations in Denmark have a long history and operate as transparently as the public funder, publishing regular calls for applications and outsourcing part of the evaluation process to external panels of international experts. Moreover, we find evidence that researchers with a Danish PhD rate government funding more highly in terms of prestige, while researchers trained elsewhere are more agnostic.

Our results suggest there is a need to consider the demand for different funding sources rather than focusing solely on the supply of funding. We believe there are opportunities to further examine these relationships in other country and different contexts. While in our experiment we face researchers with the choice of two funders providing them the same net amount, we do not explicitly consider the impact of the university share apportioned to the recovery of indirect costs, which vary significantly between countries and between disciplines (Graddy-Reed, Bercovitz, and Feldman 2019). These are further considered in the calculation of the costs and benefits of different funding sources. In addition, while we examine the tradeoffs between government and foundations, there is an opportunity to further examine tradeoffs with industry funding to gain a fuller picture of the academic funding landscape. With these humble efforts we hope to encourage other researcher to examine these topic in science policy.

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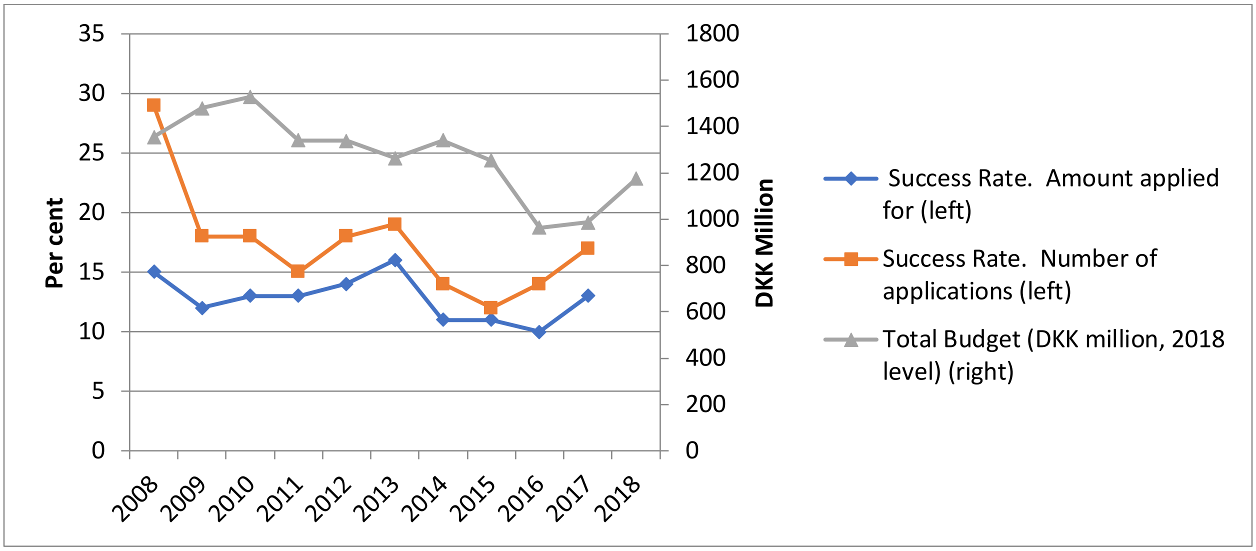
FIGURES & TABLES

Figure 1: Dynamics of funding and success rates at the government funder "DFF"



Source: https://dff.dk/aktuelt/publikationer/arsrapport-2017-statistik

Figure 2: The Funding Line

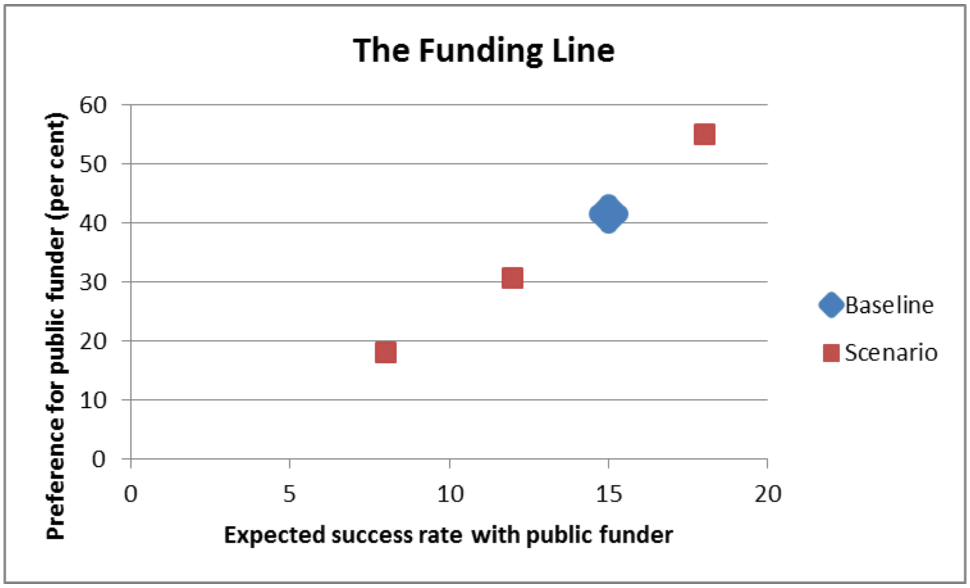


Figure 3a: Gender

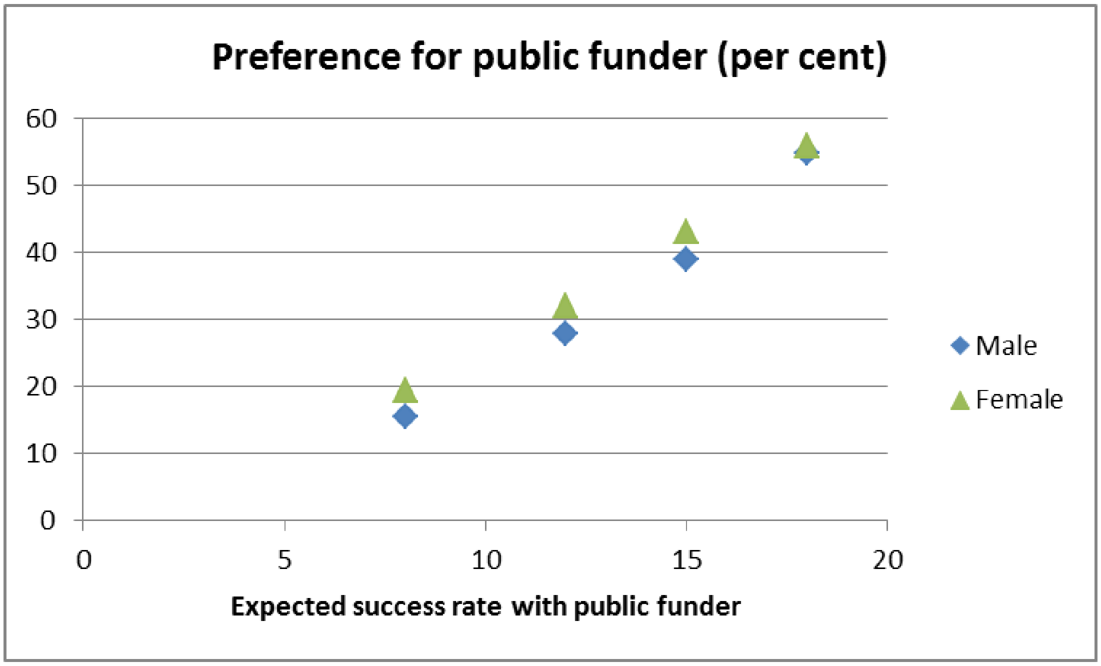


Figure 3b: Nationality (Danish or foreign PhD)

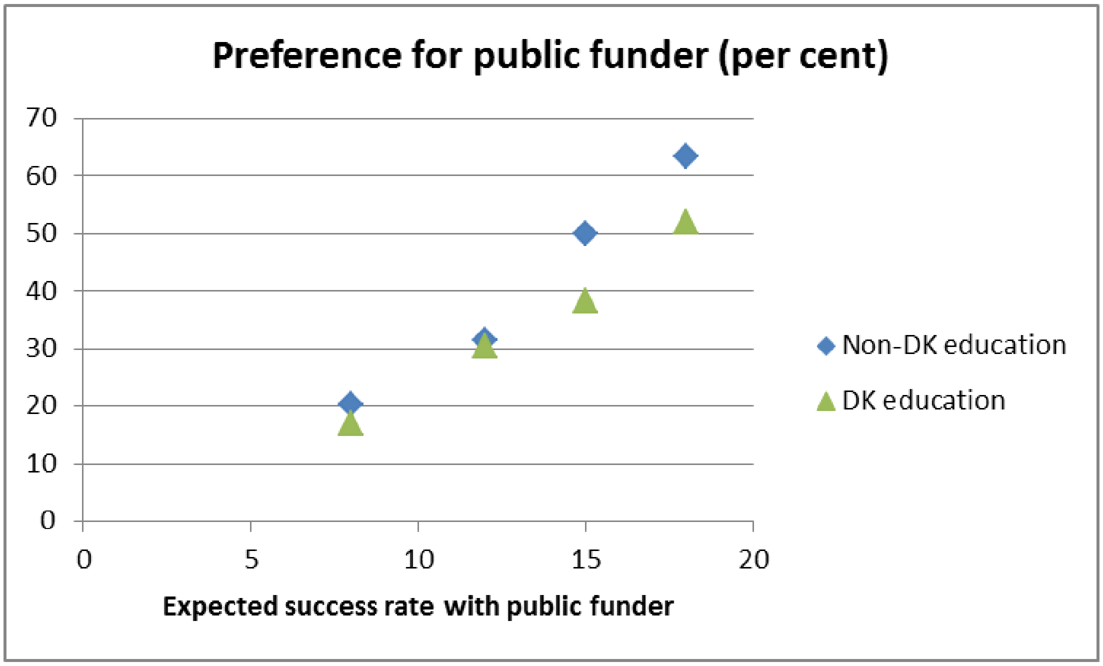


Figure 3c: Academic field

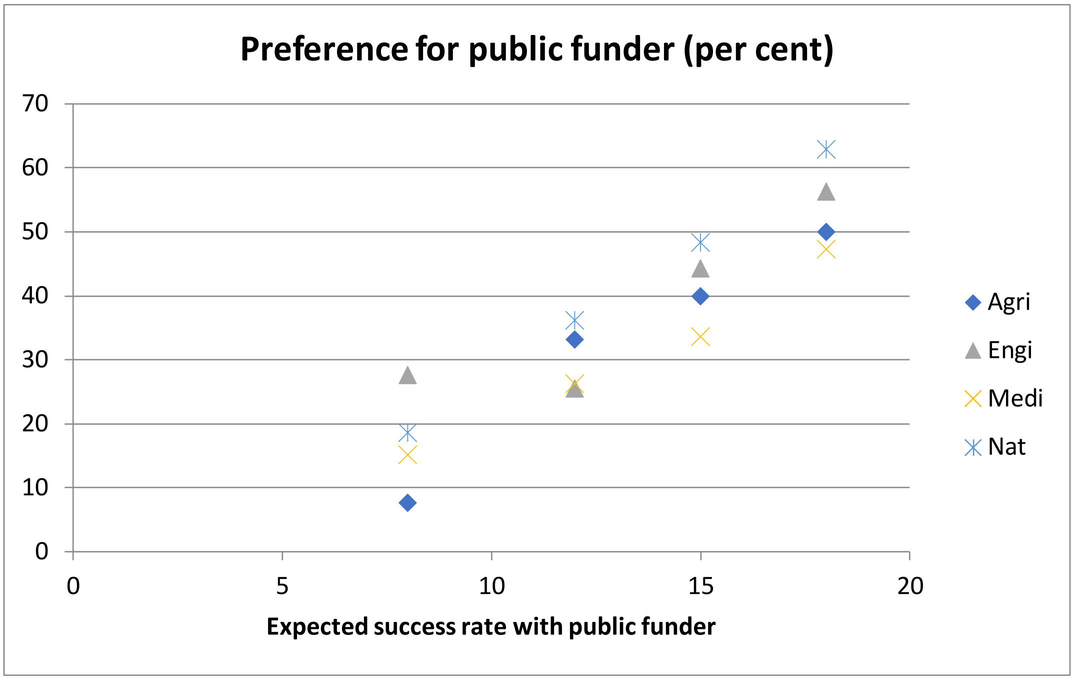


Figure 3d: Academic rank

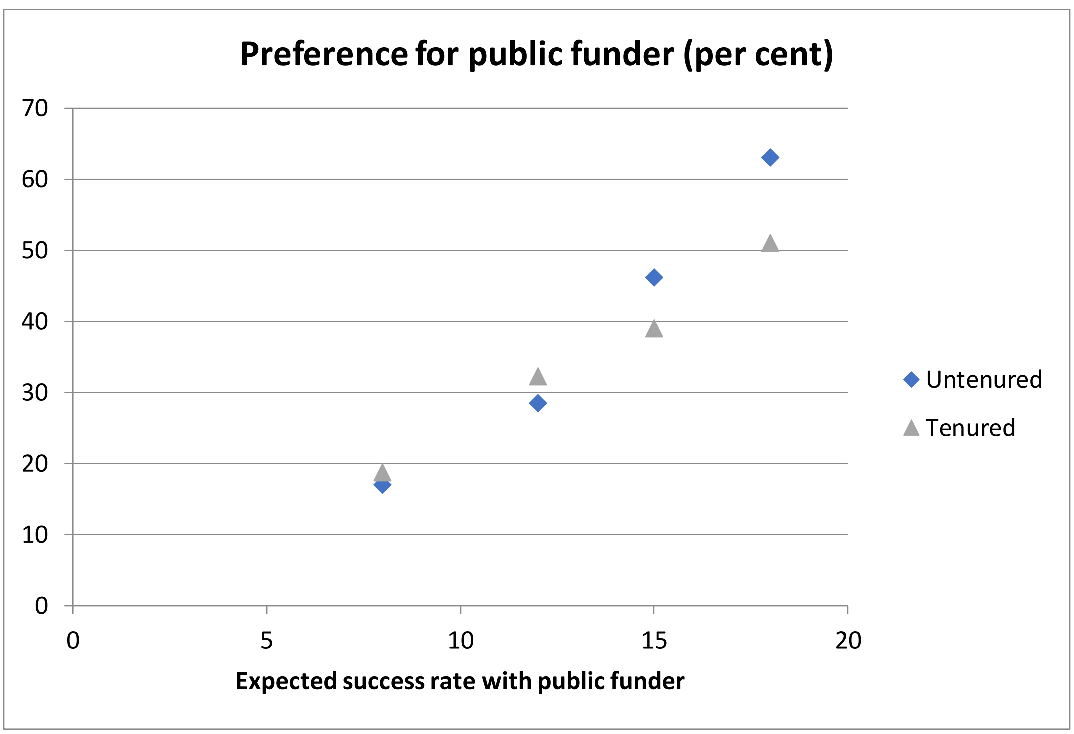


Figure 3e: Productivity

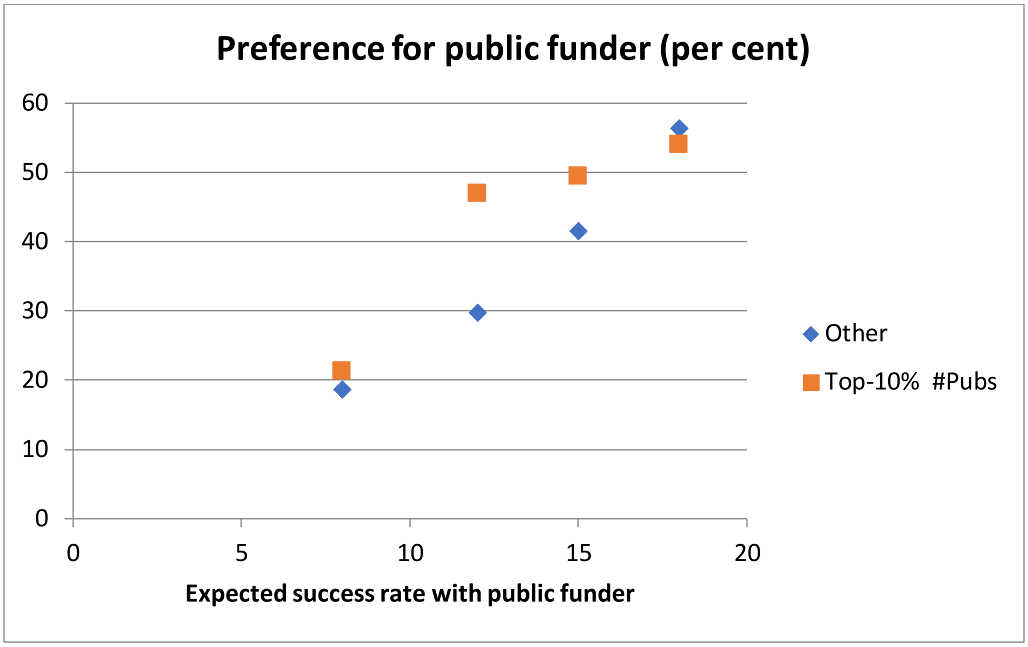


Table 1: experimental scenarios

Scenario	*DFF*	*Private foundation*
Baseline	**15%**	**Unknown**
Treatment A (drastic cutback)	8%	Unknown
Treatment B (moderate cutback)	12%	Unknown
Treatment C (moderate increase)	18%	Unknown

Table 2: "How would you rate [PUB/PRIV] along the following dimensions?" STEMM faculty respondents (non-emeritus) with a valid choice of private funder.

	N	PUB Average score	PRIV Average score	Score difference PUB-PRIV
Prestige from receiving a grant	1,544	4.181	3.990	0.192***
Importance of getting a [PUB/PRIV] grant for the likelihood of obtaining further funding from other sources	1,209	3.697	3.583	0.114***
Impact on subsequent career from obtaining a grant	1,330	3.941	3.789	0.153***
Ease of the application process	1,310	2.749	3.373	-0.624***
Burden of reporting	920	3.043	2.665	0.378***
Flexibility of use of the funds awarded	905	3.008	3.422	-0.413***
Importance of building a long-run relationship with [PUB/PRIV] for success of the application	888	3.475	3.533	-0.057
Overall success rate	1,390	1.944	2.619	-0.675***

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Note: 5-level Likert scale converted to scores 1 ("Very low"), 2 ("Low"), 3 ("Medium"), 4 ("High"), 5 ("Very high"). 2,896 respondents were asked this question

Table 3 – Researchers' characteristics

Variable	**Description**
Gender	*Female vs male, with male as the reference category*
Nationality	*PhD obtained in Denmark or abroad, with PhD abroad as the reference category*
Academic field	*Science, engineering, medical, or agricultural science, with science as the reference category*
Academic rank	*Tenured (associate/full professor-level) vs non-tenured (post-doc, assistant-professor-level), with non-tenured as the reference category*
Scientific productivity	*In the top-10 per cent in terms of number of publications (standardized within main academic field and position (post-doc/assistant/associate/full) vs not in top-10 per cent (reference category)*

Table 4: Score differences PUB/PRIV. All positions.

VARIABLES	(1) Prestige	(2) Further	(3) Career	(4) Easeappl	(5) Burden	(6) Flexuse	(7) Longrun	(8) Succrate
Female	0.059	0.016	0.042	-0.034	-0.020	-0.020	0.156	0.007
	(0.060)	(0.075)	(0.057)	(0.071)	(0.080)	(0.092)	(0.107)	(0.065)
DK PhD	0.104+	0.092	0.050	-0.181*	0.120	0.059	-0.127	-0.161*
	(0.062)	(0.078)	(0.060)	(0.075)	(0.083)	(0.092)	(0.108)	(0.067)
Engineering	0.167*	-0.024	-0.043	-0.095	0.268*	0.098	0.073	-0.118
	(0.076)	(0.097)	(0.075)	(0.094)	(0.105)	(0.114)	(0.138)	(0.083)
Medical	0.321***	0.264***	0.077	-0.081	0.256**	-0.318***	0.154	0.095
	(0.062)	(0.077)	(0.059)	(0.073)	(0.079)	(0.090)	(0.107)	(0.066)
Agriculture	0.168	0.202	0.127	0.492**	-0.046	0.341	0.288	0.222
	(0.135)	(0.168)	(0.129)	(0.171)	(0.195)	(0.211)	(0.249)	(0.147)
Tenured	0.168**	-0.034	0.011	-0.139+	-0.032	-0.067	-0.330**	-0.318***
	(0.058)	(0.074)	(0.057)	(0.073)	(0.089)	(0.096)	(0.107)	(0.065)
Productivity	-0.332***	-0.191+	-0.204**	0.006	-0.003	-0.150	-0.288*	-0.000
	(0.082)	(0.101)	(0.079)	(0.095)	(0.099)	(0.116)	(0.139)	(0.086)
Constant	-0.131+	-0.005	0.104	-0.347***	0.158	-0.270*	0.192	-0.384***
	(0.072)	(0.090)	(0.069)	(0.090)	(0.106)	(0.117)	(0.128)	(0.079)
Observations	1,325	1,047	1,156	1,145	802	791	767	1,204
R-squared	0.051	0.023	0.012	0.021	0.022	0.034	0.028	0.032

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 5: Score differences PUB/PRIV. Career funding info. Tenured faculty.

VARIABLES	(1) Prestige	(2) Further	(3) Career	(4) Easeappl	(5) Burden	(6) Flexuse	(7) Longrun	(8) Succrate
Female	0.136	0.026	0.070	-0.037	-0.080	0.202+	0.244+	0.013
	(0.084)	(0.104)	(0.082)	(0.098)	(0.104)	(0.116)	(0.141)	(0.088)
DK PhD	0.184*	0.130	0.147+	-0.131	0.025	0.213+	-0.025	-0.142
	(0.088)	(0.111)	(0.087)	(0.104)	(0.109)	(0.116)	(0.145)	(0.092)
Engineering	0.103	-0.093	-0.065	-0.123	0.354*	-0.067	-0.011	-0.142
	(0.109)	(0.136)	(0.106)	(0.130)	(0.139)	(0.147)	(0.179)	(0.113)
Medical	0.423***	0.361***	0.070	-0.159	0.300**	-0.490***	0.259+	0.118
	(0.084)	(0.104)	(0.081)	(0.096)	(0.098)	(0.108)	(0.135)	(0.086)
Agriculture	0.302	0.249	0.168	0.425+	0.067	-0.016	0.431	0.138
	(0.185)	(0.229)	(0.176)	(0.236)	(0.234)	(0.263)	(0.328)	(0.187)
Productivity	-0.335**	-0.289*	-0.310**	-0.080	-0.006	-0.068	-0.321+	0.037
	(0.104)	(0.129)	(0.101)	(0.121)	(0.119)	(0.133)	(0.169)	(0.106)
No PRIV grant	0.176+	-0.191	-0.092	0.172	-0.254	0.409*	0.231	0.101
	(0.105)	(0.138)	(0.105)	(0.133)	(0.159)	(0.167)	(0.194)	(0.111)
No PUB grant	-0.204+	-0.425**	-0.127	-0.449**	0.005	-0.211	0.705**	-0.425**
	(0.124)	(0.161)	(0.125)	(0.145)	(0.191)	(0.212)	(0.242)	(0.133)
No PRIV or PUB grant	0.337	-0.233	-0.204	-0.064	-0.728	0.562	0.028	-0.813*
	(0.348)	(0.451)	(0.339)	(0.453)	(0.503)	(0.538)	(0.569)	(0.373)
Constant	-0.109	-0.049	0.052	-0.481***	0.220*	-0.459***	-0.370*	-0.719***
	(0.092)	(0.114)	(0.089)	(0.108)	(0.109)	(0.117)	(0.152)	(0.095)
Observations	742	607	651	687	543	521	461	696
R-squared	0.076	0.063	0.033	0.037	0.033	0.070	0.054	0.032

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 6: Score differences PUB/PRIV. Career funding info. Tenured faculty only. Foundation fixed effects included.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Prestige	Further	Career	Easeappl	Burden	Flexuse	Longrun	Succrate
Female	0.133	0.051	0.077	-0.089	-0.068	0.197+	0.301*	-0.024
	(0.083)	(0.105)	(0.082)	(0.095)	(0.103)	(0.117)	(0.142)	(0.087)
DKedu	0.179*	0.109	0.133	-0.110	0.029	0.203+	-0.037	-0.132
	(0.087)	(0.111)	(0.087)	(0.101)	(0.107)	(0.116)	(0.146)	(0.090)
Engineering	-0.057	-0.222	-0.127	0.086	0.233	0.002	-0.172	0.100
	(0.114)	(0.147)	(0.114)	(0.134)	(0.149)	(0.161)	(0.194)	(0.117)
Medical	0.290**	0.392**	0.085	-0.310**	0.380**	-0.632***	0.367*	0.213*
	(0.103)	(0.130)	(0.101)	(0.116)	(0.122)	(0.134)	(0.167)	(0.104)
Agriculture	0.294	0.288	0.205	0.366	0.086	0.020	0.533	0.163
	(0.183)	(0.230)	(0.176)	(0.227)	(0.231)	(0.264)	(0.327)	(0.183)
Productivity	-0.326**	-0.278*	-0.296**	-0.065	0.015	-0.084	-0.319+	-0.002
	(0.103)	(0.130)	(0.102)	(0.118)	(0.118)	(0.135)	(0.168)	(0.105)
No PRIV grant	0.206*	-0.177	-0.080	0.197	-0.261+	0.433*	0.229	0.076
	(0.104)	(0.139)	(0.106)	(0.129)	(0.157)	(0.169)	(0.194)	(0.109)
No PUB grant	-0.275*	-0.442**	-0.131	-0.344*	-0.014	-0.169	0.601*	-0.321*
	(0.123)	(0.162)	(0.126)	(0.141)	(0.190)	(0.215)	(0.248)	(0.131)
No PRIV or PUB grant	0.214	-0.284	-0.295	0.224	-0.989*	0.657	0.044	-0.643+
	(0.344)	(0.454)	(0.341)	(0.441)	(0.501)	(0.546)	(0.564)	(0.367)
Constant	0.372*	-0.216	0.196	-0.253	0.364+	-0.622*	-0.939**	-0.753***
	(0.180)	(0.222)	(0.181)	(0.207)	(0.219)	(0.249)	(0.292)	(0.190)
Observations	742	607	651	687	543	521	461	696
R-squared	0.127	0.091	0.062	0.127	0.100	0.101	0.105	0.098
Private Foundation FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Appendix 1: Scenarios

Baseline:

Please read the following scenario carefully.

You are considering submitting a grant proposal to either the DFF or to a Danish private foundation that is active in your field. They both accept applications within your field; therefore, they could potentially fund the exact same research project. They have the exact same deadline for submission in one month. You already have a concrete idea in mind for a project. However, you have never applied for this specific type of call before, and the application process needs to be tailored to the specific funding body. It will take you two weeks to define the project, and you will need the remaining two weeks to customise the application to the specific funder. Hence, you must choose between the two funders due to having insufficient time to write two applications.

The following table provides both the expected success rate and the amount of funding you would receive if successful.

	DFF	Private foundation
Expected success rate	15%	unknown
Award amount	3,000,000 Kr	3,000,000 Kr

What would you do in this situation?

Submit to DFF	Submit to the private foundation
☐	☐

A. Scenario:

It is now two weeks before the submission deadline, and you are done finalising the details of the scientific part of your proposal. As you prepare to start customising your application to the funder of your choice, you receive news that the government has approved drastic cuts to the research budget. Hence, the DFF will not be able to fund as many proposals as before, and the success rate is therefore expected to be significantly lower. The following table illustrates the situation after the cuts:

	DFF	Private foundation
Expected success rate	8%	unknown
Award amount	3,000,000 Kr	3,000,000 Kr

What would you do in this situation?

Submit to DFF	Submit to the private foundation
☐	☐

B. Scenario:

It is now two weeks before the submission deadline, and you are done with finalising the details of the scientific part of your proposal. As you prepare to start customising your application to the funder of your choice, you receive news that the government has approved a moderate cut to the research budget. Hence, the DFF will not be able to fund as many proposals as before, and the success rate is therefore expected to be lower. The following table illustrates the situation after the cut:

	DFF	Private foundation
Expected success rate	12%	unknown
Award amount	3,000,000 Kr	3,000,000 Kr

What would you do in this situation?

Submit to DFF	Submit to the private foundation
☐	☐

C. Scenario:

It is now two weeks before the submission deadline, and you are done with finalising the details of the scientific part of your proposal. As you prepare to start customising your application to the funder of your choice, you receive news that the government has approved an increased research budget. Hence, the DFF will be able to fund more proposals than before, and the success rate is therefore expected to be higher. The following table illustrates the situation after the increase:

	DFF	Private foundation
Expected success rate	18%	unknown
Award amount	3,000,000 Kr	3,000,000 Kr

What would you do in this situation?

Submit to DFF	Submit to the Private foundation
☐	☐