DARPA's Role in Financing Innovation: Do Program Managers Have Private Information?

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Abstract

This paper provides an analysis of the Defense Advanced Research Projects Agency's (DARPA) innovation funding model, emphasizing the pivotal role of Program Managers (PMs) in shaping outcomes. DARPA's decentralized, high-risk, high-reward funding approach, combined with PM autonomy and expertise, is often credited as a model for fostering breakthrough technological advancements. Using a novel dataset spanning 2012–2019, we examine the mechanisms through which PMs allocate resources, test hypotheses surrounding private information, cherry-picking, and cronyism, and evaluate the resultant innovation impacts. Our findings reveal that PMs leverage both past performance and unique industry-specific knowledge gained through prior professional connections to select grantees capable of delivering superior innovation outcomes, as evidenced by increased patent filings, higher citation rates, and enhanced Department of Defense (DoD) contract awards. Contrary to concerns of cronyism, connected grantees outperform their peers, suggesting the informational advantage of PMs outweighs any potential bias. However, the concentration of funding among a few large grantees raises questions about the inclusivity of DARPA's model in supporting smaller, nascent innovators. Still, our results underscore the importance of expertise-driven decision-making in navigating uncertainty and driving technological progress, while also advocating for strategies to balance support for established leaders and emerging disruptors in the innovation ecosystem.

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1 Introduction

There is a long discussion in the literature on how to fund cutting-edge innovation and whether government agencies can be configured to provide the right incentives for private firms and universities to ultimately pursue those innovations (Lerner and Malmendier, 2013). For instance, governments can subsidize firms or provide grants to overcome the initial discovery costs (i.e., crowd-in private R&D), coordinate actors to create network externalities, and ultimately serve as initial customers for such inventions (Rodrik, 2004; Howell et al., 2021; Moretti et al., 2023). The issue at stake is that we do not have much systematic empirical evidence of the best practices for government agencies and grant programs to foster cutting-edge innovation (Howell et al., 2021; Bonvillian et al., 2019). One example is a study by Gross and Sampat (2023) examines how large-scale U.S. government R&D contracts during World War II shaped the long-term trajectory of the U.S. innovation system. They document persistent increases in patenting and technological capacity among wartime contractors, with spillovers across related and unrelated technological fields; however, their work focuses on a one-time, economy-wide mobilization rather than an ongoing and discretionary funding model like that of the Defense Advanced Research Agency (DARPA).

Among the institutional features that are highlighted as a best practice to promote cutting edge innovation is the so-called DARPA model. DARPA is the Department of Defense's Advanced Research Projects Agency and it is in charge of using its grant programs to foster research and development in cutting-edge technologies in the United States. The most salient features of the DARPA Model of innovation are threefold. First, its program managers (PMs) often come from the private sector (i.e., from private and publicly-traded firms and universities)—the rest have military backgrounds. Second, program managers have a high degree of autonomy to allocate grants to firms and universities, with little to no overseeing or vetoing when allocating amounts close to half a million dollars. Third, the PM terms tend to be short (3-5 years), thus leading them to find grantees with innovative capabilities in their areas of expertise who can deliver results fast.

The key to the DARPA model of funding innovation rests on the capacity of program managers to discern the innovation capabilities of potential grantees so that they can advance their agendas in a relatively short period of time. For instance, having worked at one or multiple firms before becoming a PM can provide individuals with information advantages to select better grantees. However, having PMs with industry experience may also lead to problems in the allocation of funding. At issue here is whether DARPA program managers that previously worked in grant recipient companies select them because they know more about the recipient's ability to innovate in a specific, cutting-edge technology or whether they are simply cherry-picking firms with a better track record or favoring their former employers (exercising a form of cronyism), disregarding the capacity they have to deliver on the innovation goals of the program.

Consequently, we examine the possible information advantages of program managers when allocating funding to firms with the objective of promoting innovation. The information asymmetry issue DARPA PMs face is, to a large extent, similar to that of bank lenders or venture capitalists. We thus build our initial hypotheses of the possible advantages or disadvantages of having connected program managers from this literature. In the *private information view*, program managers have worked at companies, usually in fields related to the programs they run at DARPA and, therefore, have private information about the innovation capabilities of those companies as it pertains to the PM's area of expertise (Benjamin Reinhardt). This is similar to the private information lenders can get from relationship lending (Petersen and Rajan, 1995, 1994). In other words, PMs have information about capabilities that are not public or obvious to an outside observer and that may or may not be correlated to innovation capabilities in other fields. Thus, when program managers select their former employers (i.e., "connected" firms) as recipients, they know they will deliver on the targets of the specific program they run, maybe even outperforming other grantees. The *cherry-picking view* is based on the literature on adverse selection in banking (Sengupta, 2007; Hao et al., 2012) and is based on the idea that "repeated interactions can reduce… information asymmetries" (Sengupta, 2007). In other words, lending officers "gain knowledge about payoff-relevant borrower attributes during the course of a lending relationship…" In our case, new program managers at DARPA may use the past performance information available at the agency as a selection criteria, rather than selecting grantees on the basis of their actual capabilities for the specific programs they lead. Thus, a key difference between cherry-picking and the private information view is that the former relies on observable outcomes at DARPA, rather than on the private information the PM has.

Finally. The *cronyism view* is based on the idea that PMs may provide funding to connected firms—i.e., firms in which they worked, even though they may get worse outcomes. That is, connected firms get funding not because of past performance or because of the capabilities they may have to innovate, but precisely because of the connections they have to those allocating the funding. Given that DARPA is a government agency, this view draws parallels between lending officers in state-owned banks and DARPA program managers, both of which have connections to those receiving funding (Khwaja and Mian, 2005). This view is also connected to the literature on financing misallocation due to political favors to connected CEOs and cronyism in subsidized lending (Bertrand et al., 2018; Carvalho, 2014; Lazzarini et al., 2015)

We examine the outcomes of DARPA grantees connected to program managers by looking at patents applied for and patent citation outcomes specifically related to the projects those managers run. We examine whether connected grantees (i.e., those firms in which program managers previously worked) have better innovation outcomes than non-connected grantees. We then control for a variety of variables that capture cherry-picking and cronyism.

To test these views systematically at DARPA, we obtained data on fund disbursements by grantee between 2012 and 2019 using Freedom of Information Act requests. We then combined the fund disbursement data with myriad data sources, including Congress annual budget allocation to DARPA programs and company and university grantees' characteristics using Compustat and other databases. We hand-collected the biographies of DARPA PM's both from government websites, Linkedin, and personal webpages. We further enhanced our data by merging it with each DARPA contract using USAspending.gov, which includes data such as NAICS codes that allow us to identify the industry classification of each DARPA project and contract. We use the United States Patent and Trademark Office (USPTO) databases to obtain applied patents and future patent citations—our main measure of innovation output. Lastly, we imported additional patent-related variables from the patent database of ip.com.

One objection to using patents and patent citations as outcomes is that, since DARPA is ultimately the research arm of the US military (a.k.a., the Pentagon's Brain) (Jacobsen, 2015), patents may not reflect the actual military applications the government wants for these projects. Still, we start with patents because much of the recent literature praising DARPA focuses on its capacity to create innovations that then can be used by the private sector to spur further innovation (Mazzucato, 2011; Voldsgaard et al., 2022; Block and Keller, 2015). From this point of view, patents and their citations are the appropriate outcome. Now, we also run a robustness check using future military contracts obtained by DARPA grantees (DoD contracts). That is, we take as an outcome the fact that specific grantees get further (often bigger) military contracts after they work with a specific PM at DARPA.

We find that, on average, grantees connected to PMs get more funds than the non-connected grantees. Connected grantees also get more patents and more citations 3 years after they start receiving funds from a specific project at DARPA. These results hold when counting all patents and when restricting innovation outcomes to patents that are probabilistically linked to each specific DARPA project (we use the NAICS code of each project and match it to the CPC codes of the patents). Our results are statistically significant and are also large in economic terms.

When we control for past granted patents, past citations, and past DARPA funding by grantee, as a proxy for cherry-picking, we find that the coefficient for connected grantees is still significant and of the same magnitude (within one standard error of our previous estimates). Having PMs who worked at specific firms or universities brings in additional information beyond the readily observable information that DARPA has. Thus, while we cannot rule out that PMs rely on observables to choose grantees, the hypothesis that PMs have private information still holds. Interestingly, it is PMs with industry backgrounds (as opposed to academic backgrounds) that drive most of the variation.

The literature on cherry-picking in banking pays particular attention to whether new entrants provide loans to small and medium enterprises or if they tend to focus on (cherry-pick) large existing lenders (Berger et al., 2001). When we split the sample by type of grantee (private firms, publicly-traded corporations, and universities) we find that private firms, which tend to be smaller and often newer grantees, are the ones where the private information advantage seems to matter more, as one would expect.

We also device tests for the cronyism view. When we split the sample into firms in the top 20 receivers of funds and other grantees, we find that while large connected firms get the largest share of funds from DARPA, they are not always the most successful at patenting and getting patent citations across programs. That is, firms outside the Top 20 firms have more patents granted and citations in programs in which the PM is a former employee, thus reinforcing the information view.

We also device other robustness checks, including placebo tests to see if PM past employment in specific organizations is what gives those beneficiaries an advantage in funding and outcomes, or if those outcomes are related to the firms themselves. We find that the effect is only significant for programs in which the PM is connected and not other programs in which the same firms receive funds.

Our findings reveal that PMs leverage both past performance and unique industry-specific knowledge gained through prior professional connections to select grantees capable of delivering superior innovation outcomes, as evidenced by increased patent filings, higher citation rates, and larger Department of Defense (DoD) contract awards. Contrary to concerns of cronyism, connected grantees outperform their peers, suggesting that the informational advantage of PMs outweighs any potential bias. However, the concentration of funding among a few large grantees raises questions about the inclusivity of DARPA's model in supporting smaller, nascent innovators. Still, our results underscore the importance of expertise-driven decision-making in navigating uncertainty and driving technological progress, while also advocating for strategies to balance support for established leaders and emerging disruptors in the innovation ecosystem.

The paper is divided into five sections. The second section (and the Appendices) describes the data and the challenges of collection. The third section reviews our empirical methodology. The fourth section presents our findings and the fifth section concludes.

2 Data

2.1 Data Sources

This study examines how DARPA program managers (PMs) influence innovation financing and outcomes through their funding decisions. Our analysis relies on a novel, comprehensive dataset that combines multiple sources to capture the relationships between funding allocations, social connections, and innovation outcomes.

In our study, we focus on the amount of funds awarded to grantees by DARPA. The main data source used in this paper is a match between the detailed DARPA fund disbursements between 2012 and 2019, obtained through Freedom of Information Act, and the Patent Assignment Dataset from 2005 to 2021, provided by the United States Patent and Trademark Office (USPTO). In addition to the patent outcome, we looked into the defence contracts that DARPA grantees achieved. We matched the master dataset to the Department of Defense (DoD) contracts between 2009 and 2022, obtained through the USASPENDING which provides publicly accessible data on what the federal government spends each year. Each observation in our master dataset contains DARPA grantee-project-PM-year level data on fund allocations, grantee and PM characteristics, and grantee-project outcomes.

We also match the main data to a separate dataset on project level annual fund allocation obtained from DARPA's filings to the congress to bring in DARPA program and project IDs and project level annual fund allocations. Congress data guides us to identify DARPA program structure as explained in figure 1. DARPA ran 16 programs between 2012 and 2019. A number of individual projects make up each program. We further enhance the main dataset by obtaining data on DARPA program manager (PM) backgrounds through both Freedom of Information Act requests and from the DARPA website. Additionally, we hand-collected the PMs' biographical data using LinkedIn and other online profiles. To identify public companies among DARPA grantees, we matched between the master dataset and Compustat, provided by Standard and Poor's.

The merge between DARPA fund disbursements to grantees and the USPTO dataset was performed by fuzzy matching between DARPA grantee names and patent assignees and manual revision of the matched set of DARPA grantee and patent assignees. We identified all the patents applied for by a DARPA grantee after the DARPA project start year and the patents granted to each grantee where the patent application year was before the DARPA project start year. We needed to restrict the matched patents to patents that were relevant to each DARPA project. We determined relevance of each matched patent for each grantee-project by probabilistic matching between the DARPA project NAICS code and the patent CPC code. North American Industrial Classification System (NAICS) is a 6-digit code that tells you what industry the work falls into. Each contract record has a NAICS code to record how much money the U.S. government spent in a specific industry. The list of industries and codes is updated every 5 years. The Cooperative Patent Classification

(CPC) is jointly managed by the EPO and the US Patent and Trademark Office. It is divided into nine sections, A-H and Y, which in turn are sub-divided into classes, sub-classes, groups and sub-groups. There are approximately 250,000 classification entries. To determine relevant patents, we employed the Algorithmic Link with Probabilities (ALP) crosswalk provided by Goldschlag et al. (2016) to problematically match CPC and NAICS codes. We then compared the NAICS code of the DARPA project and the probabilistically determined NAICS codes each matched patent for grantees. We considered a patent relevant if the NAICS code of the project matched the probabilistically determined NAICS code of the patent.

The merge between DARPA fund disbursements to grantees and the DoD contracts dataset was performed by fuzzy matching between DARPA grantee names and DoD contract recipients. We identified all the DoD contracts awarded to each DARPA grantee before and after the DARPA project start year. We needed to restrict the matched DoD contracts to patents that were relevant to each DARPA project. The DoD contract was considered relevant to a DARPA project if the NAICS code of the DARPA project was equal to the NAICS code of the DoD contract.

Our full sample contains 8,139 grantee-project-PM-year observations. A subsample of 4,478 observations has known project NAICS codes, allowing us to identify project-relevant innovation outcomes.

By creating a unique dataset, we would like to investigate the innovation outcome of DARPA research and development spending. We recognize that unobserved factors can get wrapped up in correlations observed in the data. We first seek to investigate certain trends in allocation of funding by DARPA program managers.

We ask whether funding can be concentrated in certain grantee types, larger firms, or returning DARPA-funded firms. Future research could enhance these findings by incorporating additional firm-level financial data and qualitative assessments of DARPA project selection criteria.

2.2 Key Variables and Measurement

2.2.1 Social Connections

Our primary variable of interest is the social connection between DARPA program managers and grantees. We define a grantee as *Connected* if we observe a past connection between the PM's background and the grantee. Specifically, we look for matches between the grantee name and organizations where the PM previously worked or studied.

Table 1 illustrates this definition with the example of Kitware, a private company that received multiple DARPA grants across different projects. Kitware became *Connected* when it received funding in 2018 for a project managed by Matt Turek, who had worked at Kitware from 2007 to 2017 before joining DARPA. For projects that started after this observed connection, Kitware is considered Connected. For earlier projects, like one that ended in 2014 before the observed connection, Kitware is considered not Connected.

We also define a *Placebo Connected* status for grantees that switch from not connected to connected during a project. These switchers are not considered Connected in our baseline regressions; they are included in the control group but analyzed separately to explore whether inherent characteristics of switchers might drive outperformance.

Table 3 shows the distribution of projects and funding between Connected and non-connected grantees across two presidential administration periods. Connected grantees constitute approximately 37 percent of our full sample and 41 percent of the subsample with known NAICS codes. While Connected grantees represent a minority of the total grantee population, they receive a disproportionate share of DARPA funding, averaging \$15.9-19.9 million per grantee compared to \$3.2-4.6 million for non-connected grantees.

Notably, funding per project for Connected grantees remained relatively stable across administration changes (\$4.9-5.5 million during 2012-2016 and 2017-2019), while funding per project for non-connected grantees decreased substantially from \$9.0 million to \$4.7 million between these periods, suggesting potential shifts in funding allocation strategies.

2.2.2 PM Degree Centrality

We test whether PMs possess private information about the grantee-project fit by directly estimating the association between PM degree centrality (*PMDC*) and grantee outcomes. *PMDC* or degree centrality of each PM considering their non-military employment measures the importance of a PM/node based on the number of direct connections they have with other PMs in the network. The degree centrality $PMDC(v)$ of a node v is defined as:

$$PMDC(v) = \frac{\deg(v)}{N-1} \tag{1}$$

where $\deg(v)$ is the number of edges connected to node v, and N is the total number of nodes in the network.

Figure 2 visualizes the PM network where nodes represent each DARPA PM in our data and edges represent connections to other DARPA PMs in our data. Two PMs are identified as connected if they worked or studied at the same organization or university. The program manager network excludes any connections they might have through the military.

2.3 Summary Statistics

DARPA funds three main types of grantees: private companies, public companies, and universities/non-profits. As shown in Figure 3, there is a relatively even distribution of funds across these three grantee types in our sample. However, the number of private companies funded by DARPA exceeds the number of public companies, suggesting that each public company receives a higher average funding amount. This pattern may reflect public companies' greater capacity to simultaneously engage in multiple projects. In our full sample, approximately 39% of grantees are private companies, 21% are public companies, and 40% are universities or non-profits. The distribution shifts in the subsample with known NAICS codes, with 48% private companies, 32% public companies, and 20% universities or non-profits.

DARPA PMs come from diverse professional backgrounds, which we categorize as: exclusively military, exclusively academic, exclusively industry, academic-military combination, or multi-industry (industry experience combined with either academic or military experience). Figure 4 reveals that a higher percentage of funds is allocated by PMs with industry or multi-industry experience. This pattern aligns with the distribution of PMs themselves, as there are more PMs with industry/multi-industry backgrounds in our sample. Specifically, 75% of PMs in our full sample have industry experience, 51% have academic research experience, and 33% have military experience (categories are not mutually exclusive).

Table 4 presents summary statistics for our key variables. Panel A shows grantee and PM characteristics, while Panel B reports innovation outcomes. Several patterns emerge:

1. The average grantee in our sample has applied for 654 patents (all patents, not just project-relevant ones), with connected grantees showing higher patent productivity.

2. Connected grantees demonstrate higher patent citation counts, suggesting that their innovations may have greater impact.

3. Grantees with past DARPA funding (75% of our sample) show different innovation patterns than first-time grantees, highlighting the importance of controlling for prior funding experience.

4. In our subsample with known NAICS codes, the average grantee has won approximately 57 DoD contracts, with Connected grantees securing larger and more numerous contracts.

3 Empirical Methodology

The core objective of this study is to examine whether DARPA Program Managers (PMs) allocate grants to firms and universities based on their private knowledge of the grantee's ability to innovate or whether they engage in cherry-picking or cronyism. To test these hypotheses, we employ an empirical framework that explores the relationship between PM connections to grantees and innovation outcomes.

Our identification strategy relies on the variation in funding allocations across grantees with and without prior employment ties to DARPA PMs. By leveraging DARPA's detailed fund disbursements and tracking grantee innovation outcomes, we estimate the impact of PM-grantee connections on patenting activity, patent citations, and subsequent Department of Defense (DoD) contract awards. To mitigate endogeneity concerns, we include program manager fixed effects, program type fixed effects, and year fixed effects in all regressions. Additionally, we explore alternative specifications to account for selection bias and omitted variable concerns.

3.1 Econometric Model

The baseline estimation equation takes the following form:

$$Y_{ijt} = \alpha + \beta_1 \text{Connected}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \tag{2}$$

where, Y_{ijt} is either the *LogGrantAmount* (the log of 1 plus the annual amount of funding for a project); the *GrantPct* (grant amount as a percentage of annual DARPA fund allocation to all grantees contracted under the project); the *LogPatentCount* applied for by grantee i after year t; or the $LogPatentCitations$ relevant to the project in which grantee i was funded (citations were counted up to three years after patent application year) by program manager j. The subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately), and patents are matched to each grantee-project by performing probabilistic mapping from the NAICS code of each contract using the CPC (industry classification) codes following Goldschlag et al. (2016). This specification also includes year (t) fixed effects, program manager (j) fixed effects, and program type (k) fixed effects (since DARPA projects are structured into three program types: basic research, applied research, and advanced technology development). We define our key variables as follows:

- Connected_{ijt} is a dummy variable equal to 1 if a DARPA PM was previously employed by the grantee. Connected_{ijt} indicates whether the grantee has a prior employment relationship with a DARPA PM managing their current grant or a PM managing their prior grants.

- γ_t represents year fixed effects to control for macroeconomic trends.

- μ_j represents PM fixed effects to control for time-invariant PM characteristics.

- δ_k represents program or program type fixed effects.

- ε_{it} is the error term clustered at the PM level.

The full sample matched to Congress budget data includes 8,139 observations for which we count of all patents or DoD contracts for the past performance and post

DARPA grant outcomes; however, for a subset of 4,478 observations with known NAICS, we restrict outcomes to relevant patents or relevant DoD contracts.

To test whether PMs actually cherry-pick grantees with good track records, we add controls for $LogPastGrantedPatents_{it}$ (1 plus the log of the number of patents granted before grantee-project start year, $LogPastPatentCitations_{it}$ (1 plus the log of total citations of $PastGrantedPatents_{it}$, and $PastDARPAFund_{it}$ (a dummy variable indicating if a grantee previously received DARPA funding). We run the following specification in an OLS panel regressions setting, using the DARPA data from 2012 to 2019:

$$\begin{aligned} Y_{ijt} = \alpha + \beta_1 \text{Connected}_{ijt} + \beta_2 \text{LogPastGrantedPatents}_{ijt} + \beta_3 \text{LogPastPatentCitations}_{ijt} \\ + \beta_4 \text{PastDARPAFund}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \tag{3}$$

To ensure the robustness of our findings, we run a variety of robustness checks, adding different controls or moving the window in which we compile patent count and citations and the results remain unchanged. We also study how the main effects change when companies are private–i.e., normally smaller, publicly traded, or when the grantee is a university. Additional tests include changing how we measure connections. Lastly, We examine the skeweness of the allocation by controlling for the effect in the top 20 beneficiaries of DARPA. We estimate models using both program type fixed effects and program-specific fixed effects.

Despite the strengths of our empirical design, potential limitations exist. First, there may be unobserved factors affecting both PM selection and grantee performance.

Second, while we control for past innovation output, some firms may receive DARPA funding due to long-term industry relationships not observable in our data. Finally, given the sensitive nature of DARPA funding, some patent innovations may not be publicly disclosed, leading to measurement error in innovation outcomes.

4 Empirical Results

4.1 DARPA Fund Allocations to Connected Grantees

Table 5 shows the amount of DARPA grants to connected grantees without controls other than year, program type and PM fixed effects. We regress *LogGrantAmount* over our dummy for Connected to see whether *Connected* grantees get more DARPA funds than non-connected recipients. We can see across the board that connected grantees do get 28 percent more annual funding, on average, with coefficients that are significant at the 1 percent level. using *Grant Pct* (annual DARPA grant as a percentage of total annual project fund allocations) Columns 3 and 4 show that *Connected* grantees receive, on average, around 2.4 percent more funding than the non-connected. This raises questions as to whether those connections denote favoritism, cherry-picking, or the allocation of funds in a counterproductive manner.

On the left-hand side of Table 5 you can see the results for our full sample and to the right of the vertical line you can see the results for a subset of the data where we did have the NAICS code of the DARPA project and could determine relevant patents. You can see that the results for the amount of funds in this subsample are similar to the results for our larger dataset.

Obviously, PMs do not make decisions on who to fund in the abstract and they use the information they have from their experience with the information available for past performance of recipients at Darpa. Thus, in table 6 we include controls for past performance of recipients in terms of the number of patents granted in the past, the citations to their patents and the past amounts received by DARPA. If recipients were chosen purely on the basis of previous performance (i.e., cherry-picking based on available information). Interestingly, the coefficients for *Connected* recipients are similar in size (and still significant at the 1 percent level) (see panel A of table 6). Similarly, panel B of table 6 that restricts the results to the subsample with known NAICS and counts only relevant patents shows a similar significant positive link between being Connected and the quantity and quality of the patent. Even if this is not conclusive, it shows that including controls for past performance does not affect these coefficients.

4.2 Innovation Outcomes of Connected Grantees

We begin the analysis by exploring whether *Connected* recipients actually end up getting more patents than non-connected recipients, using the baseline model in table 7 and including controls for past performance in table 8. For patent outcomes, we built measures of quantity and quality of total and project-relevant innovation (i.e., our measure of patents in the relevant NAICS-IPC bins for each specific DARPA project). For quantity we used *Patent Count* which is the number of patents that the grantee applied for after the project start year. We only count relevant patents according to the NAICS-IPC match of each DARPA project. As for patent quality, we built a measure of the number of future *Patent Citations* of only the project-relevant patents.

Our baseline test in table 7 shows that the coefficients for *Connected* grantees and innovation outcomes is positive and significant at the 1 percent level in most specifications. That is, *Connected* grantees do have more patents on average than non-connected recipients. The economic magnitude is also not trivial, since *Connected* grantees get around twice more patents than the average grantee (the mean number of patents for non-connected at the project-grantee-PM-year level is over 5). *Connected* also have over 2.9 times more patent citations per year than non-connected grantees (the mean is more than 18 citations per year for the non-connected.) (see panel A of table 7). Columns 5 through 8 of panel A shows that restricting the test to the subsample with known NAICS and counting only relevant patents as the innovation outcome yield a similar positive significant link between being *Connected* and the quantity and quality of innovation; however the magnitude of the link is smaller (being *Connected* is associated with 1.2 times more patent applications and 1.5 times more patent citations while the average number of applied patents and citations for the non-connected are respectively around 6 and more than 12). testing the robustness of these results, we restrict patent outcomes to three years after the observation year in panel B of table 7 which yield similar results. Although the magnitude of the positive association reduces to some extent but the results remain significant at the 1 percent level.

If PMs were influenced by cronyism only, we would not generally expect connected grantees to have a better innovation outcome relative to non-connected grantees after considering past performance. The positive link between *Connected* recipients and innovation outcome shown in table 8 suggests that the PMs might possess information beyond the grantee's past performance, which allows them to select grantees that outperform non-connected recipients. As we explain above, this is not purely a product of using available information of past performance at DARPA, because when we include those controls, the magnitude and significance for the *Connected* coefficients hold for patent outcomes and citations. That is, we cannot discard that the selection is done using previous information about patent quality.

Since DARPA PMs have a sense of urgency in their projects, one may wonder if the relevant measure of innovation outcomes should be for the entire period after the grant recipient gets funding. As a robustness check, we look at the same total and project-relevant innovation outcomes but only for the first three years after the recipient starts getting funding in a project—to minimize the possibility of counting patents that are not a direct product of the work with DARPA. Table 9 shows that *Connected* grantees still show better innovation outcomes relative to non-connected grantees.

One challenge to the *private information* hypothesis could be that since PMs are mostly drawn from large corporations that tend to be strong innovators, the information advantage we are describing is simply a product of the fact that PMs know how good those companies are (beyond their past performance at DARPA). To try to disentangle that possible cherry-picking of firms/universities versus having

PMs that select recipients on the basis of project-specific, private information they have, we devise the a placebo test. When we observe a connection between a DARPA PM and a grantee, we code all the projects they work on later as *Connected*. We then switch those grantees who were in the middle of another project prior to this observed connection to the control group in our initial evaluations. We identify these observations as *Placebo-Connected* and call them *switchers*. If the PMs are cherry-picking firms/universities because they are simply good innovators and not because they have private, project-specific information, we will find that the placebo connections will also have a significant coefficient. If these placebo-connected firms have no significant coefficient, we cannot assume that the PMs are selecting firms because they are simply good innovators. In other words, we want to find that the only connections that are significant are connections to the projects for which the connected PM selected the recipients.

The results in Table 10 show that grantees with a placebo-connection did not outperform the rest of the sample. This finding confirms that PMs are not simply selecting recipients that are good innovators. Instead, it seems that they are selecting *Connected* recipients that are good at innovating in the projects these connected PMs lead. This evidence provides further support for the private information hypothesis.

4.3 Heterogeneous Effects

Next, we explore whether there is heterogeneity in outcomes for different PM backgrounds. We divide the total effect of *Connected* into five types of PM backgrounds: Military, Academic, Industry, Multi-inudstry (for PMs who have mixed military or academic backgrounds with private sector experiences), and Military-academic (for those PMs that have military and academic backgrounds). Table 11 reports the findings. We can see that PM expertise matters both for the quantity of innovation (*Patent Counts*) and for the quality of innovation (*Patent Citations*). That is, when the recipient is connected to a PM with industry experience, the number of relevant patents applied for by the grantee is 6 to 11 percent higher. The results are even larger for *Patent Citations* (25 to 35 percent more citations).

In Table 12, we also look at the heterogeneity in the *Connected* effect for *Private* firms, *Public* firms and *Universities*. This Table shows that there are significant improvements in innovation due to PM connections when the DARPA recipients are *Private* firms. This makes sense because the largest asymmetries of information in terms of innovation performance happen when the potential recipients are private firms, which tend not to disclose a lot of information and may be smaller (or have less research experience or labs) than large publicly-traded firms like Raytheon, Boston Dynamics, or Boeing. This also supports the findings of Kerr and Nanda, who find that startups (usually private firms) tend to be more pioneering in their innovations.

4.4 Do PMs Have Private Information about the Grantee-Project Fit?

Trying to explore further the Informational Advantage of PMs, we also built a measure of PM degree centrality (*PMDC*), which counts the number of connections that a PM has to other PMs in DARPA through their work or education background. We explore the private information hypothesis by estimating the association between PM degree centrality (*PMDC*) of connected grantees and grantee outcomes. The idea here is that PMs that are more central to the network of DARPA PMs not only have private information but also receive private information from other PMs. For this exercise we restrict these *PMDC* to non-military connections and use this as a proxy for the information channel. Interacting this degree centrality (DC) measure with *Connected*, while adding controls for past performance, we see a positive link between the interaction term and the innovation outcome of the grantee (table 13). Keep in mind that the DC measure is a continuous measure while Connected is a dummy. The results reinforce the informational advantage idea.

4.5 Are PMs decisions to allocate funds influenced by capture?

Finally, we explore the possibility that there is capture at DARPA. To first establish if there is indeed capture we want to create a measure of capture. We start by creating a dummy variable that identifies the top 20 firms who capture the most cumulative funds from DARPA each observation year. We examine whether DARPA funds are captured by a few top grantees. We split our connected dummy by interacting it with our capture dummy, to see if there are significant difference between capture-connected and non-capture-connected grantees/firms. No difference or positive results in favor of the capture-connected would imply benevolent capture, while a difference in outcomes that favors better innovation for non-capture-connected would imply problematic capture.

The top 20 recipients of funds actually get around half of the funds that DARPA disburses (see table 2). Those *Top20* recipients also have big lobbying machines and have large campaign donations. Therefore, one plausible alternative explanation to what we are finding is that PMs that are *Connected* come from the largest 20 firms and the effect we find has nothing to do with project-specific private information, but are simply a product of the fact that these big firms get all the funding and tend to be the ones that innovate more than the average grantee.

In Table 14 we include an interaction of *Connected* with dummies for the *Top 20* and *Other* recipients. We can see that the coefficient for *Connected*Top 20* shows that, on average, these top recipients are not better at innovating than the average (non-Top 20) DARPA grantee, even if they receive significantly more funds. Therefore, even if we cannot fully discard the hypothesis that PMs in part do cherry-picking of the top 20 firms, the evidence we have shows that the connections of PMs with firms are correlated with more and better innovations outside the Top 20 grantees. Moreover, as we highlighted in previous sections, the coefficients are the strongest for private firms—which tend to be smaller and younger than publicly-traded firms.

In sum, the evidence in 14 is also consistent with a private information channel leading to outcomes that are better than what just using observables or cherry-picking would yield. That is, the logic of using private sector managers because of their knowledge of specific areas, can yield better outcomes because it bridges the information asymmetries PMs would otherwise face.

4.6 DoD Contract Outcomes of Connected Grantees

One potential criticism of our approach is that patents are innovation outcomes that are not good for measuring more secretive military cutting-edge frontier technologies– which is what the government wants for some DARPA projects. In fact, many argue that DARPA provides seed funding to overcome innitial discovery costs, but that the real development of some of the innovations is done once a DARPA grantee gets a large military contract Bonvillian et al. (2019). Hence, we check if our findings hold when we use future military contracts (DoD contracts) as an outcome variable. That is, we take as an outcome the fact that specific grantees get further (often bigger) military contracts after they work with a specific PM at DARPA and check if connected grantees get more (number) contracts or larger monetary amounts than non-connected parties.

Table 15, panel B, shows our results. *Connected* grantees, on average, receive 11 to 26 percent more relevant DoD contracts than the number of DoD contracts received by the non-connected, while a grantee with no DARPA PM connection and no past DoD contracts is expected to receive about 6 to 7 relevant DoD contracts. In Panel A (without controls for available information at DARPA), we also find that *Connected* grantees get larger contracts than their non-connected peers. However, these coefficients become insignificant after adding controls in Panels B and C. These findings imply that, while connections to a PM can get grantees more contracts with the DoD, those contracts may not be larger than the average for new DoD contractors. This is confirmed by well known anecdotes of DoD contracting, which argue that only very established players get the largest contracts.

5 Conclusion

This study analyzed DARPA's innovation funding model, highlighting the central role of Program Managers (PMs) in shaping technological outcomes. Our findings reinforce the idea that DARPA's decentralized, high-risk, high-reward funding strategy, combined with PM autonomy and expertise, facilitates breakthrough innovation. Using a dataset spanning 2012–2019, we examined how PMs allocate resources and assessed concerns regarding private information, cherry-picking, and cronyism.

Our results indicate that PMs rely on both past performance and industry-specific knowledge gained through prior professional connections to select grantees with strong innovation potential. Connected grantees demonstrate superior outcomes in patent filings, citation impact, and Department of Defense (DoD) contract awards, suggesting that PMs' informational advantages outweigh concerns of favoritism. However, we also find that DARPA's funding tends to concentrate among a small number of established players, something that could raise concerns about its ability to support smaller, emerging innovators.

Yet, our evidence supports the importance of a private information channel, as connected PMs that provide funding for firms or universities they worked at usually observe outcomes that are better than what they would get if they were using just observables or cherry-picking from the Top 20 Darpa performers to make their funding decisions. That is, the logic of using private sector managers because they bring knowledge of specific areas of cutting-edge innovation is supported by our tests. In fact, we find that the connections and knowledge these PMs have can yield better outcomes because they bridge the information asymmetries they would otherwise face. The counterfactual in our work is a non-connected PM, but it would be interesting to compare against a counterfactual of a civil-service, career bureaucrat in charge of promoting innovation, given that she would probably face larger asymmetries of information and would have to rely more often on existing information (i.e., cherry-picking).

Our findings underscore the value of expertise-driven decision-making in funding breakthrough technologies while also pointing to the need for policies that ensure a balance between supporting established leaders and fostering the next generation of innovators. Future research could explore mechanisms to broaden DARPA's impact by enhancing opportunities for nascent firms while maintaining the effectiveness of its existing model.

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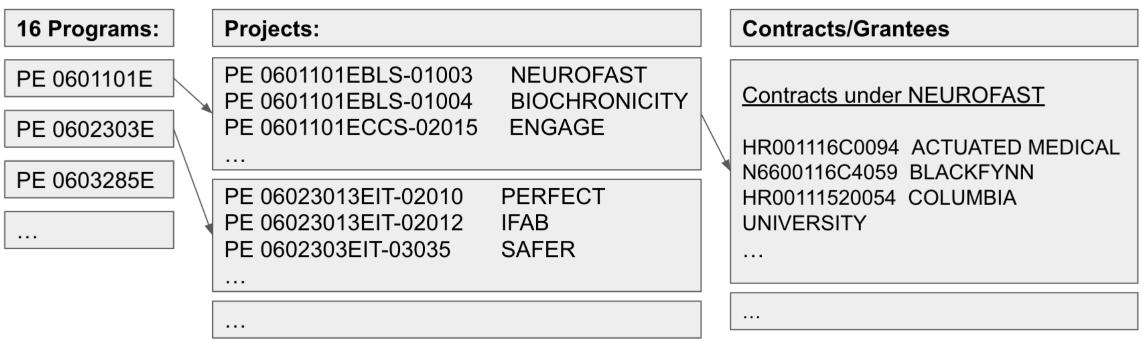
Tables and Figures

Figure 1. DARPA Program Structure

This figure explains the DARPA program structure. DARPA ran 16 programs between 2012 and 2019. A number of individual projects make up each program.
(a) The projects listed in this figure are examples of some of the projects defined under two of the 16 total higher level programs observed in our sample of DARPA detailed fund allocations to grantees. We obtained the program and project identifying codes by matching project names to projects in the DARPA's annual filings to Congress. Each project is run as funded research, performed entirely under contract with outside organizations (grantees).
(b) This table lists the 16 DARPA programs observed between 2012 and 2019 in our sample of detailed DARPA fund disbursements to grantees.



(a) Program and Project Examples

ProgramID	Name	Program Type
PE 0601101E	DEFENSE RESEARCH SCIENCES	Basic Research
PE 0601117E	BASIC OPERATIONAL MEDICAL SCIENCE	Basic Research
PE 0602115E	BIOMEDICAL TECHNOLOGY	Applied Research
PE 0602303E	INFORMATION & COMMUNICATIONS TECHNOLOGY	Applied Research
PE 0602304E	COGNITIVE COMPUTING SYSTEMS	Applied Research
PE 0602305E	MACHINE INTELLIGENCE	Applied Research
PE 0602383E	BIOLOGICAL WARFARE DEFENSE	Applied Research
PE 0602702E	TACTICAL TECHNOLOGY	Applied Research
PE 0602715E	MATERIALS AND BIOLOGICAL TECHNOLOGY	Applied Research
PE 0602716E	ELECTRONICS TECHNOLOGY	Applied Research
PE 0603286E	ADVANCED AEROSPACE SYSTEMS	Advanced Technology Development
PE 0603287E	SPACE PROGRAMS AND TECHNOLOGY	Advanced Technology Development
PE 0603739E	ADVANCED ELECTRONICS TECHNOLOGIES	Advanced Technology Development
PE 0603760E	COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS	Advanced Technology Development
PE 0603766E	NETWORK-CENTRIC WARFARE TECHNOLOGY	Advanced Technology Development
PE 0603767E	SENSOR TECHNOLOGY	Advanced Technology Development

(b) Programs and Program Types

Table 1. Kitware's Social Connection

This tables provides an example that explains how we identify social connection to DARPA PMs and define the variable *Connected*. A grantee has an observed social connection to a PM if the PM was employed by the grantee or studied there if the grantee is an academic institution. Kitware is a private company and a DARPA grantee observed our sample of DARPA fund allocations between 2012 and 2019. Kitware received multiple grants for different DARPA projects in our dataset. This table shows three of the projects that Kitware worked on. For one of the projects, Kitware received funding in 2018 and 2019. For another project, it received funding from 2015 to 2018. For a third project, Kitware received funding in 2013 and 2014. For the project that started in 2018 and was managed by Matt Turek, Kitware is considered *Connected*, because Matt Turek worked at Kitware from 2007 to 2017, before joining DARPA. For the project that started in 2015 and ended in 2018, Kitware switches in status from not connected to connected, because we observe a social connection between Kitware and a DARPA PM starting 2018. Switchers are not considered *Connected* in our baseline regressions; they are included in the control group. On a separate experiment, we define switchers as *Placebo Connected* and compare their innovation outcomes to the rest of the sample (see table 10). For any project that starts after 2018, we consider Kitware as Connected. The third project ended in 2014, which was before our observed connection of Kitware to a DARPA PM, so we consider Kitware not *Connected* for that project.

Grantee	**FY**	**Program ID**	**Program Manager**	**Connected**	**Placebo Connected**
Kitware	2013	PE 0602702ETT-13023	Christopher M. White	0	0
Kitware	2014	PE 0602702ETT-13023	Christopher M. White	0	0
Kitware	2015	PE 0602702ETT-04035	Christopher Orlowski	0	0
Kitware	2016	PE 0602702ETT-04035	Christopher Orlowski	0	0
Kitware	2017	PE 0602702ETT-04035	LTC Philip Root	0	1
Kitware	2018	PE 0602702ETT-04035	LTC Philip Root	0	1
Kitware	2018	PE 0602702ETT-13034	Matt Turek	1	0
Kitware	2019	PE 0602702ETT-13034	Matt Turek	1	0

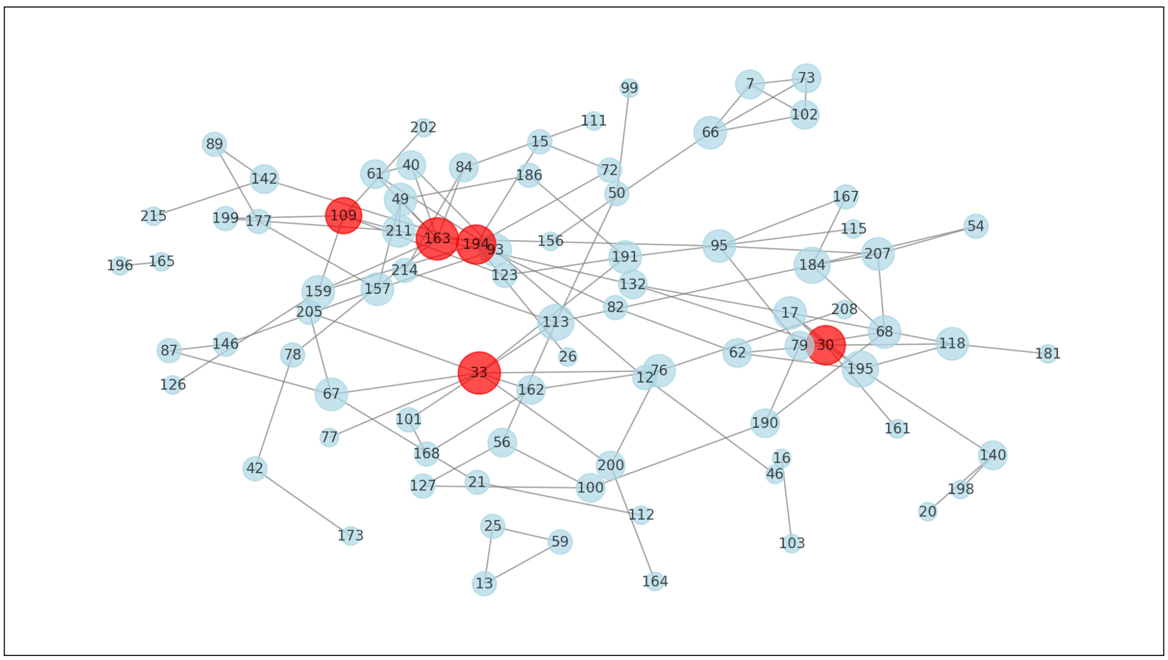
Figure 2. PM Network

This figure visualizes the DARPA PM network; Nodes represent individual PMs (IDs) and Edges represent connections (shared organization employment excluding military employment). Node sizes are scaled according to degree centrality, highlighting individuals who serve as critical intermediaries in the network.

$PMDC$ or Degree centrality of each PM considering their nonmilitary employment measures the importance of a PM/node based on the number of direct connections they have with other PMs in the network. The degree centrality $PMDC(v)$ of a node v is defined as:

$$PMDC(v) = \frac{\deg(v)}{N-1} \tag{4}$$

where $\deg(v)$ is the number of edges connected to node v, and N is the total number of nodes in the network.



Top 5 Program Managers		
PM ID	**PM Name**	**Affiliations**
33	Carl McCants	ODNI-NCSC, MD - Intelligence Advanced Research Projects Activity (IARPA), Washington DC - Booz Allen Hamilton - Agilent Technologies - Hewlett Packard
163	Reza Ghanadan	Google, CA - Algorithm Technologies LLC - Boeing, VA - BAE Systems - Flarion Tech - AT&T/Lecent Bell labs - University of Maryland
30	Brian M. Pierce	Raytheon, CA - Rockwell Scientific, CA
194	Thomas Karr	Lockheed Palo Alto Research Laboratory - Lawrence Livermore National Laboratory - RDL Space Corporation - Alamo Research - MCHI - Logos Technologies, Inc. - Northrop Grumman Electronic Systems - Raytheon Space & Airborne Systems - Alamo Rsearch
109	Joshua Baron	RAND Corporation - HRL Laboratories, LLC, CA - UCLA - NASA Jet Propulsion Laboratory - MIT Lincoln Laboratory

Table 2. Top 20 Grantees

This figure shows list of *Top20* grantees in our full sample of 8,139 observations. *Top20* equals 1 for grantees who rank in the top 20 in terms of the cumulative funds they have received from DARPA up to each fiscal year as observed in our dataset. Column 2 shows the grantee type. column 3 lists the total amount of DARPA funds each of the top 20 grantees received from 2012 to 2019. Column 4 calculates the percentage of total DARPA funds from 2012 to 2019 received by each of the grantees in our *Top20* list.

Top 20 Grantees	Grantee Type	Total DARPA Fund ($M)	Total Fund Pct
RAYTHEON BBN TECHNOLOGIES	Public	883.15	7.80
LOCKHEED MARTIN	Public	723.38	6.39
NORTHROP GRUMMAN	Public	539.81	4.77
BAE SYSTEMS	Public	488.15	4.31
MASSACHUSETTS INSTITUTE OF TECHNOLOGY	University	395.07	3.49
BOEING	Public	328.67	2.90
SRI INTERNATIONAL	Private	254.90	2.25
LEIDOS	Public	190.35	1.68
JOHNS HOPKINS UNIVERSITY	University	155.65	1.37
UNIVERSITY OF SOUTHERN CALIFORNIA	University	152.13	1.34
AURORA FLIGHT SCIENCES	Private	140.53	1.24
HRL LABORATORIES	Private	136.31	1.20
CARNEGIE MELLON UNIVERSITY	University	124.12	1.10
HARVARD COLLEGE	University	123.39	1.09
INTERNATIONAL BUSINESS MACHINES	Public	121.19	1.07
UNIVERSITY OF PENNSYLVANIA	University	116.31	1.03
BOOZ ALLEN HAMILTON	Public	115.08	1.02
MANTECH	Public	99.07	0.87
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION	Public	97.00	0.86
THE CHARLES STARK DRAPER LABORATORY	University	94.18	0.83
LELAND STANFORD JUNIOR UNIVERSITY	University	90.93	0.80
L3 TECHNOLOGIES	Public	90.70	0.80
TELEDYNE SCIENTIFIC AND IMAGING	Private	83.88	0.74
SCHAFER	Private	72.26	0.64
GENERAL ATOMICS	Private	56.68	0.50
NOVAWURKS	Private	47.15	0.42
STRATEGIC ANALYSIS	Private	45.65	0.40
BOSTON DYNAMICS	Private	40.33	0.36
DATA TACTICS	Private	25.25	0.22
GENERAL DYNAMICS	Public	14.73	0.13
Total		5,846.00	51.62

Table 3. Distribution of Connected Grantees

This table provides details on how DARPA projects and funds are distributed among *Connected* and non-connected grantees. Number of unique projects, number of unique grantees, annual funding (from DARPA), finding per project, and funding per grantee are aggregated or summarized for years 2012 to 2016 (Democratic presidential period) and 2017 to 2019 (Republican presidential period). Panel A shows the distribution for the full sample of 8,139 observations and panel B for the subsample of 4,478 observations with known project NAICS.

Panel A: Full Sample (8,139 observations)

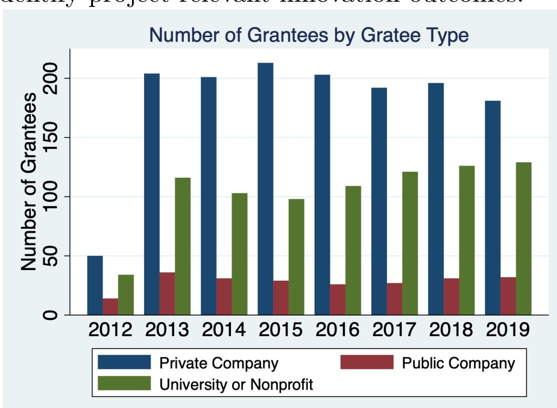
	Connected		**Not Connected**	
	2012-2016	2017-2019	2012-2016	2017-2019
# Projects	516	423	662	900
# Grantees	127	145	1,372	910
Annual Funding ($)	2,521,571,540	2,306,708,096	5,957,925,856	4,206,542,912
Funding per Project ($)	4,887,753	5,455,120	8,998,826	4,674,358
Funding per Grantee ($)	19,856,474	15,915,923	4,343,577	4,621,472

Panel B: Subsample with Known NAICS (4,478 observations)

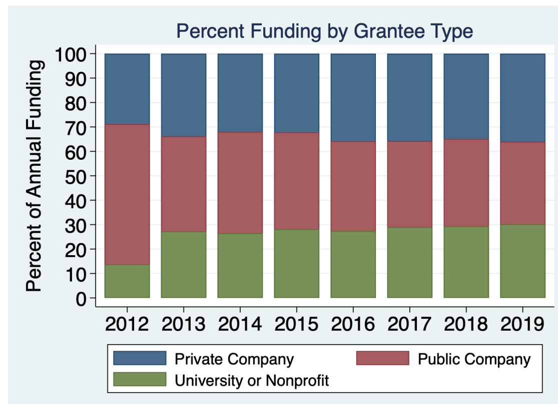
	Connected		**Not Connected**	
	2012-2016	2017-2019	2012-2016	2017-2019
# Projects	458	352	601	858
# Grantees	101	116	1,105	786
Annual Funding ($)	2,015,555,776	1,672,828,672	3,581,781,408	2,519,629,120
Funding per Project ($)	4,399,904	4,752,344	5,961,345	2,935,664
Funding per Grantee ($)	19,954,024	14,423,522	3,241,125	3,204,363

Figure 3. Distribution of DARPA Grantees and Fund Allocations to Grantees

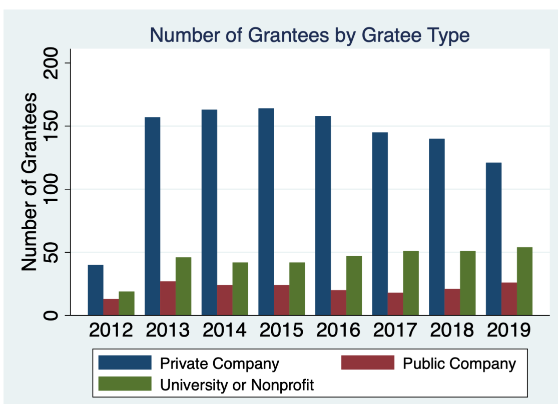
This figure presents the the distribution of grantee types and the distribution of funds allocated by grantees who are public, private, or a university or nonprofit. Public Companies are identified by matching between the DARPA dataset of detailed fund allocations to the Compustat dataset on grantee name and fiscal year. University or nonprofits are identified through grantee names and manual search of grantee backgrounds. The remaining grantees are classified as private companies. Figures (a) and (b) show the distribution of grantee types and DARPA funds allocated by Private, Public, and University or Nonprofit grantees in our full sample. Figures (c) and (d) show the distribution of grantee types and DARPA funds allocated by Private, Public, and University or Nonprofit grantees in our subsample with known project NAICS. Known project NAICS are used to identify project relevant innovation outcomes.



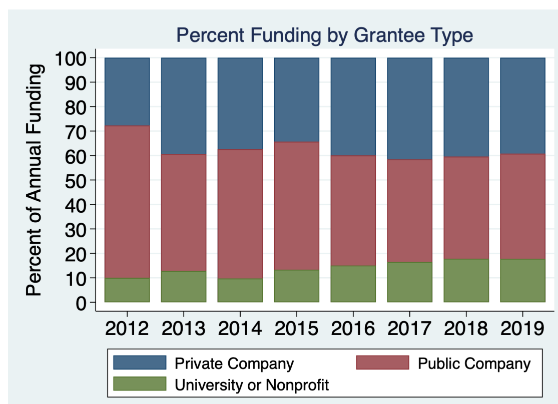
(a) Full Sample of 8,139 Observations



(b) Full Sample of 8,139 Observations



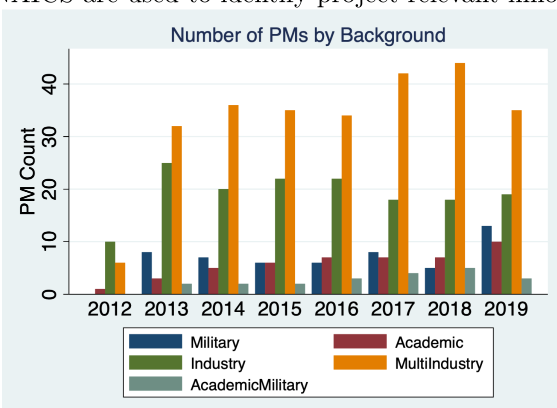
(c) Subsample of 4,478 Observations



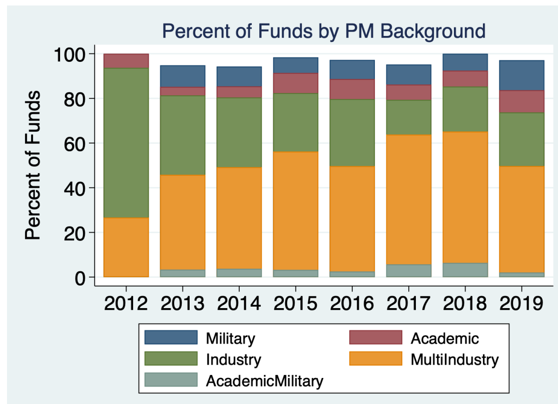
(d) Subsample of 4,478 Observations

Figure 4. Distribution of DARPA PM Backgrounds and Funds Allocated by PMs

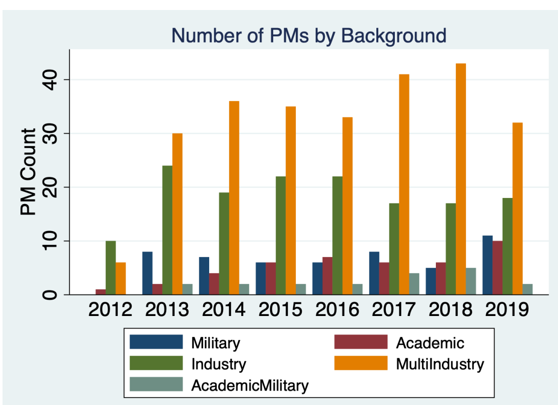
This figure presents the the distribution of PM backgrounds and the distribution of funds allocated by PMs with backgrounds in Military, Industry, and/or Academic Research backgrounds. Military refers to PMs with a background only in the military. Industry refers to PMs with a background only in the industry or the private sector. Academic refers to PMs with a background only in academic research. MultiIndustry refers to PMs who have a background in the industry and military and/or academia. AcademicMilitary refers to PMs with a background both in academia and the military. Figures (a) and (b) show the distribution of PM backgrounds and DARPA funds allocated by PMs with backgrounds in military, industry, and/or academia in our full sample. Figures (c) and (d) show the distribution of PM backgrounds and DARPA funds allocated by PMs with backgrounds in military, industry, and/or academia in our subsample with known project NAICS. Known project NAICS are used to identify project relevant innovation outcomes.



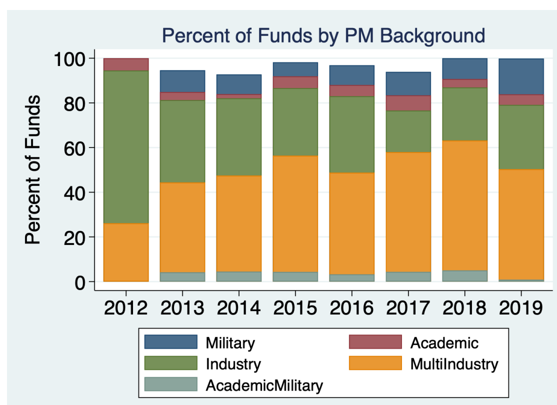
(a) Full Sample of 8,139 Observations



(b) Full Sample of 8,139 Observations



(c) Subsample of 4,478 Observations



(d) Subsample of 4,478 Observations

Table 4. Summary Statistics

Panel A presents the summary statistics of grantee and PM characteristics. $Connected$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. $PlaceboConnected$ is a dummy variable that equals 1 if the grantee-project has an observed social connection to a DARPA PM on a different concurrent project. $Public$ refers to public grantees identified by matching between the DARPA and Compustat datasets on grantee name and fiscal year. $Universityornonprofit$ grantees are identified through grantee names and manual search of grantee backgrounds. The remaining grantees are classified as $Private$ companies. $Military$ refers to PMs with a background (not exclusively) in the military. $Industry$ refers to PMs with a background (not exclusively) in the industry or the private sector. $Academic$ refers to PMs with a background (not exclusively) in academic research.

Panel B presents the summary statistics of grantee-project-PM level innovation outcomes. $PastGrantedPatents$ equals the number of patents granted before grantee-project start year and $PastPatentCitations$ equals total citations of $PastGrantedPatents$. $PastGrantedPatents(past3yrs)$ equals the number of patents granted up to three years before grantee-project start year, and $PastPatentCitations(past3yrs)$ equals total citations of $PastGrantedPatents(past3yrs)$. $PastDARPAFund$ is a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year. $PatentCount$ equals count of patents applied for by grantee i after year t. $LogPatentCitations$ equals citation count of patents applied for by grantee i after year t). $PatentCount(3yrs)$ counts patents applied for by a grantee up to three years after observation year t) and $PatentCitations(3yrs)$ counts citations of patents applied for by a grantee up to three years after year t). Citations were counted up to three years after patent application year.

Both panels report the distribution of grantee and PM characteristics and grantee-project-PM outcomes for the full sample and for the subsample of 4,478 observations with known project NAICS. A known NAICS is used to count patents and DoD contracts relevant to the DARPA project.

Panel A: Grantee and PM Characteristics								
	Full Sample				Subsample with Project-Relevant Outcomes			
	Mean	Median	Std. Dev.	Obs.	Mean	Median	Std. Dev.	Obs.
Connected	0.37	0.00	0.48	8,139	0.41	0.00	0.49	4,478
Placebo Connected	0.39	0.00	0.49	8,139	0.42	0.00	0.49	4,478
PMDC	0.02	0.01	0.03	8,139	0.02	0.01	0.03	4,478
Top20	0.32	0.00	0.46	8,139	0.39	0.00	0.49	4,478
Private	0.39	0.00	0.49	8,139	0.48	0.00	0.50	4,478
Public	0.21	0.00	0.41	8,139	0.32	0.00	0.47	4,478
University	0.40	0.00	0.49	8,139	0.20	0.00	0.40	4,478
Military	0.33	0.00	0.47	8,139	0.31	0.00	0.46	4,478
Industry	0.75	1.00	0.43	8,139	0.80	1.00	0.40	4,478
AcademicResearcher	0.51	1.00	0.50	8,139	0.48	0.00	0.50	4,478
Panel B: Grantee Outcomes								
Past Granted Patent Count	523.98	5.00	3,781.02	8,139	1.29	0.00	9.73	4,478
Past Granted Patent Citing	11,824.92	84.00	72,149.61	8,139	24.05	0.00	255.73	4,478
Past Granted Patent Count (3yrs)	187.08	1.00	1,351.07	8,139	0.66	0.00	5.06	4,478
Past Granted Patent Citing (3yrs)	753.29	4.00	4,558.17	8,139	2.36	0.00	23.73	4,478
PastDARPAFund	0.75	1.00	0.43	8,139	0.74	1.00	0.44	4,478
Applied Patent Count	654.37	3.00	5,126.25	8,139	3.63	0.00	31.01	4,478
Applied Patent Citing	4,282.21	13.00	28,795.80	8,139	21.90	0.00	243.04	4,478
Applied Patent Count (3yrs)	388.06	2.00	3,037.51	8,139	2.06	0.00	18.31	4,478
Applied Patent Citing (3yrs)	1,132.87	4.00	7,220.25	8,139	6.56	0.00	73.50	4,478
Past DOD Contracts					39.61	4.00	106.11	4,478
Past DOD Contract Amount					90,749,532.16	502,664.22	479,477,025.00	4,478
Past DOD Contracts (3 yrs)					24.66	2.00	67.21	4,478
Past DOD Contract Amount (3 yrs)					50,732,729.23	99,998.00	298,665,171.33	4,478
DOD Contracts					57.16	6.00	204.47	4,478
DOD Contract Amount					251,645,933.24	5,477,130.50	880,789,702.82	4,478
DOD Contracts (3 yrs)					45.65	5.00	136.07	4,478
DOD Contract Amount (3 yrs)					191,630,018.94	4,119,991.00	705,018,135.01	4,478

Table 5. Grantee Connections with PMs and DARPA Funding

This table examines the link between social connection to DARPA PMs and the amount of DARPA grants received by a grantee. Columns (1) through (4) report the results of the following regression for the larger subsample of 8,139 observations. Columns (5) through (8) report the regression results for a subsample with known DARPA project NAICS. A known NAICS is used to count patents or DoD contracts relevant to the DARPA project. The following OLS framework is used:

$$Y_{ijt} = \alpha + \beta_1 \text{Connected}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \quad (5)$$

clustering std errors around PM and where, Y_{ijt} is either *LogGrantAmount* (log of 1 plus the annual amount of funding for a project to a grantee), or *GrantPct* which is (*LogGrantAmount* as a percentage of annual DARPA fund allocation to all grantees contracted under the project. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program or program type (k) fixed effects; Columns (1), (3), (5), (7) include program type (k) fixed effects (since DARPA projects are structured into three program types: basic research, applied research, and advanced technology development). Columns (2), (4), (6), (8) include program (k) fixed effects since each DARPA project can be defined as part of one of 16 DARPA programs that spanned 2012 to 2019.

	Full Sample				Subsample with Project-Relevant Outcomes			
	Log Grant Amount	Log Grant Amount	Grant Pct	Grant Pct	Log Grant Amount	Log Grant Amount	Grant Pct	Grant Pct
Connected	0.251***	0.253***	2.431***	2.470***	0.208***	0.206***	2.318***	2.325***
	(0.043)	(0.043)	(0.603)	(0.602)	(0.053)	(0.053)	(0.862)	(0.856)
Constant	13.113***	12.938***	11.261***	15.626***	13.502***	13.201***	11.568**	13.932***
	(0.230)	(0.256)	(3.356)	(4.169)	(0.283)	(0.282)	(4.489)	(5.089)
Observations	8,139	8,139	8,139	8,139	4,478	4,478	4,478	4,478
R^2	0.109	0.113	0.130	0.135	0.136	0.142	0.143	0.153
ymean	13.305	13.305	13.114	13.114	13.596	13.596	16.068	16.068
ysd	1.321	1.321	18.698	18.698	1.324	1.324	20.251	20.251
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	No	Yes	No	Yes	No	Yes	No
Program FE	No	Yes	No	Yes	No	Yes	No	Yes

Table 6. Exploring Evidence of Cherry Picking: Fund Allocation to Connected Grantees

This table examines the link between grantee social connections and DARPA funding controlling for past DARPA funding and patent innovation outcomes. We run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$\begin{aligned} Y_{ijt} = \alpha &+ \beta_1 \text{Connected}_{ijt} + \beta_2 \text{LogPastGrantedPatents}_{ijt} + \beta_3 \text{LogPastPatentCitations}_{ijt} \\ &+ \beta_4 \text{PastDARPAFund}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \quad (6)$$

clustering std errors around PM and where, Y_{ijt} is either *LogGrantAmount* (the log of 1 plus the annual amount of funding for a project to a grantee), or *GrantPct* (*LogGrantAmount* as a percentage of annual DARPA fund allocation to all grantees contracted under the project). Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. To test whether PMs cherry-pick grantees with good track records, we control for $LogPastGrantedPatents_{it}$ (log of 1 plus the number of patents granted before grantee-project start year), $LogPastPatentCitations_{it}$ (log of 1 plus total citations of $LogPastGrantedPatents_{it}$), and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.
Panel A reports the results exploring the link between the *LogGrantAmount*, or *GrantPct* funded to a grantee and their social connection to a DARPA PM for the larger subsample of 8,139 observations. Panel B reports the results for a subset of the data where the NAICS code of the project is known. A known NAICS is used to count patents or DoD contracts relevant to the DARPA project.

Panel A: Full Sample								
	Log Grant Amount	Log Grant Amount	Log Grant Amount	Log Grant Amount	Grant Pct	Grant Pct	Grant Pct	Grant Pct
Connected	0.240***	0.236***	0.241***	0.237***	2.319***	2.270***	2.349***	2.298***
	(0.043)	(0.043)	(0.043)	(0.043)	(0.586)	(0.633)	(0.593)	(0.640)
Log Past Granted Patents	0.071***	0.070***			0.701**	0.699**		
	(0.024)	(0.024)			(0.344)	(0.345)		
Log Past Patent Citations			0.032**	0.032**			0.256	0.255
			(0.012)	(0.012)			(0.167)	(0.167)
Past DARPA Fund		0.013		0.013		0.173		0.179
		(0.052)		(0.052)		(0.643)		(0.642)
Constant	13.103***	13.104***	13.106***	13.106***	11.170***	11.175***	11.206***	11.211***
	(0.231)	(0.231)	(0.231)	(0.231)	(3.341)	(3.338)	(3.346)	(3.343)
Observations	8,139	8,139	8,139	8,139	8,139	8,139	8,139	8,139
R^2	0.110	0.110	0.110	0.110	0.131	0.131	0.131	0.131
ymean	13.305	13.305	13.305	13.305	13.114	13.114	13.114	13.114
ysd	1.321	1.321	1.321	1.321	18.698	18.698	18.698	18.698
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Panel B: Subsample with Project-Relevant Outcomes								
	Log Grant Amount	Log Grant Amount	Log Grant Amount	Log Grant Amount	Grant Pct	Grant Pct	Grant Pct	Grant Pct
Connected	0.184***	0.140**	0.188***	0.143***	2.025**	1.593*	2.117**	1.679*
	(0.053)	(0.054)	(0.054)	(0.054)	(0.851)	(0.915)	(0.866)	(0.928)
Log Past Granted Patents	0.112***	0.108***			1.372**	1.336**		
	(0.031)	(0.032)			(0.537)	(0.534)		
Log Past Patent Citations			0.043***	0.041**			0.429	0.409
			(0.016)	(0.016)			(0.265)	(0.263)
Past DARPA Fund		0.146**		0.147**		1.426		1.451
		(0.064)		(0.064)		(0.986)		(0.986)
Constant	13.477***	13.503***	13.485***	13.511***	11.265**	11.521**	11.400**	11.660***
	(0.284)	(0.278)	(0.284)	(0.277)	(4.461)	(4.451)	(4.479)	(4.468)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.138	0.140	0.137	0.139	0.145	0.145	0.144	0.144
ymean	13.596	13.596	13.596	13.596	16.068	16.068	16.068	16.068
ysd	1.324	1.324	1.324	1.324	20.251	20.251	20.251	20.251
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Table 7. PM Connections and Grantee Innovation Outcomes

This table examines the link between social connection to DARPA PMs and the amount of DARPA grants received by a grantee. Columns (1) through (4) report the results of the following regression for the larger subsample of 8,139 observations. Columns (5) through (8) report the regression results for a subsample with known DARPA project NAICS, that is, in columns (5) through (8) *LogPatentCount* and *LogPatentCitation* count relevant patents and their citations as a measure of innovation outcome. A known NAICS is used to count patents or DoD contracts relevant to the DARPA project. The following OLS framework is used:

$$Y_{ijt} = \alpha + \beta_1 \text{Connected}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \tag{7}$$

clustering std errors around PM and where, Y_{ijt} is either *LogPatentCount* (log of 1 plus count of patents applied for by grantee i after year t), or *LogPatentCitations* (log of 1 plus citation count of patents applied for by grantee i after year t). Citations were counted up to three years after patent application year). *LogPatentCount* and *LogPatentCitations* in columns (1) through (4) count all patents applied by grantee i who was funded by program manager j. Columns (5) through (8) count patents restricting them to patents relevant to the project in which grantee i was funded by program manager j. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program or program type (k) fixed effects; Columns (1), (3), (5), (7) include program type (k) fixed effects (since DARPA projects are structured into three program types: basic research, applied research, and advanced technology development). Columns (2), (4), (6), (8) include program (k) fixed effects since each DARPA project can be defined as part of one of 16 DARPA programs that spanned 2012 to 2019.
Panel A counts all patents (nonrestricted patents for the full sample and relevant patents for the subsample of 4,478 observations with known project NAICS) applied for by grantee i after year (t) up to year 2021. Panel B counts only patents where the patent application year is up to three years after year (t). *PatentCitations* are counted up to three years after patent application year.

Panel A: Total Patent Outcomes

	All Applied Patents				Project-Relevant Applied Patents			
	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation
Connected	1.093***	1.095***	1.349***	1.351***	0.806***	0.801***	0.929***	0.922***
	(0.113)	(0.113)	(0.146)	(0.147)	(0.134)	(0.134)	(0.178)	(0.178)
Constant	2.099***	1.762***	3.378***	2.941***	1.886***	1.733***	2.744***	2.475***
	(0.370)	(0.472)	(0.512)	(0.647)	(0.532)	(0.603)	(0.730)	(0.820)
Observations	8,139	8,139	8,139	8,139	4,478	4,478	4,478	4,478
R^2	0.078	0.082	0.078	0.082	0.110	0.116	0.109	0.115
ymean	2.352	2.352	3.248	3.248	2.305	2.305	3.219	3.219
ysd	2.708	2.708	3.483	3.483	2.630	2.630	3.405	3.405
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	No	Yes	No	Yes	No	Yes	No
Program FE	No	Yes	No	Yes	No	Yes	No	Yes

Panel B: Patent Outcomes within 3 years

	Log Patent Count (3 yrs)	Log Patent Count (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Count (3 yrs)	Log Patent Count (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Citation (3 yrs)
Connected	0.995***	0.997***	1.206***	1.206***	0.227***	0.224***	0.325***	0.320***
	(0.104)	(0.105)	(0.127)	(0.127)	(0.030)	(0.030)	(0.042)	(0.041)
Constant	1.784***	1.492***	2.322***	1.962***	0.225**	0.355***	0.305**	0.517***
	(0.344)	(0.435)	(0.415)	(0.526)	(0.087)	(0.100)	(0.120)	(0.136)
Observations	8,139	8,139	8,139	8,139	4,478	4,478	4,478	4,478
R^2	0.077	0.081	0.081	0.085	0.090	0.095	0.100	0.107
ymean	2.122	2.122	2.557	2.557	0.185	0.185	0.247	0.247
ysd	2.499	2.499	2.961	2.961	0.689	0.689	0.932	0.932
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	No	Yes	No	Yes	No	Yes	No
Program FE	No	Yes	No	Yes	No	Yes	No	Yes

Table 8. Exploring Evidence of Cherry Picking: Innovation Outcomes of Connected Grantees

This table examines the link between grantee social connections and innovation outcomes of DARPA grantees controlling for past DARPA funding and patent innovation outcomes. We run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$
\begin{aligned}
Y_{ijt} = \alpha &+ \beta_1 \text{Connected}_{ijt} + \beta_2 \text{LogPastGrantedPatents}_{ijt} + \beta_3 \text{LogPastPatentCitations}_{ijt} \\
&+ \beta_4 \text{PastDARPAFund}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \qquad (8)
\end{aligned}
$$

clustering std errors around PM and where, Y_{ijt} is either the *LogPatentCount* (log of 1 plus count of patents applied for by grantee i after year t), or the *LogPatentCitations* (log of 1 plus citation count of patents applied for by grantee i after year t). Citations were counted up to three years after patent application year. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. To test whether PMs cherry-pick grantees with good track records, we control for $LogPastGrantedPatents_{it}$ (log of 1 plus the number of patents granted before grantee-project start year), $PastPatentCitations_{it}$ (log of 1 plus total citations of $LogPastGrantedPatents_{it}$), and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.
Panel A reports the results for the larger subsample of 8,139 observations where *PatentCount* and *PatentCitations* count all patents applied for by grantee i who was funded by program manager j up to year 2021 (i.e. patents are not restricted by their relevance). Panel B reports the results for a subsample of 4,478 observations where the NAICS of the project is known and *PatentCount* and *PatentCitations* count only relevant patents applied for by grantee i who was funded by program manager j. A known NAICS is used to count patents relevant to the DARPA project.

Panel A: Full Sample with All Patent Outcomes								
	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation	Log Patent Citation	Log Patent Citation
Connected	0.353***	0.310***	0.476***	0.423***	0.353***	0.310***	0.476***	0.423***
	(0.072)	(0.074)	(0.079)	(0.082)	(0.072)	(0.074)	(0.079)	(0.082)
Log Past Granted Patents	1.091***	1.091***			1.091***	1.091***		
	(0.011)	(0.011)			(0.011)	(0.011)		
Log Past Patent Citations			0.692***	0.692***			0.692***	0.692***
			(0.008)	(0.008)			(0.008)	(0.008)
Past DARPA Fund		0.151**		0.185**		0.151**		0.185**
		(0.075)		(0.081)		(0.075)		(0.081)
Constant	1.211***	1.215***	0.934***	0.939***	1.211***	1.215***	0.934***	0.939***
	(0.351)	(0.354)	(0.357)	(0.360)	(0.351)	(0.354)	(0.357)	(0.360)
Observations	8,139	8,139	8,139	8,139	8,139	8,139	8,139	8,139
R^2	0.729	0.729	0.688	0.688	0.729	0.729	0.688	0.688
ymean	3.248	3.248	3.248	3.248	3.248	3.248	3.248	3.248
ysd	3.483	3.483	3.483	3.483	3.483	3.483	3.483	3.483
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No
Panel B: Subsample with Project-Relevant Patent Outcomes								
Connected	0.618***	0.663***	0.613***	0.660***	0.712***	0.793***	0.707***	0.791***
	(0.138)	(0.145)	(0.140)	(0.146)	(0.184)	(0.191)	(0.186)	(0.192)
Log Past Granted Patents	0.878***	0.882***			1.016***	1.023***		
	(0.145)	(0.145)			(0.174)	(0.173)		
Log Past Patent Citations			0.410***	0.412***			0.472***	0.476***
			(0.064)	(0.064)			(0.078)	(0.078)
Past DARPA Fund		-0.148		-0.156		-0.269		-0.278
		(0.147)		(0.145)		(0.194)		(0.192)
Constant	1.692***	1.666***	1.726***	1.698***	2.520***	2.471***	2.559***	2.509***
	(0.502)	(0.501)	(0.501)	(0.500)	(0.692)	(0.690)	(0.690)	(0.689)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.151	0.151	0.149	0.149	0.141	0.142	0.139	0.140
ymean	2.305	2.305	2.305	2.305	3.219	3.219	3.219	3.219
ysd	2.630	2.630	2.630	2.630	3.405	3.405	3.405	3.405
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Table 9. Exploring Evidence of Cherry Picking: Innovation Outcomes of Connected Grantees, Robustness When Restricting Patent Outcome to 3 Years

This table examines the link between grantee social connections and innovation outcomes of DARPA grantees controlling for past DARPA funding and patent innovation outcomes. We run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$\begin{aligned} Y_{ijt} = \alpha &+ \beta_1 \text{Connected}_{ijt} + \beta_2 \text{LogPastGrantedPatents (past 3 yrs)}_{ijt} \\ &+ \beta_3 \text{LogPastPatentCitations (past 3 yrs)}_{ijt} + \beta_4 \text{PastDARPAFund}_{ijt} \\ &+ \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \quad (9)$$

clustering std errors around PM and where, Y_{ijt} is either the $PatentCount(3yrs)$ (log of 1 plus count of patents applied for by grantee i up to three years after year t), or the $PatentCitations(3yrs)$ (log of 1 plus citation count of patents applied for by grantee i up to three years after year t). Citations were counted up to three years after patent application year. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. To test whether PMs cherry-pick grantees with good track records, we control for $PastGrantedPatents(past3yrs)_{it}$ (log of 1 plus the number of patents granted up to three years before grantee-project start year), $LogPastPatentCitations(past3yrs)_{it}$ (log of 1 plus total citations of $PastGrantedPatents(past3yrs_{it})$, and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.

Panel A reports the results for the larger subsample of 8,139 observations where $PatentCount(3yrs)$ and $PatentCitations(3yrs)$ count all patents applied for by grantee i who was funded by program manager j up to three years after the observation year t (i.e. patents are not restricted by their relevance). Panel B reports the results for a subsample of 4,478 observations where the NAICS of the project is known and ($PatentCount(3yrs)$ and $PatentCitations(3yrs)$ count only relevant patents applied for by grantee i who was funded by program manager j. A known NAICS is used to count patents relevant to the DARPA project.

Panel A: Full Sample with All Patent Outcomes

	Log Patent count (3 yrs)	Log Patent count (3 yrs)	Log Patent count (3 yrs)	Log Patent count (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Citation (3 yrs)
Connected	0.120***	0.085***	0.158***	0.118***	0.203***	0.154***	0.236***	0.181***
	(0.031)	(0.031)	(0.035)	(0.035)	(0.045)	(0.046)	(0.047)	(0.048)
Log Past Granted Patents	1.051***	1.051***			1.205***	1.205***		
(past 3 yrs)	(0.005)	(0.005)			(0.008)	(0.008)		
Log Past Patent Citations			0.814***	0.814***			0.944***	0.944***
(past 3 yrs)			(0.004)	(0.004)			(0.006)	(0.006)
Past DARPA Fund		0.122***		0.140***		0.172***		0.192***
		(0.034)		(0.040)		(0.048)		(0.052)
Constant	0.113	0.117	0.087	0.090	0.407*	0.412*	0.354*	0.359*
	(0.158)	(0.159)	(0.141)	(0.143)	(0.232)	(0.234)	(0.209)	(0.211)
Observations	8,139	8,139	8,139	8,139	8,139	8,139	8,139	8,139
R^2	0.900	0.901	0.869	0.869	0.851	0.851	0.838	0.839
ymean	2.122	2.122	2.122	2.122	2.557	2.557	2.557	2.557
ysd	2.499	2.499	2.499	2.499	2.961	2.961	2.961	2.961
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Panel B: Subsample with Project-Relevant Patent Outcomes

	Log Patent count (3 yrs)	Log Patent count (3 yrs)	Log Patent count (3 yrs)	Log Patent count (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Citation (3 yrs)	Log Patent Citation (3 yrs)
Connected	0.060***	0.053***	0.091***	0.081***	0.113***	0.099***	0.149***	0.131***
	(0.019)	(0.019)	(0.018)	(0.019)	(0.028)	(0.030)	(0.027)	(0.028)
Log Past Granted Patents	1.210***	1.209***			1.537***	1.536***		
(past 3 yrs)	(0.033)	(0.033)			(0.046)	(0.046)		
Log Past Patent Citations			0.798***	0.798***			1.034***	1.034***
(past 3 yrs)			(0.038)	(0.038)			(0.046)	(0.046)
Past DARPA Fund		0.021		0.033**		0.044*		0.059**
		(0.015)		(0.016)		(0.023)		(0.024)
Constant	0.010	0.013	0.042	0.047	0.032	0.039	0.068	0.078
	(0.049)	(0.048)	(0.051)	(0.051)	(0.077)	(0.076)	(0.078)	(0.078)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.797	0.797	0.735	0.735	0.722	0.722	0.689	0.690
ymean	0.185	0.185	0.185	0.185	0.247	0.247	0.247	0.247
ysd	0.689	0.689	0.689	0.689	0.932	0.932	0.932	0.932
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Table 10. DARPA PMs' Expertise in Selecting Grantees for Projects

This table examines whether the PMs have private information about the grantee-project fit that leads to superior innovation outcomes of DARPA grantees controlling for past DARPA funding and patent innovation outcomes. We create a placebo connection for connected grantees in projects where they switch to a connected status on a different project. We test the innovation outcomes of *Placeboo Connected* against the rest of the sample (see table 1 for an example explaining the definition of *Placebo Connected*). We run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$\begin{aligned} Y_{ijt} = \alpha &+ \beta_1 \text{Placebo Connected}_{ijt} + \beta_2 \text{LogPastGrantedPatents}_{ijt} + \beta_3 \text{LogPastPatentCitations}_{ijt} \\ &+ \beta_4 \text{PastDARPAFund}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \tag{10}$$

clustering std errors around PM and where, Y_{ijt} is either $PatentCount$ (log of 1 plus count of patents applied for by grantee i after year t), or $LogPatentCitations$ (log of 1 plus citation count of patents applied for by grantee i after year t). Citations were counted up to three years after patent application year. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $PlaceboConnected_{it}$ is a dummy variable that equals 1 if the grantee-project has an observed social connection to a DARPA PM on a different concurrent project. We keep the controls for $LogPastGrantedPatents_{it}$ (log of 1 plus the number of patents granted before grantee-project start year), $PastPatentCitations_{it}$ (log of 1 plus total citations of $PastGrantedPatents_{it}$), and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.
Panel A reports the results for the larger subsample of 8,139 observations where $PatentCount$ and $PatentCitations$ count all patents applied for by grantee i who was funded by program manager j up to year 2021 (i.e. patents are not restricted by their relevance). Panel B reports the results for a subsample of 4,478 observations where the NAICS of the project is known and $PatentCount$ and $PatentCitations$ count only relevant patents applied for by grantee i who was funded by program manager j. A known NAICS is used to count patents relevant to the DARPA project.

Panel A: Full Sample with All Patent Outcomes

	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation	Log Patent Citation	Log Patent Citation
Placebo Connected	-0.350	-0.384	-0.340	-0.383	-0.350	-0.384	-0.340	-0.383
	(0.306)	(0.308)	(0.312)	(0.315)	(0.306)	(0.308)	(0.312)	(0.315)
Log Past Granted Patents	1.102***	1.099***			1.102***	1.099***		
	(0.011)	(0.011)			(0.011)	(0.011)		
Log Past Patent Citations			0.700***	0.699***			0.700***	0.699***
			(0.007)	(0.007)			(0.007)	(0.007)
Past DARPA Fund		0.281***		0.362***		0.281***		0.362***
		(0.074)		(0.079)		(0.074)		(0.079)
Constant	1.211***	1.203***	0.950**	0.940**	1.211***	1.203***	0.950**	0.940**
	(0.365)	(0.369)	(0.374)	(0.378)	(0.365)	(0.369)	(0.374)	(0.378)
Observations	8,139	8,139	8,139	8,139	8,139	8,139	8,139	8,139
R^2	0.727	0.728	0.684	0.685	0.727	0.728	0.684	0.685
ymean	3.248	3.248	3.248	3.248	3.248	3.248	3.248	3.248
ysd	3.483	3.483	3.483	3.483	3.483	3.483	3.483	3.483
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Panel B: Subsample with Project-Relevant Patent Outcomes

	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation	Log Patent Citation	Log Patent Citation
Placebo Connected	0.384	0.364	0.307	0.289	0.377	0.368	0.289	0.282
	(0.408)	(0.409)	(0.408)	(0.410)	(0.525)	(0.527)	(0.527)	(0.530)
Log Past Granted Patents	0.950***	0.942***			1.098***	1.095***		
	(0.138)	(0.137)			(0.165)	(0.163)		
Log Past Patent Citations			0.446***	0.442***			0.513***	0.512***
			(0.060)	(0.060)			(0.073)	(0.073)
Past DARPA Fund		0.126		0.117		0.060		0.050
		(0.141)		(0.140)		(0.190)		(0.188)
Constant	1.878***	1.889***	1.900***	1.911***	2.724***	2.729***	2.751***	2.756***
	(0.527)	(0.528)	(0.524)	(0.525)	(0.721)	(0.721)	(0.716)	(0.717)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.140	0.140	0.138	0.138	0.132	0.132	0.130	0.130
ymean	2.305	2.305	2.305	2.305	3.219	3.219	3.219	3.219
ysd	2.630	2.630	2.630	2.630	3.405	3.405	3.405	3.405
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Table 11. Source of PM Expertise

This table examines the source of program managers' expertise. We identify PMs' backgrounds as experienced in *Military*, for PMs with a background exclusively in the military, *Industry*, for PMs with a background exclusively in the industry or the private sector, *Academic*, for PMs with a background exclusively in academic research. We also define *MultiIndustry* equal to 1 for PMs with backgrounds in the industry and the military and/or academia, and *MilitaryAcademic* equal to 1 for PMs with backgrounds both in the military and academia. We interact *Connected* with each PM background dummy variable and run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$\begin{aligned} Y_{ijt} = \alpha &+ \beta_1 \text{Connected}_{ijt} * \text{Military}_{ijt} + \beta_2 \text{Connected}_{ijt} * \text{Academic}_{ijt} \\ &+ \beta_3 \text{Connected}_{ijt} * \text{Industry}_{ijt} + \beta_4 \text{Connected}_{ijt} * \text{MultiIndustry}_{ijt} \\ &+ \beta_5 \text{Connected}_{ijt} * \text{MilitaryAcademic}_{ijt} \\ &+ \beta_6 \text{LogPastGrantedPatents}_{ijt} + \beta_7 \text{LogPastPatentCitations}_{ijt} \\ &+ \beta_8 \text{PastDARPAFund}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \tag{11}$$

clustering std errors around PM and where, Y_{ijt} is either the *LogPatentCount* (log of 1 plus count of patents applied for by grantee i after year t), or the *LogPatentCitations* (log of 1 plus citation count of patents applied for by grantee i after year t). Citations were counted up to three years after patent application year. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. To test whether PMs cherry-pick grantees with good track records, we control for $LogPastGrantedPatents_{it}$ (log of 1 plus the number of patents granted before grantee-project start year), $PastPatentCitations_{it}$ (log of 1 plus total citations of $LogPastGrantedPatents_{it}$), and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.

This reports the results for a subsample of 4,478 observations where the NAICS of the project is known and *PatentCount* and *PatentCitations* count only relevant patents applied for by grantee i who was funded by program manager j. A known NAICS is used to count patents relevant to the DARPA project.

	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation	Log Patent Citation	Log Patent Citation
Military*Connected	0.075	0.075	0.124	0.125	0.173	0.161	0.241	0.230
	(0.086)	(0.086)	(0.106)	(0.106)	(0.137)	(0.137)	(0.167)	(0.167)
Academic*Connected	0.183*	0.182*	0.162	0.163	0.442**	0.432**	0.413*	0.404*
	(0.099)	(0.099)	(0.114)	(0.114)	(0.213)	(0.213)	(0.228)	(0.228)
Industry*Connected	0.064*	0.064*	0.107***	0.108***	0.241***	0.227***	0.299***	0.287***
	(0.035)	(0.036)	(0.039)	(0.040)	(0.069)	(0.070)	(0.074)	(0.075)
MultiIndustry*Connected	0.095***	0.094***	0.083**	0.084**	0.282***	0.270***	0.263***	0.253***
	(0.031)	(0.032)	(0.036)	(0.036)	(0.055)	(0.057)	(0.057)	(0.057)
MilitaryAcademic*Connected	-0.098	-0.099	-0.088	-0.087	-0.129	-0.142	-0.120	-0.131
	(0.105)	(0.105)	(0.143)	(0.143)	(0.211)	(0.211)	(0.247)	(0.247)
Log Past Granted Patents	1.071***	1.071***			1.512***	1.511***		
	(0.037)	(0.037)			(0.052)	(0.052)		
Log Past Patent Citations			0.465***	0.465***			0.661***	0.661***
			(0.024)	(0.024)			(0.032)	(0.032)
PastDARPAFund		0.002		-0.003		0.042		0.035
		(0.019)		(0.021)		(0.031)		(0.033)
Constant	0.287***	0.288***	0.320***	0.320***	0.515***	0.520***	0.558***	0.562***
	(0.075)	(0.075)	(0.095)	(0.096)	(0.133)	(0.133)	(0.160)	(0.160)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.766	0.766	0.645	0.645	0.683	0.683	0.589	0.589
ymean	0.250	0.250	0.250	0.250	0.395	0.395	0.395	0.395
ysd	0.796	0.796	0.796	0.796	1.230	1.230	1.230	1.230
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Table 12. Heterogeneity of Grantee Outcomes

This table examines the heterogeneity of fund allocations to and the innovation outcomes of different grantee types. Grantees are classified as *Public*, *University*, or *Private*. *Public* refers to public grantees identified by matching between the DARPA and Compustat datasets on grantee name and fiscal year. *University* or nonprofit grantees are identified through grantee names and manual search of grantee backgrounds. The remaining grantees are classified as *Private* companies. We interact *Connected* with each grantee type dummy variable and run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$\begin{aligned} Y_{ijt} = \alpha &+ \beta_1 \text{Connected}_{ijt} * \text{Public}_{ijt} + \beta_2 \text{Connected}_{ijt} * \text{Private}_{ijt} + \beta_3 \text{Connected}_{ijt} * \text{University}_{ijt} \\ &+ \beta_4 \text{LogPastGrantedPatents}_{ijt} + \beta_5 \text{LogPastPatentCitations}_{ijt} \\ &+ \beta_6 \text{PastDARPAFund}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \quad (12)$$

clustering std errors around PM. Y_{ijt} is either *LogGrantAmount* (the log of 1 plus the annual amount of funding for a project to a grantee), or *GrantPct* (*LogGrantAmount* as a percentage of annual DARPA fund allocation to all grantees contracted under the project) in Panels A and B. Y_{ijt} is either *LogPatentCount* (log of 1 plus count of patents applied for by grantee i after year t), or *LogPatentCitations* (log of 1 plus citation count of patents applied for by grantee i after year t) in Panels C and D. Citations were counted up to three years after patent application year. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately).
$Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. To test whether PMs cherry-pick grantees with good track records, we control for $LogPastGrantedPatents_{it}$ (log of 1 plus the number of patents granted before grantee-project start year), $PastPatentCitations_{it}$ (log of 1 plus total citations of $LogPastGrantedPatents_{it}$), and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.
This reports the results for a subsample of 4,478 observations where the NAICS of the project is known and *PatentCount* and *PatentCitations* count only relevant patents applied for by grantee i who was funded by program manager j. A known NAICS is used to count patents relevant to the DARPA project.

Panel A: Annual DARPA Grant - Total Effects

	Log Grant Amount	Log Grant Amount	Log Grant Amount	Log Grant Amount	Grant Pct	Grant Pct	Grant Pct	Grant Pct
Public*Connected	0.232***	0.186***	0.240***	0.194***	3.513***	3.134***	3.633***	3.254***
	(0.068)	(0.068)	(0.068)	(0.068)	(1.104)	(1.175)	(1.120)	(1.188)
Private*Connected	0.365***	0.319***	0.366***	0.321***	3.589***	3.212**	3.590***	3.211**
	(0.081)	(0.081)	(0.081)	(0.081)	(1.379)	(1.423)	(1.381)	(1.424)
University*Connected	-0.034	-0.070	-0.047	-0.081	-1.730	-2.029	-1.799	-2.089
	(0.096)	(0.098)	(0.098)	(0.099)	(1.490)	(1.503)	(1.528)	(1.538)
Log Past Granted Patents	0.131***	0.127***			1.501***	1.467***		
	(0.033)	(0.033)			(0.544)	(0.542)		
Log Past Patent Citations			0.058***	0.055***			0.585**	0.565**
			(0.016)	(0.016)			(0.276)	(0.275)
PastDARPAFund		0.143**		0.141**		1.175		1.176
		(0.063)		(0.063)		(0.976)		(0.975)
Constant	13.140***	13.159***	13.143***	13.161***	13.058**	13.211***	13.132**	13.288***
	(0.280)	(0.279)	(0.279)	(0.278)	(5.067)	(5.072)	(5.073)	(5.079)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.149	0.150	0.148	0.150	0.160	0.160	0.159	0.160
ymean	13.596	13.596	13.596	13.596	16.068	16.068	16.068	16.068
ysd	1.324	1.324	1.324	1.324	20.251	20.251	20.251	20.251
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Panel B: Annual DARPA Grant - Marginal Effects

	Log Grant Amount	Log Grant Amount	Log Grant Amount	Log Grant Amount	Grant Pct	Grant Pct	Grant Pct	Grant Pct
Private*Connected	0.858***	0.850***	0.848***	0.840***	8.039***	8.031***	7.913***	7.901***
	(0.127)	(0.129)	(0.127)	(0.129)	(2.158)	(2.160)	(2.152)	(2.155)
University*Connected	0.283*	0.284*	0.275*	0.275*	2.528	2.528	2.444	2.445
	(0.163)	(0.163)	(0.164)	(0.164)	(2.673)	(2.673)	(2.680)	(2.680)
Connected	-0.355***	-0.358***	-0.346***	-0.349***	-3.168*	-3.172*	-3.054*	-3.060*
	(0.095)	(0.094)	(0.095)	(0.094)	(1.698)	(1.707)	(1.701)	(1.710)
Private	-0.744***	-0.737***	-0.742***	-0.735***	-8.187***	-8.179***	-8.190***	-8.178***
	(0.083)	(0.084)	(0.083)	(0.084)	(1.483)	(1.498)	(1.473)	(1.487)
University	-0.557***	-0.556***	-0.562***	-0.561***	-7.939***	-7.937***	-7.986***	-7.984***
	(0.130)	(0.129)	(0.130)	(0.130)	(2.068)	(2.069)	(2.079)	(2.080)
Log Past Granted Patents	0.107***	0.106***			1.290**	1.289**		
	(0.033)	(0.033)			(0.543)	(0.543)		
Log Past Patent Citations			0.042***	0.042***			0.452*	0.452*
			(0.016)	(0.016)			(0.270)	(0.270)
PastDARPAFund		0.027		0.028		0.031		0.045
		(0.063)		(0.063)		(0.974)		(0.974)
Constant	13.639***	13.638***	13.644***	13.643***	18.700***	18.699***	18.799***	18.797***
	(0.290)	(0.290)	(0.290)	(0.290)	(4.966)	(4.960)	(4.973)	(4.968)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.171	0.171	0.170	0.170	0.172	0.172	0.171	0.171
ymean	13.596	13.596	13.596	13.596	16.068	16.068	16.068	16.068
ysd	1.324	1.324	1.324	1.324	20.251	20.251	20.251	20.251
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Panel C: Patent Outcome - Total Effects	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation	Log Patent Citation	Log Patent Citation
Public*Connected	0.023	0.023	0.089***	0.093***	0.111**	0.100**	0.203***	0.198***
	(0.024)	(0.025)	(0.030)	(0.031)	(0.043)	(0.044)	(0.052)	(0.053)
Private*Connected	0.316***	0.316***	0.325***	0.329***	0.853***	0.842***	0.866***	0.861***
	(0.032)	(0.033)	(0.031)	(0.032)	(0.077)	(0.078)	(0.077)	(0.078)
University*Connected	0.019	0.019	-0.085	-0.082	0.112	0.104	-0.042	-0.047
	(0.042)	(0.043)	(0.052)	(0.052)	(0.073)	(0.074)	(0.080)	(0.080)
Log Past Granted Patents	1.083***	1.083***			1.542***	1.541***		
	(0.037)	(0.037)			(0.053)	(0.053)		
Log Past Patent Citations			0.476***	0.476***			0.685***	0.684***
			(0.024)	(0.024)			(0.033)	(0.033)
PastDARPAFund		-0.000		-0.011		0.034		0.017
		(0.019)		(0.022)		(0.032)		(0.034)
Constant	0.277***	0.277***	0.300***	0.299***	0.497***	0.501***	0.525***	0.527***
	(0.073)	(0.074)	(0.091)	(0.092)	(0.132)	(0.132)	(0.155)	(0.156)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.772	0.772	0.654	0.654	0.700	0.700	0.609	0.609
ymean	0.250	0.250	0.250	0.250	0.395	0.395	0.395	0.395
ysd	0.796	0.796	0.796	0.796	1.230	1.230	1.230	1.230
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Panel D: Patent Outcome - Marginal Effects								
Private*Connected	0.166***	0.160***	0.067	0.060	0.530***	0.513***	0.390***	0.372***
	(0.051)	(0.051)	(0.056)	(0.057)	(0.098)	(0.098)	(0.105)	(0.106)
University*Connected	-0.091	-0.091	-0.202***	-0.201***	-0.240**	-0.239**	-0.399***	-0.398***
	(0.059)	(0.059)	(0.076)	(0.076)	(0.108)	(0.108)	(0.127)	(0.127)
Connected	0.125***	0.122***	0.212***	0.209***	0.293***	0.285***	0.417***	0.408***
	(0.040)	(0.040)	(0.046)	(0.046)	(0.063)	(0.063)	(0.072)	(0.072)
Private	0.131***	0.138***	0.173***	0.180***	0.218***	0.236***	0.280***	0.299***
	(0.034)	(0.033)	(0.040)	(0.041)	(0.048)	(0.048)	(0.057)	(0.058)
University	0.089*	0.090*	0.022	0.023	0.247***	0.250***	0.150	0.154
	(0.046)	(0.046)	(0.057)	(0.057)	(0.081)	(0.081)	(0.094)	(0.094)
Log Past Granted Patents	1.087***	1.087***			1.546***	1.545***		
	(0.037)	(0.037)			(0.052)	(0.052)		
Log Past Patent Citations			0.482***	0.482***			0.692***	0.692***
			(0.024)	(0.024)			(0.032)	(0.032)
PastDARPAFund		0.023		0.026		0.065**		0.069**
		(0.018)		(0.022)		(0.030)		(0.033)
Constant	0.190**	0.189**	0.191**	0.190**	0.343**	0.341**	0.340**	0.338**
	(0.079)	(0.078)	(0.096)	(0.095)	(0.140)	(0.138)	(0.161)	(0.159)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.773	0.774	0.658	0.659	0.702	0.702	0.612	0.613
ymean	0.250	0.250	0.250	0.250	0.395	0.395	0.395	0.395
ysd	0.796	0.796	0.796	0.796	1.230	1.230	1.230	1.230
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Table 13. Informational Advantage of PMs

This table explores whether DARPA PMs have an informational advantage in determining the grantee-project fit. We interact *Connected* with degree centrality of each PM.
PMDC or degree centrality of each PM considering their nonmilitary employment measures the importance of a PMnode based on the number of direct connections they have in a network. The degree centrality $PMDC(v)$ of a node v is defined as:

$$PMDC(v) = \frac{\deg(v)}{N-1} \tag{13}$$

where $\deg(v)$ is the number of edges connected to node v, and N is the total number of nodes in the network.
We run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$\begin{aligned} Y_{ijt} = \alpha &+ \beta_1 \text{Connected}_{ijt} * \text{PMDC}_{ijt} + \beta_2 \text{LogPastGrantedPatents}_{ijt} + \beta_3 \text{LogPastPatentCitations}_{ijt} \\ &+ \beta_4 \text{PastDARPAFund}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \tag{14}$$

clustering std errors around PM and where, Y_{ijt} is either the *LogPatentCount* (log of 1 plus count of patents applied for by grantee i after year t), or the *LogPatentCitations* (log of 1 plus citation count of patents applied for by grantee i after year t). Citations were counted up to three years after patent application year. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. To test whether PMs cherry-pick grantees with good track records, we control for $LogPastGrantedPatents_{it}$ (log of 1 plus the number of patents granted before grantee-project start year), $PastPatentCitations_{it}$ (log of 1 plus total citations of $LogPastGrantedPatents_{it}$), and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.
This table reports the results for a subsample of 4,478 observations where the NAICS of the project is known and *PatentCount* and *PatentCitations* count only relevant patents applied for by grantee i who was funded by program manager j. A known NAICS is used to count patents relevant to the DARPA project.

	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation	Log Patent Citation	Log Patent Citation
Connected*PMDC	1.259**	1.145*	1.158*	1.037*	4.537***	4.046***	4.350***	3.858***
	(0.631)	(0.661)	(0.618)	(0.617)	(1.012)	(1.076)	(0.951)	(0.954)
Log Past Granted Patents	1.075***	1.074***			1.526***	1.521***		
	(0.037)	(0.037)			(0.052)	(0.052)		
Log Past Patent Citations			0.468***	0.467***			0.669***	0.667***
			(0.024)	(0.024)			(0.032)	(0.032)
PastDARPAFund		0.024		0.026		0.103***		0.104***
		(0.019)		(0.021)		(0.033)		(0.033)
Constant	0.278***	0.281***	0.322***	0.326***	0.481***	0.497***	0.541***	0.557***
	(0.077)	(0.076)	(0.097)	(0.097)	(0.138)	(0.136)	(0.166)	(0.164)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.764	0.764	0.642	0.642	0.678	0.679	0.583	0.584
ymean	0.250	0.250	0.250	0.250	0.395	0.395	0.395	0.395
ysd	0.796	0.796	0.796	0.796	1.230	1.230	1.230	1.230
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Table 14. Exploring Evidence of Capture

This table explores whether DARPA PMs have an informational advantage in determining the grantee-project fit. We interact *Connected* with the dummy variable $Top20$ which equals 1 for grantees who rank in the top 20 in terms of the cumulative funds they have received from DARPA up to each fiscal year and the dummy variable *Other* that equals 1 if the grantee is not ranked in the top 20. We run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$\begin{aligned} Y_{ijt} = \alpha &+ \beta_1 \text{Connected}_{ijt} * \text{Top20}_{ijt} + \beta_2 \text{Connected}_{ijt} * \text{Other}_{ijt} \\ &+ \beta_3 \text{LogPastGrantedPatents}_{ijt} + \beta_4 \text{LogPastPatentCitations}_{ijt} \\ &+ \beta_5 \text{PastDARPAFund}_{ijt} + \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \tag{15}$$

clustering std errors around PM and where, Y_{ijt} is either the $LogPatentCount$ (log of 1 plus count of patents applied for by grantee i after year t), or the $LogPatentCitations$ (log of 1 plus citation count of patents applied for by grantee i after year t). Citations were counted up to three years after patent application year. Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. To test whether PMs cherry-pick grantees with good track records, we control for $LogPastGrantedPatents_{it}$ (log of 1 plus the number of patents granted before grantee-project start year), $PastPatentCitations_{it}$ (log of 1 plus total citations of $LogPastGrantedPatents_{it}$), and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.

This reports the results for a subsample of 4,478 observations where the NAICS of the project is known and *PatentCount* and *PatentCitations* count only relevant patents applied for by grantee i who was funded by program manager j. A known NAICS is used to count patents relevant to the DARPA project.

Panel A: Annual Allocation of DARPA Funds

	Log Grant Amount	Log Grant Amount	Log Grant Amount	Log Grant Amount	Grant Pct	Grant Pct	Grant Pct	Grant Pct
Connected*Top20	0.222***	0.174***	0.226***	0.178***	2.515***	2.092**	2.618***	2.189**
	(0.057)	(0.057)	(0.057)	(0.057)	(0.946)	(0.989)	(0.960)	(1.001)
Connected*Other	0.057	0.023	0.056	0.023	0.617	0.319	0.660	0.360
	(0.097)	(0.099)	(0.097)	(0.099)	(1.457)	(1.516)	(1.461)	(1.519)
Log Past Granted Patents	0.113***	0.109***			1.274**	1.242**		
	(0.032)	(0.032)			(0.534)	(0.531)		
Log Past Patent Citations			0.045***	0.042***			0.389	0.369
			(0.016)	(0.016)			(0.265)	(0.263)
PastDARPAFund		0.147**		0.147**		1.296		1.319
		(0.063)		(0.063)		(0.960)		(0.959)
Constant	13.192***	13.208***	13.199***	13.215***	13.835***	13.979***	13.973***	14.120***
	(0.284)	(0.283)	(0.284)	(0.283)	(5.079)	(5.080)	(5.088)	(5.090)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.146	0.147	0.145	0.146	0.155	0.156	0.154	0.155
ymean	13.596	13.596	13.596	13.596	16.068	16.068	16.068	16.068
ysd	1.324	1.324	1.324	1.324	20.251	20.251	20.251	20.251
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Panel B: Project-Relevant Patent Outcomes

	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Count	Log Patent Citation	Log Patent Citation	Log Patent Citation	Log Patent Citation
Connected*Top20	0.047*	0.044*	0.070**	0.070**	0.214***	0.198***	0.244***	0.232***
	(0.024)	(0.026)	(0.029)	(0.031)	(0.043)	(0.045)	(0.049)	(0.051)
Connected*Other	0.162***	0.160***	0.132***	0.131***	0.349***	0.339***	0.304***	0.295***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.060)	(0.060)	(0.054)	(0.054)
Log Past Granted Patents	1.070***	1.070***			1.510***	1.509***		
	(0.037)	(0.037)			(0.052)	(0.052)		
Log Past Patent Citations			0.464***	0.464***			0.660***	0.659***
			(0.024)	(0.024)			(0.032)	(0.032)
PastDARPAFund		0.009		0.002		0.048		0.038
		(0.019)		(0.022)		(0.032)		(0.034)
Constant	0.273***	0.274***	0.319***	0.320***	0.502***	0.508***	0.566***	0.570***
	(0.075)	(0.075)	(0.095)	(0.095)	(0.134)	(0.134)	(0.162)	(0.161)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.766	0.766	0.644	0.644	0.683	0.683	0.588	0.588
ymean	0.250	0.250	0.250	0.250	0.395	0.395	0.395	0.395
ysd	0.796	0.796	0.796	0.796	1.230	1.230	1.230	1.230
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Table 15. PM Connections and DoD Contract Outcomes

This table examines the link between grantee social connections and DoD contract outcomes of DARPA grantees. Panel A shows the results for the baseline regression while Panels B and C add controls for past DARPA funding and DoD outcomes. We run the following specification in an OLS panel regressions setting, using data on DARPA fund allocations from 2012 to 2019:

$$\begin{aligned} Y_{ijt} &= \alpha + \beta_1 \text{Connected}_{ijt} + \beta_2 \text{LogPastDoDContracts}_{ijt} \\ &+ \beta_3 \text{LogPastDoDContractAmount}_{ijt} + \beta_4 \text{PastDARPAFund}_{ijt} \\ &+ \gamma_t + \mu_j + \delta_k + \varepsilon_{it} \end{aligned} \tag{16}$$

clustering std errors around PM and where, Y_{ijt} is either the $LogDoDContracts$ (log of 1 plus count of DoD contracts received by grantee i after year t), or the $LogDoDContractAmount$ (log of 1 plus the obligated amount of DoD contracts received by grantee i after year t). Funding dates go from 2012 to 2019. Subscript i represents each grantee-project observation (i.e., grantees appearing in different projects are treated separately). $Connected_{it}$ is a dummy variable that equals 1 if the grantee has an observed social connection to a DARPA PM. To test whether PMs cherry-pick grantees with good track records, we control for $LogPastDoDContracts_{it}$ (log of 1 plus the number of DoD contracts before grantee-project start year), $LogPastDoDContractAmount_{it}$ (log of 1 plus total obligated amount of $LogPastDoDContracts_{it}$), and $PastDARPAFund_{it}$ (a dummy variable that equals 1 if the grantee received funding from DARPA under a different project prior to the current grantee-project start year). This specification also includes year (t) fixed effects and program manager (j) fixed effects, and program type (k) fixed effects; DARPA projects are structured into three program types: basic research, applied research, and advanced technology development. The regressions are also run with program type (k) fixed effects in place of program type fixed effects where the results are similar to the ones presented in this table.
Panels A through C report the results for a subsample of 4,478 observations where the NAICS of the project is known. We count only relevant DoD contracts received by grantee i who was funded by program manager j. A known NAICS is used to count patents relevant to the DARPA project. Panel C restricts the DoD contract outcomes up to three years after observation year t and past DoD contracts up to three years before the grantee-project start year.

Panel A: Baseline Relevant DoD Contract outcomes

	Log DoD Contracts	Log DoD Contracts	Log DoD Contract Amount	Log DoD Contract Amount	Log DoD Contracts (3yrs)	Log DoD Contracts (3yrs)	Log DoD Contract Amount (3yrs))	Log DoD Contract Amount (3yrs)
Connected	0.765***	0.761***	2.212***	2.185***	0.737***	0.733***	2.332***	2.306***
	(0.105)	(0.105)	(0.497)	(0.499)	(0.102)	(0.102)	(0.491)	(0.493)
Constant	2.614***	2.178***	10.725***	9.466***	2.149***	1.716***	9.536***	7.837***
	(0.362)	(0.406)	(1.312)	(1.663)	(0.353)	(0.394)	(1.399)	(1.638)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.150	0.160	0.121	0.130	0.147	0.157	0.126	0.135
ymean	2.145	2.145	10.920	10.920	2.068	2.068	10.588	10.588
ysd	2.019	2.019	8.709	8.709	1.950	1.950	8.640	8.640
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	No	Yes	No	Yes	No	Yes	No
Program FE	No	Yes	No	Yes	No	Yes	No	Yes

Panel B: Relevant DoD Contract outcomes								
	Log DoD Contracts	Log DoD Contracts	Log DoD Contracts	Log DoD Contracts	Log DoD Contract Amount	Log DoD Contract Amount	Log DoD Contract Amount	Log DoD Contract Amount
Connected	0.109**	0.073	0.235***	0.163***	-0.346	-0.318	-0.111	-0.162
	(0.044)	(0.048)	(0.061)	(0.062)	(0.278)	(0.307)	(0.286)	(0.295)
Log Past DOD Contracts	0.909***	0.906***			3.543***	3.545***		
	(0.016)	(0.016)			(0.069)	(0.071)		
Log Past DOD Contract Amount			0.192***	0.191***			0.841***	0.840***
			(0.005)	(0.005)			(0.018)	(0.019)
PastDARPAFund		0.125**		0.246***		-0.098		0.174
		(0.055)		(0.060)		(0.377)		(0.341)
Constant	2.065***	2.088***	1.828***	1.875***	8.582***	8.564***	7.277***	7.311***
	(0.212)	(0.213)	(0.261)	(0.258)	(0.863)	(0.870)	(1.002)	(0.998)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.784	0.785	0.686	0.688	0.639	0.639	0.674	0.674
ymean	2.145	2.145	2.145	2.145	10.920	10.920	10.920	10.920
ysd	2.019	2.019	2.019	2.019	8.709	8.709	8.709	8.709
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Panel C: Relevant DoD Contract outcomes within 3 yrs								
	Log DoD Contract (3yrs)	Log DoD Contract (3yrs)	Log DoD Contract (3yrs)	Log DoD Contract (3yrs)	Log DoD Contract Amount (3yrs)	Log DoD Contract Amount (3yrs)	Log DoD Contract Amount (3yrs)	Log DoD Contract Amount (3yrs)
Connected	0.070*	0.049	0.200***	0.136**	-0.242	-0.132	0.060	0.052
	(0.041)	(0.044)	(0.055)	(0.058)	(0.278)	(0.300)	(0.288)	(0.299)
Log Past DOD Contracts	0.995***	0.993***			3.836***	3.846***		
(3 yrs)	(0.013)	(0.014)			(0.076)	(0.077)		
Log Past DOD Contract Amount			0.190***	0.189***			0.803***	0.803***
(3 yrs)			(0.004)	(0.004)			(0.019)	(0.019)
PastDARPAFund		0.072		0.217***		-0.380		0.026
		(0.048)		(0.059)		(0.355)		(0.351)
Constant	1.395***	1.409***	1.277***	1.320***	6.627***	6.553***	5.849***	5.854***
	(0.175)	(0.175)	(0.244)	(0.242)	(0.842)	(0.837)	(1.071)	(1.066)
Observations	4,478	4,478	4,478	4,478	4,478	4,478	4,478	4,478
R^2	0.815	0.815	0.702	0.703	0.632	0.632	0.631	0.631
ymean	2.068	2.068	2.068	2.068	10.588	10.588	10.588	10.588
ysd	1.950	1.950	1.950	1.950	8.640	8.640	8.640	8.640
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ProgramType FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	No	No	No	No	No	No	No

Appendix

Table 16. Variable Definitions

Variable	**Definition**
Social Connection	
Connected	We define a grantee as *Connected* if we observe a past connection between the PM's background and the grantee.
Placebo Connected	Grantees that transition from not connected to connected during a project, analyzed separately from permanently connected grantees.
Outcome Variables	
Log Patent Count	Log of one plus the total number of patents applied for by a grantee after the observation year.
Log Patent Count (3 yrs)	Log of one plus the number of patents applied for up to three years after the observation year.
Log Patent Citations	Log of one plus the number of citations received by counted patents in *Patent Count*. Citations are counted up to 3 years after the patent application year.
Log Patent Citations (3 yrs)	Log of one plus the number of citations received by counted patents in *Patent Count (3 yrs)*. Citations are counted up to 3 years after the patent application year.
Log DoD Contracts	Log of one plus the total number of DoD contracts won by a grantee after the observation year.
Log DoD Contracts (3 yrs)	Log of one plus the number of DoD contracts won by a grantee up to 3 years after the observation year.
Log DoD Contract Amount	Log of one plus the total obligated amount of DoD contracts won by the grantee after the observation year.
Log DoD Contract Amount (3 yrs)	Log of one plus the total obligated amount of DoD contracts won by the grantee up to 3 years after the observation year.
Control Variables	
Log Past Granted Patents	Log of one plus the number of patents granted to a grantee before the project start year.
Log Past Granted Patents (3 yrs)	Log of one plus the number of patents granted to a grantee up to 3 years before the project start year.
Log Past Patent Citations	Log of one plus the number of citations received by patents granted before the project start year. Citations are counted up to 3 years after the patent application year.
Log Past Patent Citations (3 yrs)	Log of one plus the number of citations received by patents granted up to 3 years before the project start year. Citations are counted up to 3 years after the patent application year.
Log Past DoD Contracts	Log of one plus the number of DoD contracts received by a grantee before the project start year.
Log Past DoD Contracts (3 yrs)	Log of one plus the number of DoD contracts received by a grantee up to 3 years before the project start year.
Log Past DoD Contract Amount	Log of one plus the total obligated amount of DoD contracts received by a grantee before the project start year.
Log Past DoD Contract Amount (3 yrs)	Log of one plus the total obligated amount of DoD contracts received by a grantee up to 3 years before the project start year.
Past DARPA Fund	A dummy variable indicating whether a grantee received DARPA funding before the current project.
Top20	A dummy variable indicating if a grantee is among the top 20 recipients of DARPA funding in a given year.
Program Type	Categorical variable distinguishing DARPA program types: basic research, applied research, and advanced technology development.
Program	Each of the 16 higher level programs at DARPA between 2012 and 2019.
PM	Individual program managers.
Grantee Type Dummies	Dummies for each grantee type; Private, Public, University or Nonprofit.
PM Background Dummies	Dummies for each PM background; Industry, Military, Academic, MultiIndustry (combination of industry and military and/or academic background), MilitaryAcademic.

Table 17. Distribution of DARPA Grantees and DARPA Grantee Fund Allocations

This table presents the the distribution of grantee types and the distribution of funds allocated by grantees who are public, private, or a university or nonprofit. Public Companies are identified by matching between the DARPA dataset of detailed fund allocations to the Compustat dataset on grantee name and fiscal year. University or nonprofits are identified through grantee names and manual search of grantee backgrounds. The remaining grantees are classified as private companies.

Panel A: Full Sample (8,139 observations)						
Grantee Type	**FY**	**# Projects**	**# Grantees**	**Annual Funding $**	**Annual Funding per Project $**	**Annual Funding per Grantee $**
University or NonProfit	2012	16	34	44,921,080	2,807,568	1,321,208
Public Company	2012	20	14	186,826,544	9,341,327	13,344,753
Private Company	2012	18	50	93,716,360	5,206,465	1,874,327
University or NonProfit	2013	97	116	416,554,272	4,294,374	3,590,985
Public Company	2013	118	36	595,771,520	5,048,911	16,549,209
Private Company	2013	114	204	516,758,016	4,532,965	2,533,128
University or NonProfit	2014	102	103	430,363,616	4,219,251	4,178,288
Public Company	2014	110	31	674,449,280	6,131,357	21,756,428
Private Company	2014	120	201	520,150,848	4,334,591	2,587,815
University or NonProfit	2015	115	98	462,948,672	4,025,641	4,723,966
Public Company	2015	119	29	652,315,904	5,481,647	22,493,652
Private Company	2015	132	213	529,444,160	4,010,941	2,485,653
University or NonProfit	2016	122	109	450,503,744	3,692,654	4,133,062
Public Company	2016	122	26	605,009,856	4,959,097	23,269,610
Private Company	2016	137	203	588,830,336	4,298,032	2,900,642
University or NonProfit	2017	110	121	435,873,536	3,962,487	3,602,261
Public Company	2017	109	27	528,908,512	4,852,372	19,589,204
Private Company	2017	128	192	537,427,200	4,198,650	2,799,100
University or NonProfit	2018	122	126	442,677,920	3,628,508	3,513,317
Public Company	2018	116	31	538,438,784	4,641,714	17,368,994
Private Company	2018	134	196	526,698,336	3,930,585	2,687,237
University or NonProfit	2019	122	129	466,965,920	3,827,590	3,619,891
Public Company	2019	112	32	521,980,352	4,660,539	16,311,886
Private Company	2019	137	181	557,004,288	4,065,725	3,077,372
Panel B: Subsample with Known NAICS (4,478 observations)						
University or NonProfit	2012	10	19	28,949,968	2,894,997	1,523,683
Public Company	2012	19	13	180,333,920	9,491,259	13,871,840
Private Company	2012	17	40	80,304,352	4,723,786	2,007,609
University or NonProfit	2013	51	46	144,883,632	2,840,856	3,149,644
Public Company	2013	107	27	542,675,392	5,071,733	20,099,088
Private Company	2013	102	157	446,374,848	4,376,224	2,843,152
University or NonProfit	2014	54	42	114,150,120	2,113,891	2,717,860
Public Company	2014	102	24	620,606,656	6,084,379	25,858,610
Private Company	2014	105	163	439,020,160	4,181,145	2,693,375
University or NonProfit	2015	67	42	159,762,368	2,384,513	3,803,866
Public Company	2015	117	24	627,561,408	5,363,773	26,148,392
Private Company	2015	118	164	411,606,880	3,488,194	2,509,798
University or NonProfit	2016	79	47	185,687,408	2,350,474	3,950,796
Public Company	2016	114	20	556,469,312	4,881,310	27,823,466
Private Company	2016	118	158	493,950,784	4,186,024	3,126,271
University or NonProfit	2017	67	51	168,292,432	2,511,827	3,299,852
Public Company	2017	96	18	428,885,056	4,467,553	23,826,948
Private Company	2017	107	145	424,754,016	3,969,664	2,929,338
University or NonProfit	2018	77	51	177,208,992	2,301,416	3,474,686
Public Company	2018	99	21	415,496,832	4,196,938	19,785,564
Private Company	2018	111	140	402,370,976	3,624,964	2,874,079
University or NonProfit	2019	72	54	166,413,936	2,311,305	3,081,740
Public Company	2019	91	26	402,365,728	4,421,602	15,475,605
Private Company	2019	100	121	367,361,216	3,673,612	3,036,043

Table 18. Distribution of DARPA PM Backgrounds and Funds Allocated by PMs

This table presents the the distribution of PM backgrounds and the distribution of funds allocated by PMs with backgrounds in Military, Industry, and/or Academic Research backgrounds. Military refers to PMs with a background only in the military. Industry refers to PMs with a background only in the industry or the private sector. Academic refers to PMs with a background only in academic research. MultiIndustry refers to PMs who have a background in the industry and military and/or academia. AcademicMilitary refers to PMs with a background both in academia and the military.

		Full Sample, 8,139 obs.		Subsample with Known NAICS, 4,478 obs.	
FY	PM Type	#PMs	Annual Funding	#PMs	Annual Funding
2012	Military	0	0	0	0
2012	Academic	1	20,532,218	1	15,916,181
2012	Industry	10	218,153,520	10	198,040,432
2012	MultiIndustry	6	86,778,240	6	75,631,632
2012	AcademicMilitary	0	0	0	0
2013	Military	8	147,844,848	8	110,330,384
2013	Academic	3	58,394,152	2	41,297,656
2013	Industry	25	543,937,920	24	417,947,712
2013	MultiIndustry	32	648,893,568	30	456,047,168
2013	AcademicMilitary	2	51,018,288	2	47,230,900
2014	Military	7	143,856,528	7	103,379,888
2014	Academic	5	81,271,688	4	22,104,508
2014	Industry	20	507,142,592	19	405,870,176
2014	MultiIndustry	36	739,159,232	36	504,638,304
2014	AcademicMilitary	2	60,278,132	2	52,544,648
2015	Military	6	115,157,824	6	75,605,496
2015	Academic	6	148,445,616	6	63,338,992
2015	Industry	22	430,579,808	22	362,505,632
2015	MultiIndustry	35	870,709,184	35	623,926,016
2015	AcademicMilitary	2	53,328,388	2	51,943,388
2016	Military	6	140,860,992	6	109,563,824
2016	Academic	7	147,393,024	7	61,812,900
2016	Industry	22	493,601,120	22	423,060,608
2016	MultiIndustry	34	775,388,672	33	562,751,488
2016	AcademicMilitary	3	41,262,172	2	40,138,512
2017	Military	8	135,178,944	8	107,093,944
2017	Academic	7	102,301,576	6	69,727,464
2017	Industry	18	234,136,576	17	190,125,776
2017	MultiIndustry	42	872,697,600	41	548,039,552
2017	AcademicMilitary	4	85,445,776	4	44,398,216
2018	Military	5	114,139,136	5	92,839,136
2018	Academic	7	107,631,512	6	37,229,796
2018	Industry	18	303,929,600	17	236,164,192
2018	MultiIndustry	44	886,411,840	43	578,997,568
2018	AcademicMilitary	5	95,702,928	5	49,846,148
2019	Military	13	207,543,072	11	150,236,016
2019	Academic	10	153,934,176	10	44,369,372
2019	Industry	19	370,876,224	18	269,345,824
2019	MultiIndustry	35	736,804,544	32	463,103,680
2019	AcademicMilitary	3	31,798,340	2	7,999,827