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Greener Pastures?
Public-Private Competition and the Capacity for Climate Governance

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Interest in climate change, across both governments and firms, is rapidly mounting. Here we model climate governance as the function of a public-private competition for a scarce pool of climate experts. Governments seek experts to develop and implement climate policies. Firms seek experts to affect policy choice, skirt enforcement, and measure climate risks to commercial interests. As firm interest in climate grows, the government's ability to attract experts declines, making it more reliant on the private sector for climate governance. To support this argument, we measure private sector demand for experts with unique data on U.S. job postings, paired with administrative data on government bureaucrats and procurement. Our findings offer a novel labor-based account of global climate politics, contributing to the study of labor markets in political science, the sources of bureaucratic expertise, and the net effects of corporate social responsibility.

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The regime complex for climate change has grown rapidly in recent years (Keohane and Victor 2011). Once primarily the domain of national governments, global climate governance today involves a widening array of international organizations, subnational governments, and firms.[1] This growth reflects broadened recognition of the pertinence of climate change and climate regulation to institutional mandates and corporate balance sheets (Clark and Zucker 2024; Lerner and Osgood 2023; Voeten 2025). It also reflects a new "all hands on deck" approach to climate governance, inaugurated by the 2015 Paris Agreement, which explicitly seeks to mobilize and involve non-state actors in climate policymaking (Hale 2016; Hsu et al. 2015).

One effect of this ascendant interest in climate is intensified demand for climate *expertise*. While the causes of climate change are well known, designing and projecting the effects of policies meant to mitigate warming are technically intensive tasks, shrouded in "fogs" of ambiguity (Stokes 2020, 36; Hai 2024). Models of climate impacts, which guide public and private investments in adaptation and resilience, are difficult to develop and require "tremendous amounts of information" that are often opaque to lay audiences (Gazmararian and Tingley 2023, 65; Sobel 2021). Climate action across the public and private sectors accordingly necessitates a high level of expert knowledge. Yet both governments and firms often lack the personnel able to supply this (Condon 2023), and recruitment of climate specialists has been complicated by the "limited number" of experts available globally and mounting demand across employers (Committeri et al. 2022, 10).[2]

We argue that mobilization on climate by non-state actors — specifically, firms — curtails states' capacity for climate governance. The mechanism underlying this is a transnational labor market competition between governments and firms for scarce climate experts.

[1] Early international climate negotiations were designed to "[maximize] the control of ... state parties" over subsequent agreements (Sabel and Victor 2022, 39). While non-state involvement in global environmental governance is not wholly new (e.g., Green 2013; Sabel and Victor 2022), private sector interest in climate has recently deepened and broadened (Green et al. 2022; Lerner and Osgood 2023).

[2] *Business Insider* 2022 [perma.cc/56PE-Y4Z4], *Financial Times* 2022 [on.ft.com/4cuIqwR].

Policymakers and regulators seek experts to design, interpret, and enforce climate policies. Firms demand those same experts to strengthen their lobbying over those policies and to meet legal and fiduciary obligations, such as to measure carbon emissions or physical climate risks to commercial interests. We characterize this competition in two steps. First, we argue that as firm demand for climate experts increases, the quality of expertise in government declines. Public bureaucracies struggle to counter the remunerative advantages of for-profit employers, impeding their ability to recruit and retain in-demand talent. Second, we argue that the net reallocation of expertise to firms prompts some privatization of climate governance, with public agencies increasingly reliant on expertise held by firms for the administration of climate policy — a process that may diminish the quality of such governance (Hart, Shleifer, and Vishny 1997; Condon 2023).

To test this argument, we use new measures of public-private competition for expertise in the case of the United States, as well as granular data on characteristics of U.S. federal bureaucrats. For the former, we leverage unique microdata on the near universe of jobs advertised by firms and the federal government over the last decade. These data reveal an ongoing rush of demand for climate experts across both domestic and foreign firms: the rate of job postings in the 2020s is triple that of the 2010s, and the private sector wage premium for experts has likewise surged. Acknowledging the possibility that public and private employers seek different forms of climate expertise, we use granular data on demand for specific occupations and skills to demonstrate that the types of experts sought by firms overlap substantially with those sought by government. Our analysis indicates that between 2011 and 2024, roughly half of all private sector climate job postings targeted the same types of climate workers recently pursued by federal agencies. Likewise, we estimate that the average level of private sector competition for climate-related hiring by federal employers — the average number of firm postings overlapping with a single simultaneous government posting — more than doubled between these years. Hiring firms are politically

active as well; we estimate that firms that advertise for climate experts are significantly more likely to lobby the federal government on environmental issues than other firms in the same industry.

Pairing these hiring metrics with individual-level data on federal civil servants, we identify that growth in private sector demand meaningfully affects bureaucratic composition. It reduces average rates of educational attainment among climate-related bureaucrats, particularly those at the highest ranks of the civil service. Evidence suggests that a key mechanism is poaching of climate bureaucrats by firms: firm demand significantly increases the number of such staff who choose to leave the federal government. While federal agencies appear able to compensate for these quits with new hires at lower ranks of the bureaucracy, we document a net outflow of talent at more advanced levels, consistent with the greater private sector wage premiums that exist for higher skilled and more senior workers. Drawing on work of an international non-profit that evaluates firms' performance on climate, we find that these outflows are driven by demand from both climate-leader and -laggard firms. Illustrative of the transnational nature of this labor market competition, we find that a large share of climate demand stems from non-U.S. firms.

To then characterize the extent to which federal agencies retain access to expertise via external consultants, we match federal contractors to firms that have sought to hire climate experts. We find that firms advertising for climate experts are more likely than similar firms to obtain environmental consulting contracts from the federal government. In line with this, we also find that growth in private sector demand increases environmental bureaucracies' reliance on external consultants, independent of the extent to which the sitting president prioritizes climate policy.

These findings build our understanding of climate, firm, and bureaucratic politics. Our labor market-based conception of climate governance diverges from the growing literature that emphasizes electoral and lobbying (dis)incentives for climate action (e.g., Milden-

berger 2020; Gaikwad, Genovese, and Tingley 2022; Colantone et al. 2024). While we agree on the importance of these factors, the labor market phenomena we identify may bind governments even in otherwise favorable political settings. Our findings connect well with work instead approaching climate as a complex issue marked by public-private expertise gaps (Green 2013). Building on literature that analyzes bureaucratic behavior and regulatory outcomes under these conditions (McCarty 2017; Perlman 2020, 2023), we offer a new dynamic understanding of how the allocation of expertise across sectors evolves over time. In doing so, we illustrate how states' ability to draw on epistemic communities for policymaking support — a relationship long recognized as critical to global climate governance (Haas 1992) — varies over time.

The paper moreover clarifies the consequences of spread in corporate social responsibility (CSR) and environmental, social, and governance (ESG) initiatives. Scholars have been wary of CSR's ability to mitigate climate change due to the concern that firms employ these initiatives in bad faith: rather than truly attempting to fight climate change, private governance can be used to preempt public regulation (Malhotra, Monin, and Tomz 2019) or mask the lack of substantive mitigation efforts (Berliner and Prakash 2015; Green et al. 2022). This paper suggests that such initiatives, even when adopted in good faith, have the potential to compromise public regulatory capacity. Every climate expert that firms hire to carry out their private governance efforts reduces in the short term the pool of expertise available to states. Sprawling growth in the "institutional patchwork" of international climate governance may thus produce welfare-suboptimal outcomes on net (Falkner 2014, 195), particularly as wage differentials expand. All such contributions advance the burgeoning literature on how firms shape climate policy trajectories (e.g., Colgan, Green, and Hale 2021; Cory, Lerner, and Osgood 2021; Bayer 2023; Gazmararian and Milner 2024).

Finally, our paper contributes a new general account of how bureaucracies develop expertise in novel policy domains. Prominent theories emphasize determinants of expertise

acquisition and recruitment that are internal to government, such as delegation of discretion by political principals or changes in messaging strategies (Gilligan and Krehbiel 1987; Gailmard and Patty 2007; Ashraf et al. 2020). We instead contend that consumption of expertise by firms impedes its acquisition in the short term by bureaucracies and other government offices. By arguing that public and private institutions draw from the same pool of high-skilled workers — conceiving of bureaucracies in terms of their place in broader labor markets — we effectively reframe expertise as a rivalrous good. While we believe this argument is particularly relevant to climate, it may extend to other technically complex issue areas like artificial intelligence and cybersecurity, where there is likewise surging global demand and limited pools of expertise.

ALLOCATION OF EXPERTISE

Our theory understands climate to be a novel political issue, one in which most public and private institutions initially lack expertise. Political institutions dedicated to climate governance began to emerge in the 1980s and 1990s, often closely tied to communities of scientific experts (Haas 1992; Aklin and Urpelainen 2014). Attention to climate at generalist institutions, however — those without mandates specific to climate — took longer to emerge. Interest in climate governance at international financial institutions, for instance, did not seriously mount until the mid-2010s (Clark and Zucker 2024). Central banks and financial regulators were further delayed in embracing the issue and remain lacking in expert knowledge (Condon 2022; Quorning 2023). Industry interest in climate is likewise recently ascendant (Lerner and Osgood 2023).

Climate is moreover distinct in its technical complexity. Take one task of rapidly growing interest across the public and private sectors: modeling of future climate-induced physical risks to economic assets. Firms, government agencies, and international organizations

use increasingly intricate catastrophe models to measure climate risks to commercial interests and government budgets, as well as to plan climate adaptation programs. The development of such models can require "a team of 10–20 leading experts from a variety of disciplines (specialists with PhD degrees) . . . work[ing] together for over two to three years" (Golnaraghi et al. 2018, 25). As another example, states have increasingly sought to evaluate financial institutions' resilience to future climate-related stressors. Efforts to conduct such tests have been plagued by a broad "lack of technical expertise on climate science and environmental economics" at both firms and regulators (NGFS 2020, 7). Measurement of greenhouse gas emissions, development of net-zero pathways, and identification of low-carbon investment opportunities likewise require expert involvement (Leffel 2022; Carnegie, Clark, and Zucker 2024).[3] Government officials have cited technical issues relating to data and measurement as key barriers to climate policymaking (Gazmararian and Tingley 2023, 65).

Demand for Climate Expertise

The novelty and complexity of climate change create incentives to acquire climate expertise. A large literature recognizes the importance of bureaucratic expertise to effective domestic and international governance (e.g., Weber 1948; Abbott and Snidal 1998; Lewis 2007). In environmental and scientific contexts, academic expertise has long factored prominently into the development of international agreements (Haas 1992; Hai 2024), domestic policy (Greenstone, Kopits, and Wolverton 2013), and regulatory action (Perlman 2023). We accordingly assume that governments seek expertise to make and enforce climate-related policies and regulations.

Public institutions' push for expertise is likely most intense when political leaders want to design and enact ambitious climate policies. But it should endure after those leaders are

[3] Also see *Financial Times* 2022 [on.ft.com/4cuIqwR].

replaced by figures with weaker climate preferences or explicitly anti-climate platforms. To the extent that civil servants remain motivated by policy outcomes despite changes in political leadership, they may still seek expertise to implement and enforce existing statutes when they retain that delegated authority across leadership transitions.[4] The ascension of anti-climate leaders, including populists who reject technocratic expertise, may dampen demand in bureaucracies under their control (Bellodi, Morelli, and Vannoni 2024; Carnegie, Clark, and Zucker 2024), but not necessarily at the subnational level or in offices associated with opposition politicians.[5] It is also important to distinguish between expertise and political preferences; individuals with deep technical knowledge may be ideologically flexible and willing to carry out anti-climate agendas (see Gailmard and Patty 2007).

Profit-motivated firms in the private sector likewise benefit from acquiring expertise. Firms seek expertise in large part to identify and manage risks to commercial interests posed by decarbonization and physical climate impacts (Gazmararian and Milner 2024). Climate expertise further allows firms to meet consumer demand for new products. Credit rating agencies are, for instance, offering more climate risk services to customers; banks are issuing "climate communiques" with scientific data to satisfy "clients' demand for [climate] information."[6] Financial institutions invest in modeling how future climate disasters will stress their portfolios (Golnaraghi et al. 2018). Agricultural firms have been pressed to assess how climate change will affect production.[7] All such projects demand extensive technical expertise, fueling growth in a nascent "climate services" industry (Condon 2023). Likewise, attention to net-zero transition plans, carbon emissions accounting, and

[4]Recent work indicates, for instance, that "the core of the U.S. federal government resembles a Weberian bureaucracy ... largely protected from political interference" (Spenkuch, Teso, and Xu 2023, 1173).

[5]Under the first Trump administration, for example, the offices of state attorneys general brought repeated pro-climate suits against the Environmental Protection Agency; *New York Times* 2019 [nyti.ms/4eS1YgK]; *Washington Post* 2019 [wapo.st/3VSNWm4].

[6]*Barron's* 2021 [bit.ly/3W8CeoG]; *Deutsche Bank Research* 2023 [perma.cc/282F-UPKW]; *Bloomberg* 2025 [bit.ly/4gKPYNJ].

[7]*Agri-Pulse* 2020 [bit.ly/4bybcvo].

ESG values has increased demand for expertise in corporate sustainability across private sectors (Thrall 2021; Lerner and Osgood 2023).[8]

Expertise also serves as a source of policy influence. In complex issue areas like climate, private sector command of issue-specific expertise confers sway over less-informed policymakers and regulators (Culpepper 2011; McCarty 2017; Brutger 2024). Perlman (2023), for example, illustrates how firms strategically withhold private information about their operations to manipulate rulemaking. This is a salient concern; information about the physical vulnerability and carbon intensity of assets and supply chains is often held privately by firms, especially in the absence of binding disclosure requirements (Carattini et al. 2022). Firms may use such expertise to persuade policymakers or, consistent with theories of lobbying as a legislative subsidy, support the work of like-minded but less knowledgeable policymakers (Hall and Deardorff 2006).

Expertise further helps firms comply with regulations and guard against unfavorable government actions.[9] For example, to the extent that expertise supports technological innovation and corporate flexibility (Ding et al. 2022), carbon-intensive firms with more in-house expertise should be better positioned to adapt to strict climate regulations (Kennard 2020).[10] More sophisticated firms should more capably avert regulatory scrutiny (Hall and Miler 2008) and quell litigation risks (de Figueiredo and de Figueiredo 2002). Hedging of this sort may be especially appealing given the existential stakes of the issue and the uncertainty that marks climate policy trajectories (Colgan, Green, and Hale 2021; Green et al. 2022). As Green (2013) highlights, firm command of expertise may in fact prompt states to delegate rule-making authority to private actors, a possibility we return to below.

As this discussion suggests, we do not claim that private sector demand necessarily pre-

[8] *GreenBiz* 2022 [bit.ly/3xMMdXA].

[9] On firms' labor investment in regulatory compliance, see, e.g., Trebbi and Zhang 2022.

[10] Green et al. 2022 find that R&D-intensive firms are typically more supportive of decarbonization, "reflecting the idea that more 'innovative' firms are more able to shift strategies" (2057).

cedes policy decisions in government. Greater climate policy ambition plausibly augments firm interest in experts for regulatory compliance and lobbying purposes, for example. While we do not hypothesize about or test for the sources of firm demand in this paper, we note that policy-related drivers would be analytically problematic if they also affect the composition and behavior of government bureaucracies. We address this possibility in the following theoretical discussion and empirical analysis.

Balance of Climate Expertise

Demand across governments and firms generates a market for *climate experts*: individuals with advanced technical knowledge of climate change and decarbonization. Here we group together individuals who acquire climate-related knowledge via formal schooling and via professional experiences. The former category encompasses researchers with advanced technical training related to climate across engineering, law, and the natural and social sciences. The latter camp includes government bureaucrats who learn about climate while on the job, as they have been found to do (Clark and Zucker 2024, 2025),[11] and private sector employees who do the same.

The novelty of climate as a hiring priority explains the scarcity of climate experts available to public and private employers. For employees of public institutions or firms, there is less incentive and opportunity to invest in acquiring expertise when climate is not a focus of political principals, firm executives, or prospective employers. There should also be less production of academic expertise; the logic of Mincer (1974) implies that individuals will invest less in learning climate-related skills when expected labor market demand and earnings are lower.

As demand for climate expertise grows, its supply should increase as well. However,

[11] Several scholars have made the argument, generalized beyond climate, that civil servants build expertise over the course of their time in government (Gailmard and Patty 2007, 2013; Lewis 2007).

growth in the production of climate experts should not be perfectly simultaneous with growth in demand for such experts. It should instead lag changes in demand. This is consistent with work on human capital: when hiring and wage offers increase for workers with certain skill sets, individuals generally lag in updating their education decisions (Deming and Noray 2020). Even if education decisions were updated immediately, there would be a delay before those education investments manifested in increased labor supply due to the length of educational programs. That lag is more substantial in higher skilled fields, including climate, where lengthy academic training is needed.[12]

There is empirical support for this intuition. A recent LinkedIn study concluded that while "the supply of green talent has ... grown" across countries in Asia, Latin America, and Europe, it consistently "lags demand."[13] A survey by the International Energy Agency found that while most energy firms intend to "hire skilled workers for the energy transition," they have "faced difficulties finding qualified applicants for almost all occupation categories."[14] Sustainability executives have cited "difficulty in hiring talent with climate change skills" as a primary impediment to decarbonization.[15] Efforts to hire new climate specialists at international financial institutions have been complicated by a "limited number" of experts available worldwide (Committeri et al. 2022, 10).[16] While supply of climate expertise may eventually equalize with demand — a possibility we discuss in the conclusion — short-term shortages following demand shocks are theoretically plausible and empirically apparent.

[12]For example, supply of skills obtained via years-long doctoral programs may react to demand growth more sluggishly than supply of skills obtained via brief vocational programs.
[13]*LinkedIn* 2024 [perma.cc/B2QT-DM2K].
[14]*IEA* 2024 [perma.cc/MFF9-AZ4H].
[15]*Ernst & Young* 2022 [go.ey.com/4eVt7iM].
[16]Mirroring this, surveys have found that while a majority of young adults globally are interested in green jobs, substantially fewer believe they are equipped with the skills required for those opportunities. *Capgemini Research Institute* 2025 [perma.cc/D3AR-KPN7].

Bureaucratic Composition

Here we theorize how private sector demand affects bureaucratic composition and quality (Appendix A contains a simple formalization of the theory). We argue that as demand rises across employers, government agencies will see erosion in the quality of their in-house climate expertise. The assumption underlying this claim is that firms can offer experts higher wages than public institutions, as ample empirical work shows. Research points to a consistent private sector wage premium for the highest skilled workers in the U.S. and other high-income democracies, with government employers reacting sluggishly to private sector wage growth (Katz and Krueger 1991; Borjas 2002; Abdallah, Coady, and Jirasavetakul 2023; CBO 2024). Government wage offers are often constrained by salary schedules that determine the maximum compensation for given positions or career grades.

We assume, further, that experts primarily select career paths according to the wages that they are offered. All else equal, experts will prefer to take higher-paying jobs; while public agencies can offer superior job security via civil service protections, scholarship indicates that pay imbalances between these institutions and private employers still entice transitions towards the latter, hence our focus on wages (Blanes i Vidal, Draca, and Fons-Rosen 2012; Shepherd and You 2020). We hasten to note that wages are not the sole motivation behind job choice. Experts may also possess some pro-social public service motivation: "desire to serve the public interest" or "commitment to a [policy] program from a genuine conviction about its social importance" (Perry and Wise 1990, 370; also see Honig 2024). Pro-social motivations of this sort would attenuate, but not eliminate, wage motivations.[17]

Growth in private sector demand for climate expertise should produce higher wage offers to scarce experts, as firms seek to out-compete each other and the government for their

[17]The formalization in Appendix A incorporates pro-social motivations into workers' job choice calculus.

labor. To the extent that wage offers are scaled to expert *quality*, government agencies should remain able to compete for lower quality experts in periods of mounting private sector demand. But the highest quality experts — those commanding the most lucrative wage offers from firms — should be increasingly difficult for government agencies to attract as firm demand mounts, with rigid budget constraints and pay schemes limiting their ability to flexibly negotiate with high-end experts (e.g., Biasi 2021). Insofar as pro-social motivations are distributed across climate experts independent of their quality (i.e., higher quality experts are not also significantly more pro-social), we should still expect a net loss of high-quality climate experts from government agencies.[18] This implies the following hypothesis.

Hypothesis 1. *Growth in private sector demand for climate expertise impedes the recruitment and retention of high-quality experts by government.*

Previously we noted that climate policy ambition may, alongside firm demand, affect the makeup of government bureaucracies. Here we emphasize that the effect of government interest in climate policy on bureaucratic composition would likely be inverse that of firm demand. We expect that firm demand reduces the quality of climate bureaucracies; conversely, pro-climate governments presumably invest in *greater* bureaucratic capacity to better design and implement climate policies, particularly where high-quality bureaucrats and the government have similar climate policy objectives (Huber and Shipan 2002).[19]

De Facto Privatization

Our theory predicts that as private sector demand for climate expertise increases, the highest quality experts will increasingly opt to work for firms rather than government. This implies

[18] Prior work finds that bureaucrat quality and pro-sociality vary independently (Ashraf et al. 2020).

[19] Erosion in the quality of climate bureaucracies is most apparent under climate-skeptical populist regimes (Carnegie, Clark, and Zucker 2024).

an erosion of the state's capacity for climate governance, to the extent that bureaucratic expertise supports policy choice and implementation (Gailmard and Patty 2012). Here we discuss one means by which agencies may compensate for challenges in hiring in-house experts and mitigate threats to their governance capacity: contracting climate-related governance tasks out to the private sector.

Contractors are, in important respects, imperfect substitutes for in-house experts. Contractors are costly; research suggests that government agencies pay significantly more for contracted labor than equivalent in-house labor (Amey 2013). Contractors may have preferences and interests biased away from those of government agencies; they plausibly devote less effort to governance tasks than bureaucrats intrinsically invested in an agency's mission (Honig 2024) and prioritize cost-cutting over high-quality service delivery (Hart, Shleifer, and Vishny 1997). In the climate domain specifically, key tasks, such as the monitoring of global weather conditions, require physical resources that are often unavailable to firms.[20]

Nevertheless, pay offers to temporary contractors are not bound by standard government payscales in countries such as the U.S., granting government agencies greater flexibility in sweetening compensation offers for contractors than for in-house experts.[21] Agencies accordingly often contract out technically intensive aspects of climate governance (Keele 2019; Leffel 2022). One example is climate modeling, a task that requires sophisticated programming skills as well as knowledge of environmental science and econometrics. The U.S. Environmental Protection Agency (EPA) recently commissioned Eastern Research Group, a private consulting firm, to help it design an environmental input-output model to understand the emissions impact of industry-specific shocks.[22] As another example, the Pennsylvania Department of Environmental Protection relied on contractor ICF to de-

[20] *Scientific American* 2025 [perma.cc/X7DT-KGNN].
[21] See 5 U.S. Code § 3109—Employment of experts and consultants; temporary or intermittent.
[22] Eastern Research Group [perma.cc/8RWC-9RY4].

velop a predictive model of extreme temperature within the state.[23] While Eastern Research Group and ICF are private firms, and their employees not government workers, they nonetheless supply expertise for the administration of public climate policy.

We argue that private sector demand for climate expertise, by diminishing the public sector's ability to attract in-house experts, pushes governments to engage in more arm's length contracting with private sector consultants. This implies, in turn, a shift in the conduct of climate governance from the public to private sector. Because this shift emerges from labor market pressures, rather than intentional acts by government, we refer to this as a *de facto*, not *de jure*, privatization of governance authority.

Hypothesis 2. *Firm demand for climate expertise increases the government's procurement of climate-related consulting services from the private sector.*

There may be other drivers of procurement, such as leaders' level of climate policy ambition. Recent work in American politics suggests that policy areas prioritized by the president draw larger research contracts, reflecting an effort to steer the production of evidence in a favorable direction (Potter 2025). Our theoretical argument is independent of this: we highlight a constraint, not a positive inducement, that yields increased government contracting. We account for these alternative explanations in the empirics described below.

EXTENT OF PUBLIC-PRIVATE COMPETITION

We focus empirically on the United States, though see the theory as applicable across countries where there are private sector wage premia for high-skilled workers.[24] The U.S. features a large administrative state and, like other advanced economies, has experienced a

[23] ICF [perma.cc/YGQ3-PLHF].

[24] This is most common in high-income countries (Abdallah, Coady, and Jirasavetakul 2023). See, e.g., private sector wage premia for the highest skilled workers in Britain (*BBC News* 2022, perma.cc/Z9FG-EJN6), France (Bargain and Melly 2008), and Germany (Caballero et al. 2024).

high level of private sector climate hiring in recent years.[25] We first characterize the nature of public-private competition for climate experts and profile the firms that have sought to hire these experts. We then test our theory, linking intensification of this competition — increased firm demand for workers also sought by government — to the quality of the U.S. federal bureaucracy and federal procurement of private sector consulting services.

We measure demand for climate experts using data on 434 million job postings in the U.S. between 2010–2024, covering the private and public sectors. We draw these data from Lightcast, a labor market analytics company that collects large amounts of information on individual job openings, including job descriptions, education requirements, requested skills, and salary ranges. Despite its unique breadth and detail, Lightcast data have not been widely used in political science nor in any studies of climate change to our knowledge.[26]

We identify full-time job postings targeted at climate experts via a keyword search of job descriptions. We develop a list of thirty terms, based on skills and tasks commonly involved in climate work. Terms include, for example, "climate change," "climatolog[y]," and "meteorolog[y]." Jobs are classified as climate related if their description includes at least one term in this dictionary. We find that this correlates closely with an alternative measure of climate-related job postings, based on Lightcast codings of the skills requested for individual jobs.[27] Appendix C details this measurement approach.

Our theory concerns competition between firms and governments over a common pool of climate experts. In practice, however, the private and public sectors may seek different types of climate experts. In secondary analyses, we accordingly consider private sector demand specifically for types of climate workers that are concurrently pursued by the federal

[25] On global demand for climate expertise, see, e.g., *Financial Times* 2025 [perma.cc/43GP-SV92].

[26] Data from Lightcast, formerly known as Burning Glass Technologies, have been recently used in labor economics (e.g., Deming and Noray 2020). For one political science application, see Berliner, Kalyanpur, and Thrall 2024. These data are proprietary and available for purchase through Lightcast.

[27] We identify climate-related skills in the Lightcast Open Skills Taxonomy. See Lightcast [perma.cc/4HYD-ZB5E].

government. To identify such workers, we first extract Lightcast data on the occupations targeted in individual job postings. We then code a private sector job posting as *overlapping* with federal demand when a federal agency sought to hire in that same occupational category at some point in the preceding two years.[28]

Figure 1 summarizes changes in demand for climate experts. Affirming our theoretical intuitions, two trends are immediately apparent. First, panel (a) illustrates a surge in private sector demand for climate expertise in recent years. Firms advertised, on average, 37,533 climate-related jobs in each quarter between 2021 and 2024, more than three times the rate of hiring in the 2010s. Firm job postings increasingly targeted the same types of workers as federal postings as well, pointing to intensified public-private hiring competitions. In the fourth quarter of 2024, each federal climate-related job posting overlapped on average with 129 contemporaneous postings by firms, a 73% increase over 2021 and elevenfold increase over 2016. About 56% of postings by firms overlapped with recent federal postings.

Second, this proliferation of climate job postings mirrors growth in the wages on offer. Panel (b) indicates that while average nominal salaries in the private sector remained roughly steady throughout the 2010s, they have dramatically increased since 2019. While federal pay has also increased, it has lagged well behind, as indicated by the growing private sector wage premium depicted in panel (c). To estimate the private sector wage premium, we matched federal jobs to firm jobs on the basis of minimum educational requirements and six-digit occupational codes from the U.S. government's Standard Occupational Classification System. Panel (c) documents that federal and firm pay was near parity throughout the 2010s. Between 2019 and 2024, however, the private sector wage premium has increased by about 30 percentage points.

[28] We use six-digit occupational codes from the U.S. government's Standard Occupational Classification System. We primarily define federal job postings as those posted to usajobs.gov, the main application portal for jobs in the federal government; we identify some additional federal jobs through a manual review of employer names.

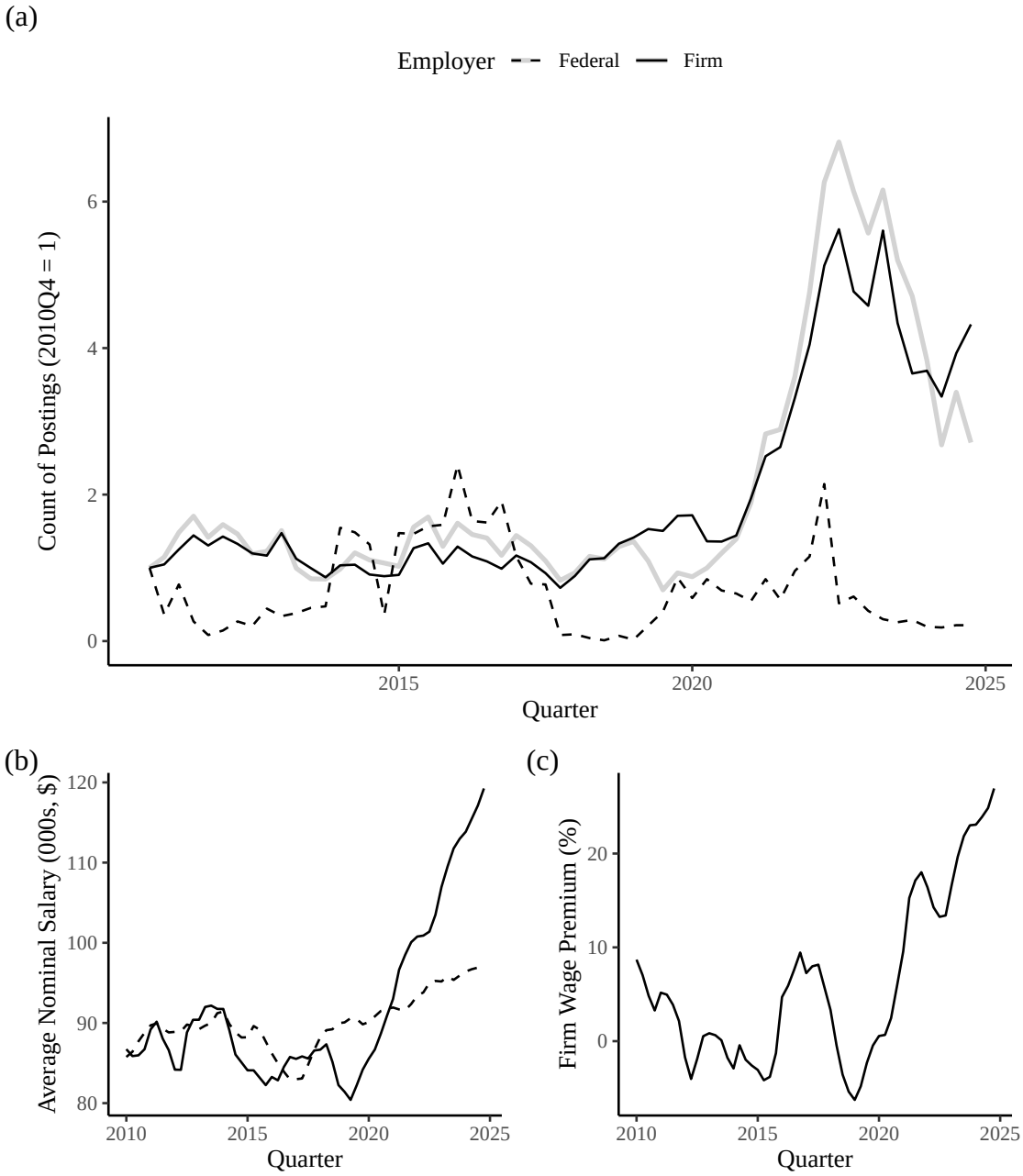

Figure 1: Panel (a) plots counts of climate-related job postings by the federal government and firms, indexed to 2010Q4; the gray line depicts the number of firm postings targeting the same occupations as federal postings by quarter. Panel (b) plots average nominal salaries by minimum education level across firms (solid) and federal agencies (dashed); eight-quarter rolling means. Panel (c) plots private sector wage premiums by minimum education level, after matching jobs by occupational code and minimum educational requirement; eight-quarter rolling means.

Profile of Hiring Firms

Which types of firms hire climate experts? Professional, scientific, and technical services firms (NAICS 541) are the most frequent advertisers of climate-related jobs in the data. In 2015, for example, the infrastructure consultancy AECOM advertised for an environmental engineer who would "evaluate and determine sources and methods of controlling pollutants in air," "provide technical-level support for ... litigation," and assess regulatory compliance. In 2023, the engineering consultancy Tetra Tech sought a senior manager in part to execute federally funded "resilience and climate adaptation" projects. In 2024, Boston Consulting Group looked to hire a research analyst with "specialization in climate policy, climate benchmarking, setting/achieving net-zero targets, and ESG ratings." Carbon-intensive companies are also active in climate-related hiring. Utilities companies (NAICS 221) are among the most frequent advertisers of climate-related jobs in our data. Southern California Edison, for example, sought in late 2023 a senior advisor to help incorporate climate adaptation into project planning, offering pay up to $218,000 — $34,500 more than the maximum salary available to most federal workers that year.[29]

To further understand the types of firms that hire climate experts, we assess whether climate expert-hiring firms are more likely than other firms to engage in two important ways with the federal climate bureaucracy: direct lobbying of the EPA and provision of environmental consulting services to any federal agency. We focus on publicly traded firms for reasons of data availability,[30] matching firm-year level financial information from Compustat to three different databases: (*a*) the job postings data from Lightcast; (*b*) federal lobbying data from LobbyView (Kim 2017); and (*c*) data on federal procurement of environmental consulting services from the Federal Procurement Data System.

[29] In 2023, the highest salary for federal workers based in Washington, D.C., and on the General Schedule pay scale was $183,500 [federalpay.org/gs/calculator].

[30] Publicly traded firms account for nearly half (49.6%) of all climate expert job postings in our data.

NAICS code	Industry	Proportion lobbied the EPA	
		Did not hire experts	Hired experts
22111*	Electric power generation	0.05	0.19
324110	Petroleum refining	0.11	0.20
562111	Solid waste collection	0.02	0.43
–	All industries	0.004	0.07
NAICS code	Industry	Prop. consulted gov. on environment	
		Did not hire experts	Hired experts
336411	Aircraft manufacturing	0.00	0.29
541330	Engineering services	0.01	0.43
541614	Process and logistics consulting	0.00	0.82
–	All industries	0.001	0.02

Table 1: Table reports the proportion of firm-years in which a firm (i) lobbied the EPA and (ii) signed a procurement contract to provide a U.S. federal agency with environmental consulting services, disaggregated by whether or not the firm attempted to hire climate experts in that year.

Table 1 presents the proportion of firm-years in which a firm lobbied the EPA or provided the federal government with environmental consulting services, disaggregated by whether or not they also attempted to hire climate experts in that year. First, in the aggregate, we find that firms that hire climate experts are an order of magnitude more likely than others to lobby and contract with the government on environmental issues. This is the case even *within* industries that are clearly climate-relevant; for example, across publicly traded petroleum refining firms, those that hired climate experts are twice as likely to lobby the EPA than those that did not. Similarly, while all aircraft manufacturers are exposed to climate regulations due to the carbon intensity of air travel, only those that hired climate experts provided environmental consulting services to the government. These within-industry relationships still hold after adjusting for firm size (Appendix Table E1).

We do not make causal claims on the basis of these comparisons, which we view as descriptive. But the results do indicate that the firms that seek to hire climate experts are often the same firms that engage in the climate policy process, both formally (through contracting

with the government to provide consulting services) and informally (through spending their own resources to lobby the EPA). In one respect, these results indicate that at least some information generated by firm experts flows to government agencies; both consulting and lobbying are means by which firms share private expertise with the government (Hall and Deardorff 2006). At the same time, relative to federal bureaucrats, private sector climate experts (and their corporate managers) have greater discretion over the information they share with the government; in this sense, high levels of political engagement among hiring firms suggest that their experts exercise meaningful influence over climate policymaking.

BUREAUCRATIC COMPOSITION

How does private sector demand for climate expertise affect the composition of the federal climate bureaucracy? To measure the composition and characteristics of climate expertise in the public sector, we draw on FedScope data from the U.S. Office of Personnel Management (OPM) for the years 2010–2024. FedScope data provide individual-level employment information on 96% of federal employees at the quarterly level.[31] This comprehensive administrative dataset, compiled automatically from files that executive agencies submit to OPM, has been used in recent micro-level studies of the federal bureaucracy (Decarolis et al. 2020; Spenkuch, Teso, and Xu 2023; Ban, Park, and You 2024). FedScope data detail the education, professional grade, and, critically, *occupation* of federal workers. We use occupation codes to identify bureaucrats who hold climate-relevant positions.[32] These data,

[31] The data exclude postal workers and politically sensitive employees, such as intelligence and foreign service officers (Jennings and Nagel 2020). The data are anonymized. While de-anonymized data procured via Freedom of Information requests are available through 2018 (e.g., the BuzzFeed records used by Spenkuch, Teso, and Xu 2023), we use FedScope since most growth in private sector demand occurs after this point.

[32] We identify thirteen climate-related occupation codes, based on a review of the occupations sought in federal climate-related job postings. These occupations are environmental engineering, environmental protection assistant, environmental protection specialist, forestry, forestry technician, general natural resources management and biological science, geography, hydrologic technician, hydrology, physical science technician, physics, wildlife biology, and zoology. Not all workers in these occupations focus on explicitly climate-related tasks, though many do (*Union of Concerned Scientists* 2021 [perma.cc/46NV-63F2]). Lack-

limited to college-educated workers, contain 50.2 million bureaucrat-quarter observations; of these, 2.2 million (4.6%) are coded as climate relevant.[33] Appendix D reports summary statistics for all main analyses.

We aggregate these data in two ways, in both cases filtering to the twenty federal agencies with at least 1,000 climate-relevant employee-quarter-year observations. Our first approach aggregates to the agency-quarter-year-job type (climate relevant or not) level. For example, we have separate observations for Department of Agriculture, 2018Q2, climate-relevant, and Department of Agriculture, 2018Q2, other (non-climate relevant). This data structure allows us to use each agency's non-climate relevant staff as a comparison group for its climate experts; non-climate employees should be unaffected by private sector climate demand, while accounting for agency-specific hiring practices.

Our second approach accounts for the General Schedule (GS) system that structures the federal civil service. Most civilian workers in the federal government are classified at a pay grade ranging from GS-1 (most junior) to GS-15 (most senior). These grades are based on the "level of difficulty, responsibility, and qualifications required" for a given position; grades from GS-1 through GS-7 are considered entry level, GS-8 through GS-12 mid-level, and GS-13 through GS-15 upper level and supervisory.[34] Approximately 70% of climate-relevant bureaucrats are classified at or above GS-11. In this approach, we aggregate data to the agency-quarter-year-*GS grade*-job type level, allowing us to compare staff within the same GS grade.

This within-GS grade approach addresses the possibility that climate policymaking confounds the relationship between firm demand and bureaucratic composition. Pro-climate administrations may trigger increased firm demand for expertise and simultaneously ex-

ing more precise data on individual bureaucrats' work tasks, we see these occupations as the best metric of staff proximity to climate governance.

[33]The data does not include identifiers that permit matching of bureaucrats across waves.

[34]OPM [perma.cc/YG7N-BKY9]; FederalPay.org [federalpay.org/gs/2025/GS-13].

pand the lower ranks of the climate bureaucracy, as they seek more staff to do the day-to-day work of climate policy implementation. GS grades, usefully, capture the administration's hiring priorities. As part of the annual appropriations process, federal agencies submit staffing plans and funding requests that specify the number and level of positions they intend to fill; once approved, jobs are advertised at these pre-authorized GS grades. Accordingly, by comparing staff within the same GS grade, we effectively control for shifts in administrative hiring priorities.

Quality

We measure bureaucratic quality as the share of bureaucrats who hold a graduate degree. Our identification strategy approximates a difference-in-differences design with continuous treatment. The treatment variable, plotted in Figure 1(a), is the logged number of climate-relevant private sector job postings in a given quarter; in secondary tests, we re-specify this as the count of firm job postings overlapping with federal demand. In tests pooling over GS grades, the treated group is the population of climate-relevant employees within each federal agency in our sample; the comparison group is the population of all other non-climate-relevant employees within those agencies. We estimate the following equation by ordinary least squares:

$$Y_{atc} = \alpha \mathbb{I}(c = \text{climate}) + \beta \text{demand}_{t-1} + \delta[\text{demand}_{t-1} \times \mathbb{I}(c = \text{climate})] + \zeta \mathbf{Z}_{t-1} + \phi_a + \gamma_t + \varepsilon_{atc}$$

where a indexes agencies, t quarter-years, and c the climate relevance of the job type. All models include quarter-year fixed effects. In tests disaggregating bureaucrats by GS grade, we include agency-GS grade fixed effects in lieu of agency fixed effects. Our coefficient of interest is δ, the interaction between private sector climate demand and a binary indicator for climate-relevant employees.

One possibility is that any association between firm demand and bureaucratic quality owes not to changes in demand for *climate* skills specifically, but rather broad shifts in high-skilled labor markets with which demand for climate expertise may be correlated. To account for this, our primary models control for the interaction of climate relevance with quarterly firm demand for non-climate-related software developers and engineers (logged count of job postings), a proxy for general demand for technically sophisticated workers.[35]

DV:	% Staff With Graduate Degree			
	GS Pooled		*GS: Mid Level*	*GS: Upper Level*
	(1)	(2)	(3)	(4)
Demand × Climate-relevant	−1.233***		−1.381	−2.669*
	(0.313)		(1.574)	(0.970)
Demand (overlapping) × Climate-relevant		−0.956***		
		(0.204)		
Climate-relevant bureaucrat	44.587***	44.112***	73.150**	40.570+
	(9.421)	(9.399)	(25.560)	(21.108)
N	2,276	2,276	9,379	7,615
Adjusted R^2	0.884	0.884	0.511	0.750
Software demand control	✓	✓	✓	✓
Quarter-year FE	✓	✓	✓	✓
Agency FE	✓	✓		
GS-agency FE			✓	✓

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 2: Regressions of the proportion of staff with a graduate degree on firm demand in the preceding quarter (logged count of job postings), interacted with the climate relevance of job type. Models (1–2) pool across GS grades within agencies; models (3) and (4) separate staff within agencies by GS grade, limited to mid-level grades (GS-8 through GS-12) or upper-level grades (GS-13 and above). All models control for the interaction of climate relevance with software demand. Standard errors clustered by agency.

Results reported in Table 2 are in line with Hypothesis 1. Pooling across all GS grades, we find that firm demand for climate workers reduces the share of climate-relevant bureaucrats with graduate degree relative to other bureaucrats in the same agency. This effect is

[35] We draw these data from Lightcast, using its coding of jobs that require skills in software development or engineering.

of non-trivial magnitude. Model 1 indicates, for example, that the change in firm demand observed between 2020Q4 and 2024Q4 would be associated with a 1.4 percentage point reduction in the proportion of bureaucrats with graduate degrees relative to others in their agencies — an 18% narrowing of the standard education gap between climate-relevant and other bureaucrats.[36] Similar results are found when focusing specifically on firm demand for the types of climate workers recently sought by the federal government (Model 2).

Models 3–4 include GS grade-by-agency fixed effects, thus comparing climate-relevant bureaucrats to others in their agency and of the same professional rank. Model 3 is limited to mid-level workers (GS-8 through GS-12) and Model 4 to upper-level workers (GS-13 and above). Results indicate that firm demand reduces relative educational attainment most clearly among upper-level bureaucrats. Among upper-level workers, the change in firm demand between 2020Q4 and 2024Q4 would be associated with a 2.9 percentage point reduction in the relative share with graduate degrees. The estimate for mid-level workers is substantially smaller and statistically insignificant. The concentrated effect on upper-level workers is consistent with our argument: the highest quality climate experts — those commanding the largest salaries — are those who the government has the hardest time acquiring and retaining amid rising firm demand.

Personnel Churn

The results in Table 2 suggest that private sector demand for climate expertise produces a relatively lower quality climate bureaucracy. There are two primary paths through which private sector demand could shape the federal workforce. First, private sector demand may lead high-quality experts to exit government in pursuit of greater private sector pay (failed *retention*). Second, more abundant and lucrative private sector opportunities could make it

[36] Across the sample, climate-relevant bureaucrats are eight percentage points more likely to hold a graduate degree than other bureaucrats.

more difficult for the government to *recruit* climate talent.

To determine how much of the aggregate effect of private sector demand is driven by challenges in retention versus recruitment, we make use of additional FedScope datasets on (*a*) bureaucrats who resigned their positions and left the federal workforce and (*b*) newly hired federal workers. We estimate the models of the same structure as those in Table 2 — with and without GS grade-agency fixed effects — redefining the outcome as logged counts of quits and hires. We additionally estimate quits and hires for each GS grade individually.

Figure 2 reports estimates for quits and hires. The results suggest that firm demand complicates retention of climate workers across much of the bureaucratic hierarchy. Model 1 indicates that the increase in firm demand between 2020Q4 and 2024Q4 would increase quits among climate-relevant bureaucrats by 63% compared to others in their agency. We find similar results when comparing quits within GS grades (Model 2): that same increase in firm demand would be predicted to increase quits by 19% compared to others within the same GS grade and agency. Results also indicate that firm demand increases hiring, consistent with an effort to compensate for quits.

There is notable variation across GS grades in the extent to which recruitment keeps pace with staff resignations. As illustrated in the lower panel of Figure 2, firm demand increases quits and hires to similar extents across lower and middle GS grades. At more senior ranks, however, firm demand increases quits to a greater extent than hires; at the two senior-most GS grades, firm demand in fact has no significant effect on hires. This suggests challenges in recruiting new upper-level climate bureaucrats, those attracting the largest private sector salaries, to make up for resignations induced by private sector demand.

Collectively, these results indicate that firm demand increases churn across much of the climate bureaucracy — movement of workers out of and into federal agencies. That in and of itself places pressure on bureaucracies; expertise and institutional knowledge grow with time spent by individuals at a single agency (Lewis 2007; Bertelli and Lewis 2013).

DV:	Quits		Hires	
	(1)	(2)	(3)	(4)
Demand × Climate-relevant	0.442***	0.159**	0.467***	0.225**
	(0.058)	(0.048)	(0.056)	(0.059)
Climate-relevant bureaucrat	0.538	−0.218	−1.400	−0.333
	(0.746)	(0.510)	(1.028)	(0.519)
N	2,200	6,600	2,200	17,600
Adjusted R^2	0.867	0.674	0.852	0.714
Software demand control	✓	✓	✓	✓
Quarter-year FE	✓	✓	✓	✓
Agency FE	✓		✓	
GS-agency FE		✓		✓

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

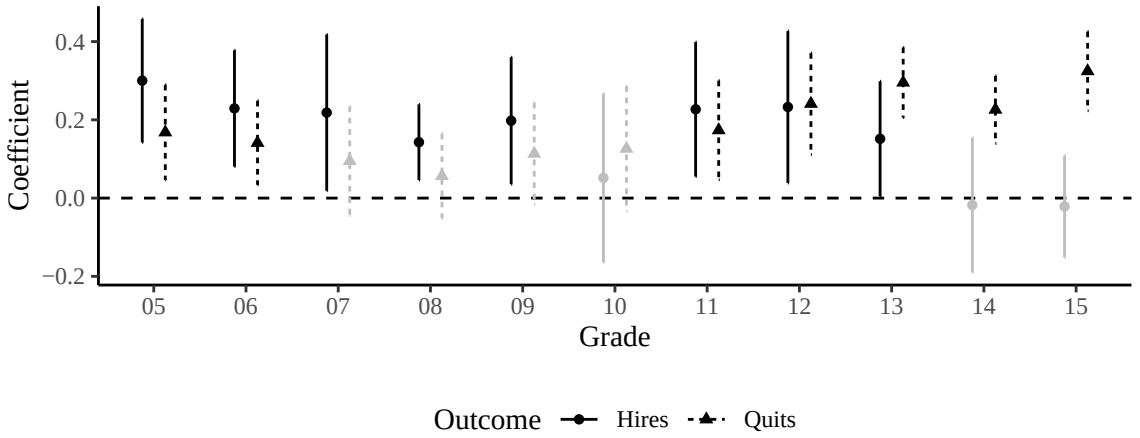

Figure 2: Table reports regressions of logged counts of quits and hires on firm demand in the preceding quarter (logged count of job postings), interacted with the climate relevance of job type. Figure plots interaction coefficients of these regressions estimated by individual GS grade; results significant at $p < 0.05$ are darkened. Standard errors clustered by agency.

Can this personnel turnover also explain the reductions in average educational attainment reported in Table 2? Additional tests suggest so. We find that at higher bureaucratic ranks, firm demand increases resignations among staff with graduate degrees (not among less educated staff). Firm demand does not, however, increase *hires* of workers with graduate degrees at any GS grade, suggesting that firm demand specifically produces a net outflow of more educated staff at high bureaucratic ranks (Appendix F).

Alternative Explanation

A possible concern is that these results conflate the effect of firm demand with shifts in presidential prioritization of climate, given the spike in firm demand around the 2021 Trump-Biden transition and Biden's own climate policy initiatives. It is likely that such policy changes affected firm hiring priorities; the Biden administration may have also expanded the ranks of junior staff, thus reducing average education levels across the climate bureaucracy in aggregate. But this explanation is not consistent with the reduced bureaucratic quality that we identify *within* GS grades (Table 2); it is not clear why pro-climate administrations would intentionally seek less educated staff to fill upper-level civil service positions. Moreover, this explanation is inconsistent with the increased quit counts, and quit counts in excess of new hires at upper-level GS grades, depicted in Figure 2. Politically motivated exits of climate-relevant bureaucrats are most plausible under climate-skeptical populist governments, not pro-climate administrations (Carnegie, Clark, and Zucker 2024).

DISAGGREGATING FIRM DEMAND

We theorize a number of reasons why firms pursue climate expertise. Some motivations are consistent with global climate objectives, such as efforts to reduce firm-level emissions. Others, such as an interest in bolstering lobbying capacity or averting regulatory scrutiny, have ambiguous or negative implications for progress towards those goals. In this section, we consider the extent to which erosion in bureaucratic capacity stems from demand from firms where the labor of climate experts is plausibly used for pro-social climate objectives, versus from firms where expert labor may be used to less pro-social ends.

To identify such firms, we draw on grades of corporate climate performance published by CDP, formerly known as the Carbon Disclosure Project, matching these to firms in Lightcast job posting data. CDP is a non-profit organization that maintains an environmen-

tal disclosure system for firms. CDP solicits disclosures from a broad cross-section of firms around the world on their climate activities and strategies (Green 2010). As of 2024, nearly 23,000 firms globally disclose information through CDP (Appendix G details this process).

Based on these firm-level disclosures, CDP awards each firm a grade from A to D that reflects its level of action on climate and the transparency of its climate-related activities and strategies; firms that do not respond to an invitation to disclose climate information receive an F. Firms on the "A List," such as Cisco, Danone, Honda, HP, L'Oréal, and LVMH, frequently publicize their marks, suggesting that A grades confer a reputational benefit and are readily observable to jobseekers.[37] Few firms receive an A grade: just 2% of all graded firms in 2024.

	Total Hiring Firms	*Non-U.S. HQ*	*U.S. HQ*
A Grade	101	71	30
Sub-A Grade	1,894	798	1,096
% A Grade	5%	8%	3%

Table 3: Counts of unique climate expert-hiring firms by 2014 CDP grade and headquarters location (firms not contacted by CDP are excluded). Note that as all job postings are for U.S.-based positions, many of the firms with foreign headquarters are U.S. subsidiaries of foreign parent firms.

In this section, we examine whether hiring by firms that received an A grade from CDP in 2014 (climate-leader firms), separated from those with a sub-A grade, predict changes in bureaucratic composition between 2015–2024.[38] Table 3 shows that a mere 5% of firms engaged in climate expert hiring received an A grade. Indicative of U.S. exposure to shifts in foreign corporate practices, 70% of the A-grade firms pursuing climate experts are headquartered outside of the U.S. Similarly, Figure 3 illustrates that the bulk of demand has come from firms with a sub-A grade; just 23% of climate job postings between 2015–24

[37] See, e.g., Cisco 2020 [perma.cc/7MBC-UJVW] and Honda 2025 [perma.cc/9YJB-BR8N].

[38] We focus on grades in 2014 and outcomes for 2015–2024 given the possibility that climate hiring affects grades. Firms not contacted by CDP are excluded from these analyses.

came from A-grade firms. This proportion has grown over time, though as of 2024Q4 postings from sub-A grade firms outnumbered A-grade postings three-to-one.

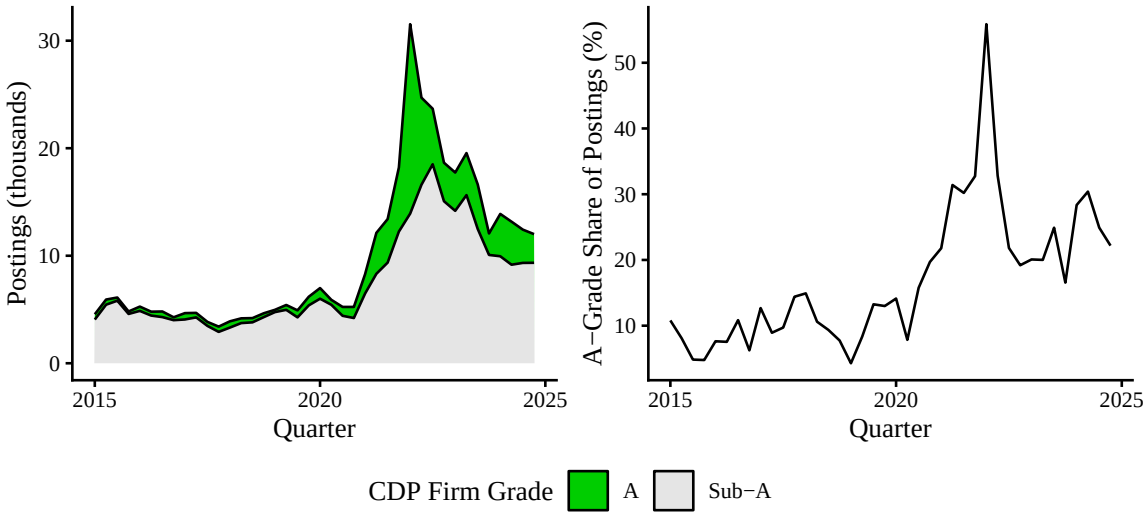

Figure 3: Left panel plots quarterly counts of climate-related job postings by A-grade or sub-A grade firms, excluding postings by firms not graded or contacted by CDP. Right panel plots the share of jobs posted by A-grade firms by quarter.

This hints that substantial flows of expertise are directed towards firms with mixed or poor records on climate. To interrogate this further, we examine the extent to which outflows of expertise from government are driven by demand from climate-leader versus -laggard firms, re-estimating the model of quits reported in Figure 2 after separating job postings by A-grade and sub-A grade firms. We focus this analysis on the Biden administration, which allows us to hold constant the government's emphasis on climate policy-making. The Biden years also account for more than 90% of all postings by A-grade firms and saw clearer differences in hiring trends between A-grade and sub-A grade firms, which aids regression estimation.

Figure 4 presents estimation results. Two conclusions can be drawn. First, across ranks, demand from A-grade firms increases quits of climate-relevant bureaucrats relative to colleagues of the same rank and within the same agency. The largest effect is observed at

DV:	Quits		
	GS: Low Level	*GS: Mid Level*	*GS: Upper Level*
	(1)	(2)	(3)
Demand (A grade) × Climate-relevant	0.392***	0.359***	0.490***
	(0.095)	(0.081)	(0.072)
Demand (sub-A grade) × Climate-relevant	0.132	0.203*	0.330***
	(0.102)	(0.096)	(0.081)
Climate-relevant bureaucrat	17.260***	15.536***	20.153***
	(3.283)	(2.979)	(2.820)
N	1,440	2,400	1,440
Adjusted R^2	0.679	0.681	0.757
Software demand control	✓	✓	✓
Quarter-year FE	✓	✓	✓
GS-agency FE	✓	✓	✓

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

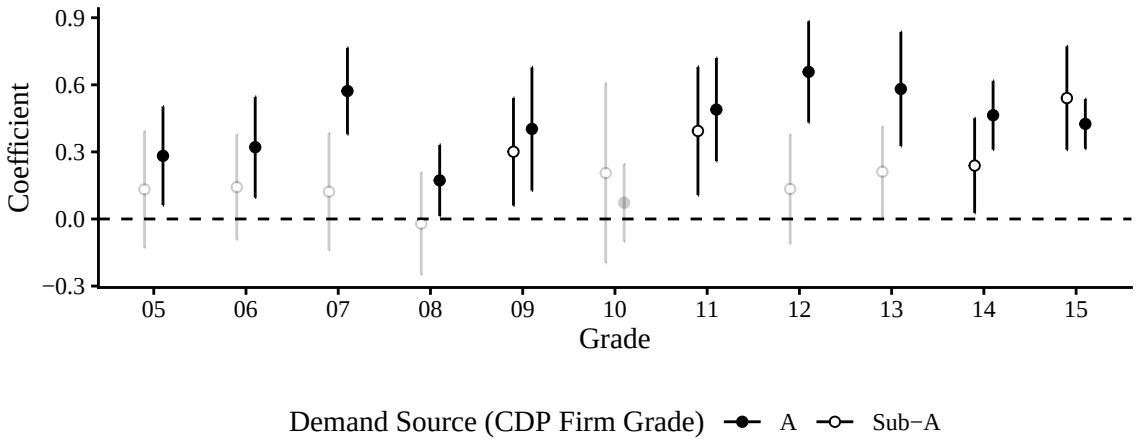

Table 4: Table reports regressions of logged counts of quits on firm demand in the preceding quarter (logged count of job postings), interacted with the climate relevance of job type (A, or lower than an A). Demand disaggregated by firms' CDP grade. Sample split across low-level (GS-5 through GS-7), mid-level (GS-8 through GS-12), and upper-level (GS-13 through GS-15) grades. Figure plots interaction coefficients of these regressions estimated by individual GS grade; results significant at $p < 0.05$ are darkened. Standard errors clustered by agency.

upper-level GS grades, where the growth in A-grade firm demand observed from 2020Q4 to 2024Q4 would predict 135% more quits among climate-relevant bureaucrats relative to colleagues. Second, independent of demand from A-grade firms, demand from firms

with poorer climate marks likewise produces relatively more quits among climate-relevant government staff. Demand from sub-A grade firms increased by 112% between 2020Q and 2024Q; this would predict 37% more quits among upper-level climate-relevant bureaucrats and 23% more quits among mid-level climate-relevant bureaucrats. We do not find that demand from sub-A grade firms significantly increases quits among lower-level staff.

Can these results clarify the aggregate welfare effects of the labor market competition we document? Experts may be able to advance societal climate goals at climate-progressive firms much as they would in government. However, the results suggest that there is a significant flow of experts from government to firms with lagging records on climate. While results in Figure 3 indicate that the marginal effect of A-grade job postings may exceed that of sub-A grade postings, level differences in demand across these types of firms point to substantial flows of expertise from government towards climate laggards. Demand from A-grade firms exceeded demand from sub-A grade firms in just one quarter between 2015–2024. Laggard firms may seek experts to upgrade their climate practices, which would attenuate the societal welfare loss of this expertise reallocation. Though to the extent that firms remain principally motivated by shareholder interests, opportunities for experts to advance public welfare should remain more limited than in government, particularly when the government makes climate policymaking a focus.

DE FACTO PRIVATIZATION

We have thus far demonstrated that private sector demand for climate expertise limits the government's retention and recruitment of high-quality experts, who enjoy substantial private sector wage premia. Hypothesis 2 posits that one consequence of this loss of expertise is increased reliance on private sector contractors for the administration of climate policy.

To test for changes in government contracting, we use data from the U.S. General Ser-

vices Administration on the near universe of procurement contracts signed by all non-military U.S. executive agencies from 2014–2023. The data, which come from the Federal Procurement Data System and were accessed via SAM.gov, contain detailed metadata on approximately nine million federal contracts, encompassing all significant ($> \$10,000$) purchases of goods and services made by government buyers from private contractors.[39] Contract-level variables include the name of the contracting firm, the primary location where the contract will be carried out, the value of the contract, and — importantly for our purposes — the firm's six-digit NAICS industry code.

We use industry codes to identify contracts in which a federal agency purchased consulting services from the private sector, indicative of the agency's effort to access external expertise. These industry codes allow us to identify all contracts in which an agency purchased private consulting services.[40] Consulting, more so than other services, captures a relationship in which the agency is paying to access private sector expertise. Such relationships are common: 70 of the 75 agencies in our data purchased some form of consulting services during the sample period and consulting services constitute 6% of all contracts signed.

Figure 4 shows that EPA use of private consultants has increased rapidly beginning in the late 2010s relative to the federal government average. While consulting accounted for less than a quarter of the agency's purchases in 2014–2017, it accounted for well over a third by 2023. Further, unlike other agencies, the vast majority of the EPA's consulting purchases concern *environmental* consulting (77% vs. 15% for other agencies). We argue that rather than solely reflecting a general increase in federal agencies' use of consultants, the disproportionate growth in the EPA's purchase of consulting services shown in Figure 4 stems at least in part from the concurrent rise in private sector demand for climate experts.

[39]Federal agencies must report all contracts that are estimated to be worth $10,000 or more to the Federal Procurement Data System. See FPDS [perma.cc/3TSX-X645].

[40]NAICS codes 541611, 541614, 541690, 541612, 541618, 541620, 541613.

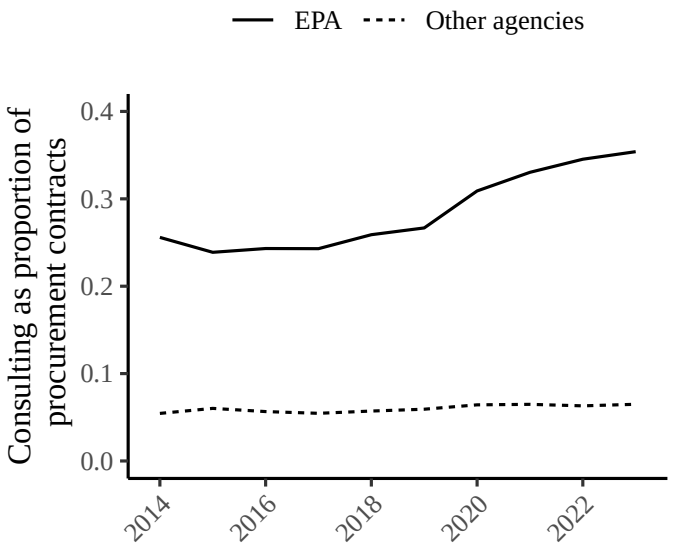

Figure 4: Proportion of procurement contracts going to consultants, by year and agency. The Environmental Protection Agency has increased its use of private sector consulting services to a greater extent than other executive agencies in recent years.

To test this claim, we estimate several regression models using the procurement contract data. We use the same measure of private sector demand for climate expertise as in previous analyses, interacted with an indicator for whether the contracting agency is the EPA. To test Hypothesis 2, we take as the outcome an indicator of whether a given contract involves the purchase of consulting services. We predict a positive sign on the interaction term: as private sector demand for climate experts grows, the EPA should increase its reliance on private sector consultants relative to other agencies. We also consider several placebo outcomes — contracts for construction, logistics, and manufacturing — for which our theory predicts no similar effect. For all outcomes, we estimate the following model:

$$Y_{aits} = \alpha \mathbb{I}(a = \text{EPA}) + \beta \text{demand}_t + \delta[\text{demand}_t \times \mathbb{I}(a = \text{EPA})] + \phi_a + \gamma_t + \iota_s + \varepsilon_{aits}$$

where a indexes agencies, i contracts, t quarter-years, and s the U.S. states where a contract

DV: contract is for...	Consulting		Construction	Logistics	Manufacturing
	(1)	(2)	(3)	(4)	(5)
Demand × EPA	0.068***	0.067***	0.003	−0.001**	0.003
	(0.015)	(0.014)	(0.002)	(0.000)	(0.007)
N	7,547,738	7,547,738	7,547,738	7,547,738	7547738
Adjusted R^2	0.017	0.071	0.021	0.012	0.149
Quarter-Year FE		✓	✓	✓	✓
Agency FE		✓	✓	✓	✓
State FE		✓	✓	✓	✓

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 5: Regressions of indicator variables for various contract industries on private sector demand, interacted with an indicator variable equal to 1 when the contracting agency is the EPA. Standard errors clustered by state.

was carried out. We include state fixed effects to ensure that results are not driven by, for example, the opening or closing of regional offices that may have systematically different procurement needs.

Table 5 presents estimation results with robust standard errors clustered at the state level. Models 1–2 support Hypothesis 2. With and without a demanding set of fixed effects, private sector demand for climate experts is strongly associated with increased use of consulting services by the EPA relative to other agencies. The effect size is substantively meaningful: a standard deviation increase in private sector demand is associated with a 3.3 percentage point increase in the EPA's use of consultants relative to the rest of the federal bureaucracy. Further, we see no meaningful effect on any placebo outcome, all of which are near zero in magnitude (Models 3–5). This allays the concern that the results for consulting are the artifact of a general shift in EPA procurement strategy.

As private sector demand for climate expertise increases, the EPA becomes more reliant on private consultants relative to other agencies. This increase is similarly pronounced when we limit our focus to *environmental* consulting (Appendix Table H1). We also aggre-

gate the contracts data to the agency-quarter-year level to consider additional outcomes; as Appendix Table H2 shows, private sector demand is associated with growth in the EPA's proportion, number, and (for environmental consulting) total value of consulting contracts compared to the rest of the federal government.

Alternative Explanation

One potential concern is that these results owe not to changes in firm demand but rather, as discussed previously, coincident shifts in presidential prioritization of climate. Potter (2025) lends credence to this possibility: presidential administrations tend to increase the procurement of policy research from the private sector in prioritized issue areas. To address this alternative explanation, we consider the type of contract that Potter (2025) finds to be susceptible to presidential manipulation: the commissioning of "special studies." As reported in Table 6, private sector demand for climate expertise has no statistically or substantively significant relationship with contracting of special studies (Model 2), while the main results for consulting are robust to excluding all special studies from the sample (Model 1). This suggests that change in the EPA's use of consultants is not simply a product of shifts in presidential priorities. In an additional robustness check, we exclude from the sample the Biden administration, which took a particular interest in climate policymaking; results are robust (Appendix Table H3).

The evidence provided in this section suggests that, despite the lack of formal legislation or salient announcements to this effect, U.S. climate governance is undergoing *de facto* privatization. While increased contracting may reflect strategic choices by the government to more effectively pursue presidential priorities (Potter 2025), our findings suggest that it is also a way in which the government responds to increased labor market competition for climate expertise.

DV: contract is for...	Consulting	Special Study
	(1)	(2)
Demand × EPA	0.074***	0.003
	(0.018)	(0.009)
N	7,453,456	7,556,596
Adjusted R^2	0.069	0.019
Quarter-Year FE	✓	✓
Agency FE	✓	✓
State FE	✓	✓

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Regressions of indicator variables for various contract categories on private sector demand, interacted with an indicator variable equal to 1 when the contracting agency is the EPA. Model (1) was estimated on a sample that does not include contracts related to special studies. Standard errors clustered by state.

Implications

What are the consequences of this observed privatization of climate governance? We offer two conjectures. First, as Hart observes (2003), a government's decision to contract out services as opposed to providing them internally mirrors the hold-up problem explored by economic theories of the firm. As private contractors specialize in government services, narrowing their pool of potential clients, the government's ability to extract a lower price for their services increases. Contractors may thus refrain from making investments sought by the government, limiting the quality of the government services they provide.

Second, scholars have long considered the trade-offs inherent in privatization. Hart, Shleifer, and Vishny (1997) notably model privatization as a choice that delivers cost savings at the risk of diminished service quality, as private contractors are typically more efficient but may not share the government's objective of maximizing social welfare. In this model, privatization is more favorable when the government wants to encourage innovation in the policy area and when the undesirable consequences of cost cutting are obvious

enough *ex ante* that they can be prevented by a well-specified contract.

The implications of this for climate contracting are ambiguous. On one hand, policy innovation, which is critical to effective climate governance, is often driven by experimentation that occurs outside of national governments (Sabel and Victor 2022). Yet the complexities of climate change, including challenges in projecting policy impacts, make it difficult to fully specify a contract that would prevent a consultant from delivering a cost-efficient but welfare-suboptimal policy solution. For example, "climate risk services" firms offer climate models of variable rigor and difficult-to-verify quality (Condon 2023). Contracting selectively based on the ease of assessing firm performance — e.g., infrastructure projects meant to build climate resiliency — may better enhance social welfare.

CONCLUSION

Burgeoning growth in the climate regime complex is amplifying global demand for climate expertise. But the supply of that expertise is limited. This paper reframes climate governance as the product of a labor market competition between governments and firms for climate experts. We argue that as firm demand increases and private sector wage premia mount, governments struggle in the short term to recruit and retain high-quality climate experts. This, in turn, prompts some *de facto* privatization of climate governance as governments compensate for relative losses of expertise via contracting with firms.

To test this argument, we analyze unique data on firm hiring priorities and the composition of the U.S. federal bureaucracy. We find, in line with our theory, that growth in firm demand lowers the share of high-skilled climate-relevant staff on government payrolls. Particularly among higher-ranking climate bureaucrats, firm demand is associated with increased departures from the federal government, but — indicating a net outflow of expertise — no commensurate increase in new hiring. We further show that a large majority

of demand has stemmed from firms with lagging corporate records on climate, suggesting a potential net welfare loss from this public-to-private reallocation of expertise. We then link growth in firm demand to increased government use of consultants in the short term.

While we test this theory in the U.S. context, we see the theory as broadly applicable. First, in a number of high-income countries, there exist meaningful private sector wage premia for the highest skilled workers, as well as ascendant private sector demand for climate expertise.[41] Second, the labor market competition we characterize is transnational — a significant share of firms hiring climate experts on the U.S. market are headquartered elsewhere. Corporate reforms in one country may thus have spillover effects on bureaucratic capacity in another. Third, international organizations such as the IMF have, like national governments, sought to hire greater numbers of climate experts in recent years (Committeri et al. 2022). Growth in private sector demand across high-income countries plausibly complicates efforts by these institutions to bolster bureaucratic expertise.

This paper points towards three paths for future work. First, for tractability, our theory treats changes in firm demand for expertise as exogenous. Future work should problematize this. One compelling possibility is that firm demand is endogenous to real or perceived climate policy trajectories. When firms experience or anticipate strengthened climate regulations, the returns to acquiring expertise plausibly grow, increasing wage offers and accelerating the flow of experts away from government. Greater policy ambition and regulatory stringency may, as a result, paradoxically complicate the implementation and enforcement of those laws. Forward-looking policymakers may anticipate this and proactively dampen their climate ambition. Alternatively, firms better able to attract climate experts may seek stronger regulations, insofar as regulatory compliance requires stores of in-house expertise that competitors lack (Kennard 2020).

Second, future work should address the non-wage motivations behind climate experts'

[41] *LinkedIn* 2024 [perma.cc/B2QT-DM2K].

decision to accept employment opportunities in the public or private sector. Growth in private sector wages should be most compelling for highly wage-motivated and less "mission-driven" workers. Private sector competition may thereby facilitate ideological sorting and, over time, increase rates of pro-sociality in the climate bureaucracy. If mission-driven bureaucrats are especially innovative and capable (Honig 2024), this process may mitigate the extent to which labor market competition undermines climate governance.

Third, we theorize about and measure short-term changes in bureaucratic expertise, arising from an initial shortage of climate experts. Over time, mounting demand for expertise should increase the supply of that expertise. As supply and demand equalize, labor market power will shift from expert workers to employers. This, in turn, may incentivize experts to further distinguish themselves to employers in some way. For those interested in private sector work, one means of doing so may be to undertake government work — acquiring political connections and bureaucratic knowledge that subsequently appeal to private employers — thus setting a revolving door between the public and private sectors into motion. While climate labor markets have not yet reached that stage in practice, scholars should remain attentive to this evolution of climate as a profession and its implications for climate governance.

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APPENDICES

A. FORMALIZATION OF THEORY

Here we theorize how private sector demand affects bureaucratic composition and quality. To do so, we develop a simple formal model of a labor market in which the government G and two firms (FA, FB) compete to hire a climate expert E. The expert is endowed with some exogenous level of quality, $q > 0$, which is observable to all potential employers. We assume that all potential employers want to hire high-quality experts. Employers' utility for hiring the expert is increasing in the demand parameter, $d > 0$, which reflects exogenous market-wide demand for climate expertise.

To compete for E, the potential employers begin the game by making wage offers ω_i $(i \in \{G, FA, FB\})$. E then selects one of the three offers to accept, and payoffs accrue. Each of the potential employers receives $dq - \omega_i$ if E accepts their offer, and 0 otherwise. If E accepts either FA or FB's offer, her utility is simply the wage ω_{FA} or ω_{FB}. However, E is also endowed with some level of pro-sociality $\gamma > 0$; this can be understood as the non-wage, intrinsic premium placed on doing meaningful, welfare-enhancing work on climate (Ashraf et al. 2020), or the strength of their public service motivation.[1] We assume that highly pro-social individuals are willing to trade off higher pay for the opportunity to work at G, where they would serve the public interest rather than the interests of corporate shareholders.[2] E receives a payoff of $\omega_G + \gamma$ if she accepts G's offer.

[1] Our conceptualization is consistent with the notion of norm-based and affective public service motivation: "desire to serve the public interest" and "commitment to a program from a genuine conviction about its social importance" (Perry and Wise 1990, 370). While there may be fully pro-social experts who would never entertain any offer from the private sector, we focus on experts that could potentially be swayed one way or another.

[2] We do not claim that private sector climate efforts do not serve the public interest in any way. We merely note that, as organizations, firms' primary responsibility is to serve shareholders rather than the general public. An interesting extension of the model could treat γ as a function of both individual expert preferences as well as the pro-sociality of particular governments and firms, to allow for the fact that some governments and firms are more pro-social than others. We leave this for future work.

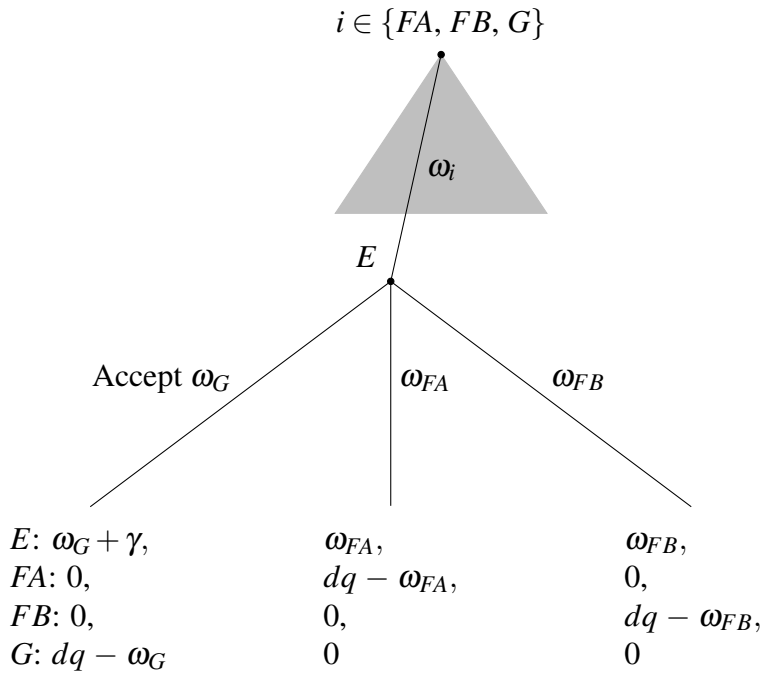

Figure A5: A model of public-private competition for climate experts.

We begin by characterizing the distinguished subgame perfect Nash equilibrium for this game when there are no constraints on the government's wage offers.[3] Beginning in the second stage, E accepts the max value of the set $\{\omega_G + \gamma, \omega_{FA}, \omega_{FB}\}$. Thus, in order to make E indifferent between its offer and that of the best private sector offer, ω_F, G only needs to offer $\omega_G = \omega_F - \gamma$. The highest wage that the identical firms would receive positive utility from paying is $\omega_F = dq - \varepsilon$. Substituting this value of ω_F into the government's wage offer, we can identify G's equilibrium wage offer:

$$\omega_G^* = dq - \gamma$$

In this unconstrained equilibrium, G can hire experts while paying below-private sector rates thanks to the non-wage, social value of government employment.

Next, we consider the more realistic scenario in which the government faces an upper bound, $\overline{\omega}_G$, on the wage offers it can make to E. Research points to a consistent private sector wage premium for the most educated workers, with government employers reacting sluggishly to private sector wage growth; further, government wage offers are often constrained by official salary schedules that determine the maximum compensation for a given position or career grade (Katz and Krueger 1991; Borjas 2002; CBO 2024).

[3]There are multiple equilibria in auction models of this sort. By "distinguished," we refer to the equilibrium where FA and FB bid their valuation of E, $\omega_F = dq - \varepsilon$ (Osborne 2004, *An Introduction to Game Theory*, Oxford University Press).

The public sector wage constraint $\overline{\omega}_G$ is not binding when it is greater than G's equilibrium offer in the unconstrained game. However, when $\overline{\omega}_G < \omega_G^*$, G can no longer compete with the private sector even after factoring in the pro-social bonus of government employment. Since there is still competition within the private sector when G cannot make a competitive offer, both firms continue to offer $\omega_{FA} = \omega_{FB} = dq - \varepsilon$ and E goes to the private sector. Formally,[4]

Proposition 1. *When $\overline{\omega}_G < dq - \gamma$, there exists no equilibrium in which E accepts G's offer.*

Having established this condition, we note that — for any $\overline{\omega}_G$ — G's ability to compete with the private sector to hire climate experts is declining in the term $dq - \gamma$. From here, it is straightforward to make predictions regarding the likely effects of increased demand for climate expertise on the characteristics of the government's climate bureaucracy. First, since $dq - \gamma$ is increasing in d, increased demand for climate expertise should increase the probability that experts choose private over public employment.

Corollary 1. *Since $\dfrac{\partial dq - \gamma}{\partial d} > 0$, higher demand for climate expertise makes experts more likely to go to the private sector.*

Second, we observe that the relationship between $dq - \gamma$ and d is affected by expert quality q. Higher levels of q amplify the effect of d on offered wages; increased demand for climate expertise has the largest effect on the market wage for high-quality experts. Thus, as demand increases, higher quality experts become relatively more likely to go to the private sector.

Corollary 2 (Hypothesis 1). *Since $\dfrac{\partial dq - \gamma}{\partial d \partial q} > 0$, higher demand for climate expertise makes higher quality experts relatively more likely to go to the private sector.*

Third, we examine the relationship between demand for climate expertise, pro-sociality γ, and the probability that E goes to the private sector. By rearranging terms of the inequality in Proposition 1, it can be shown that G can make competitive offers when:

$$\gamma \geq dq - \overline{\omega}_G$$

Intuitively, G can compete for climate experts when they are sufficiently pro-social to make up for the gap between the private sector wage dq and the maximum public sector wage $\overline{\omega}_G$. As demand rises, however, the level of pro-sociality necessary for G to remain competitive increases as well. Thus, increased demand (and accordingly the private sector wage available to experts) is likely to "screen out" less pro-social experts from government, increasing the average pro-sociality of the climate bureaucracy.

[4]Proofs available in Appendix B.

Corollary 3 (Hypothesis 2). *Since* $\frac{\partial dq - \overline{\omega}_G}{\partial d} > 0$*, higher demand for climate expertise should increase the average pro-sociality of government climate experts.*

We now consider an extended version of the model, accounting for the possibility of government contracting with the private sector. In this extension, if E accepts a firm's offer and goes to the private sector, G can contract with E's employer to procure E's consulting services. If G chooses to do so, it receives the payoff $dq - \omega_F$, the same payoff as the firm that hired E; if it chooses not to do so it receives 0. Other players' payoffs are unaffected by G's choice. Crucially, the upper bound on G's wage offer does not apply to contracting; G offers ω_F at this stage even if $\omega_F > \overline{\omega}_G$.

Contracting is not an attractive option for G when it has the option to hire an expert directly (i.e., when $\overline{\omega}_G \geq dq - \gamma$), because contracting would lead G to forfeit its pro-sociality subsidy γ by paying the higher private sector wage. However, when $\overline{\omega}_G < dq - \gamma$ and the government cannot hire the expert in-house, contracting becomes a favorable option. Again, it is clear from this expression that this is more likely to be the case as demand increases.

Corollary 4 (Hypothesis 3). *Increased demand for climate expertise increases the government's procurement of climate-related consulting services from the private sector.*

B. PROOFS

Unconstrained game

The game we analyze is a modified first-price sealed-bid auction with complete information: potential employers submit "bids" to an expert, knowing each other's valuations of the expert's labor, and the employer who submits the highest bid wins the expert's labor at the price bid. In the unconstrained game, we add only two modifications to the standard first-price sealed-bid auction. First, we model the expert who receives the wage bids as a (weakly) strategic actor. Second, we introduce a parameter γ that increases the expert's utility for accepting G's wage offer.

To facilitate the comparison to the first-price sealed-bid auction, we introduce the concept of **total bid value** (U_E^i): this is the total utility that E receives from the wage and non-wage benefits of potential employer i's offer, and the basis upon which E chooses among its various offers. For each firm, FA and FB, total bid value is equivalent to the wage offer ω because their offers have no nonwage component ($U_E^{FA} = \omega_{FA}$, $U_E^{FB} = \omega_{FB}$). For G, total bid value is equal to the government's wage offer plus the nonwage pro-sociality benefit of government employment: $U_E^G = \omega_G + \gamma$.

Having introduced total bid value, we can now consider different potential employers' **valuations** of E's labor. An employer's valuation for hiring an expert E is simply the positive part of their payoff if E is hired. Each firm receives dq if it hires E. Since neither q nor d varies between firms, both firms value E's labor at dq ($v_{FA} = v_{FB} = dq$). G also

receives dq if it hires E; however, when G offers ω_G, E receives $\omega_G + \gamma$ if she accepts. Thus, γ functions as a sort of subsidy (or, alternatively, a handicap) for governmental hiring.

We can move γ into G's utility function by noting the following. Thanks to γ's subsidizing effect, G does not have to set $\omega_G = U_E^G$ in order to ensure that its total bid value is equal to U_E^G. Rather, to ensure that E receives a given value of U_E^G, G must only offer:

$$\omega_G = U_E^G - \gamma \tag{1}$$

We can then express G's utility for making any wage offer with total bid value of U_E^G, if that offer is accepted, as follows:

$$dq - (U_E^G - \gamma) \tag{2}$$

$$= dq + \gamma - U_E^G \tag{3}$$

Expression (3) makes clear that, in the unconstrained game, G values E's labor at $v_G = dq + \gamma$. This is because, as γ functions as a substitute for wage compensation, G is able to capture this value by reducing its wage offers by γ. Further, since we have assumed that $\gamma > 0$, the potential employers' valuations satisfy the following:

$$v_G > v_{FA} = v_{FB} \tag{4}$$

It is clear that the potential employer with the highest valuation will make the offer with highest total bid value, and in turn hire the expert, in any equilibrium. To see why, consider an outcome in which G makes an offer that is lower than one of the firm's offers, which in turn is less than or equal to the firm's valuation ($\omega_G + \gamma < \omega_F \leq dq$). In this case, G could profit by making any offer ω_G such that $\omega_F \leq \omega_G + \gamma \leq dq + \gamma$, which would guarantee G positive utility as opposed to 0 (the payoff for failing to hire E). Likewise, consider an outcome in which both G and a firm make offers that are greater than the firm's valuation, and in which the firm's offer is higher than the government's ($dq < \omega_G + \gamma < \omega_F$). In this case, the firm hires E but receives negative utility from doing so; it would therefore prefer to lower its offer to $\omega_F \leq dq$ and receive 0, resulting in G hiring E.[5]

We characterize what Osborne (2004) calls the "distinguished" equilibrium of this game as follows. First, assume that when E receives n offers with identical utility, she chooses each of them with probability $\frac{1}{n}$. Both of the identical firms make the highest wage offers that, if accepted, would provide them positive utility: $\omega_{FA}^* = \omega_{FB}^* = dq - \varepsilon$. G would find it profitable to make any offer such that $dq - \varepsilon < \omega_G + \gamma < dq + \gamma$. G will make the lowest possible offer with a total bid value greater than $dq - \varepsilon$; this offer is $\omega_G^* = dq - \gamma$, resulting in a total bid value of dq for E. In this equilibrium, E gets a payoff of $(dq - \gamma) + \gamma = dq$; G hires E and receives the payoff $dq - (dq - \gamma) = \gamma$; both firms get a payoff of 0. ■

[5]This discussion is adapted from Osborne 2004, *An Introduction to Game Theory*, Oxford University Press.

Proposition 1

We now consider a version of the model in which G faces an upper bound ($\overline{\omega}_G$) on the wage that it can offer to any expert. Intuitively, the government wage ceiling is only binding when it is lower than the wage that G *would have offered* absent the contraint (e.g., when $\overline{\omega}_G < dq - \gamma$). When this is not the case, such that $\overline{\omega}_G \geq dq - \gamma$, the game and its equilibria are identical to those of the unconstrained version.

Proposition 1 states, however, that G cannot hire E in equilibrium when the wage constraint binds ($\overline{\omega}_G < dq - \gamma$).[6] The proof is simple: when $\overline{\omega}_G < dq - \gamma$, the maximum total bid value that G can offer to E is $U_E^G = \overline{\omega}_G + \gamma$. However, when $\overline{\omega}_G < dq - \gamma$, it is clear that $\overline{\omega}_G + \gamma < dq$. Assuming that $dq - \overline{\omega}_G + \gamma > \varepsilon$, G is unable to make an offer that E prefers to the firms' maximum profitable offer of $\omega_{FA} = \omega_{FB} = dq - \varepsilon$.

Further, because both firms have identical valuations, both firms will make the maximum profitable offer of $\omega_{FA} = \omega_{FB} = dq - \varepsilon$ in all equilibria. If either firm makes a wage offer greater than $dq - \varepsilon$, its utility can only either be 0 (if $\omega_F = dq$) or negative (if $\omega_F > dq$) and it would thus prefer to lower the offer to $dq - \varepsilon$. If one firm makes an offer lower than $dq - \varepsilon$ while the other one makes the offer $dq - \varepsilon$, the firm with the lower offer could raise its utility from 0 to $\frac{\varepsilon}{2} > 0$ by raising its offer to $dq - \varepsilon$.[7]

Thus, when $\overline{\omega}_G < dq - \gamma$, the government's offer is irrelevant and the expert's wage is decided by private sector competition. Both firms will offer $\omega_{FA} = \omega_{FB} = dq - \varepsilon$; G offers any $\omega_G \leq \overline{\omega}_G$; E accepts both firm's offers with equal probability. E receives utility of $dq - \varepsilon$, both firms receive $\frac{\varepsilon}{2}$ in expectation, and G receives 0. ■

Corollary 1

Proposition 1 states that G cannot hire climate experts when $\overline{\omega}_G < dq - \gamma$. Corollary 1 claims that, all else equal, this inequality is more likely to be satisfied as demand for climate expertise increases. To show this, we can take the partial derivative of $dq - \gamma$ with respect to d:

$$\frac{\partial dq - \gamma}{\partial d} \tag{5}$$

$$= q \tag{6}$$

Since $q > 0$, the inequality $\overline{\omega}_G < dq - \gamma$ is more likely to hold as d grows. Thus, as demand for climate expertise increases, climate experts become less likely to go to work for the government. ■

Corollary 2

Corollary 2 claims that, all else equal, higher quality experts will be relatively more likely to go to the private sector following increases in demand for climate expertise. To see why,

[6] More completely, when $\overline{\omega}_G < dq - \gamma - \varepsilon$.

[7] Recall that we are assuming ties are broken with equal probability.

we can begin as in Corollary 1 by differentiating $dq - \gamma$ with respect to d:

$$f_d = \frac{\partial dq - \gamma}{\partial d} = q \tag{7}$$

We can then take the cross-partial of f_d with respect to q:

$$f_{dq} = \frac{\partial f_d}{\partial q} = q^{1-1} = 1 \tag{8}$$

Since $1 > 0$, we can see that the effect of an increase in d on the term $dq - \gamma$ is increasing in q. ■

Corollary 3

Corollary 3 claims that, all else equal, an increase in demand for climate expertise will increase the level of pro-sociality necessary for experts to accept government employment. To prove this, we begin by inverting the inequality in Prop. 1; experts *will* opt for government employment when:

$$\overline{\omega}_G \geq dq - \gamma \tag{9}$$

Expressed in terms of γ, we have:

$$\gamma \geq dq - \overline{\omega}_G \tag{10}$$

As the right-hand side of Eq. 10 grows larger, the value of γ necessary to keep the inequality satisfied must grow as well. To determine how an increase in d will affect the size of $dq - \overline{\omega}_G$, we can take the partial derivative of this expression with respect to d:

$$\frac{\partial dq - \overline{\omega}_G}{\partial d} = q \tag{11}$$

Since $q > 0$ by definition, an increase in d (holding q and $\overline{\omega}_G$ constant) will necessarily increase the value of γ necessary for E to accept G's offer. ■

Extension: Consulting

In the extended version of the game (depicted in Figure B6), G has the option to purchase consulting services from FA or FB after E has accepted the firm's offer.

We begin by demonstrating that, when $\overline{\omega}_G \geq dq - \gamma$, G does not purchase consulting services on the equilibrium path. Via backward induction, we can see that—in the event that E accepts FA or FB's offer—G will prefer to purchase consulting services when $dq - \omega_F > 0$. Both firms' payoffs for hiring E are identical to those in the baseline game, regardless of whether or not G purchases consulting services. Therefore, both firms can in equilibrium be expected to make the highest profitable wage offer $\omega^*_{FA} = \omega^*_{FB} = dq - \varepsilon$ according to the logic previously discussed. Since $dq - (dq - \varepsilon) > 0$, G will always purchase consulting

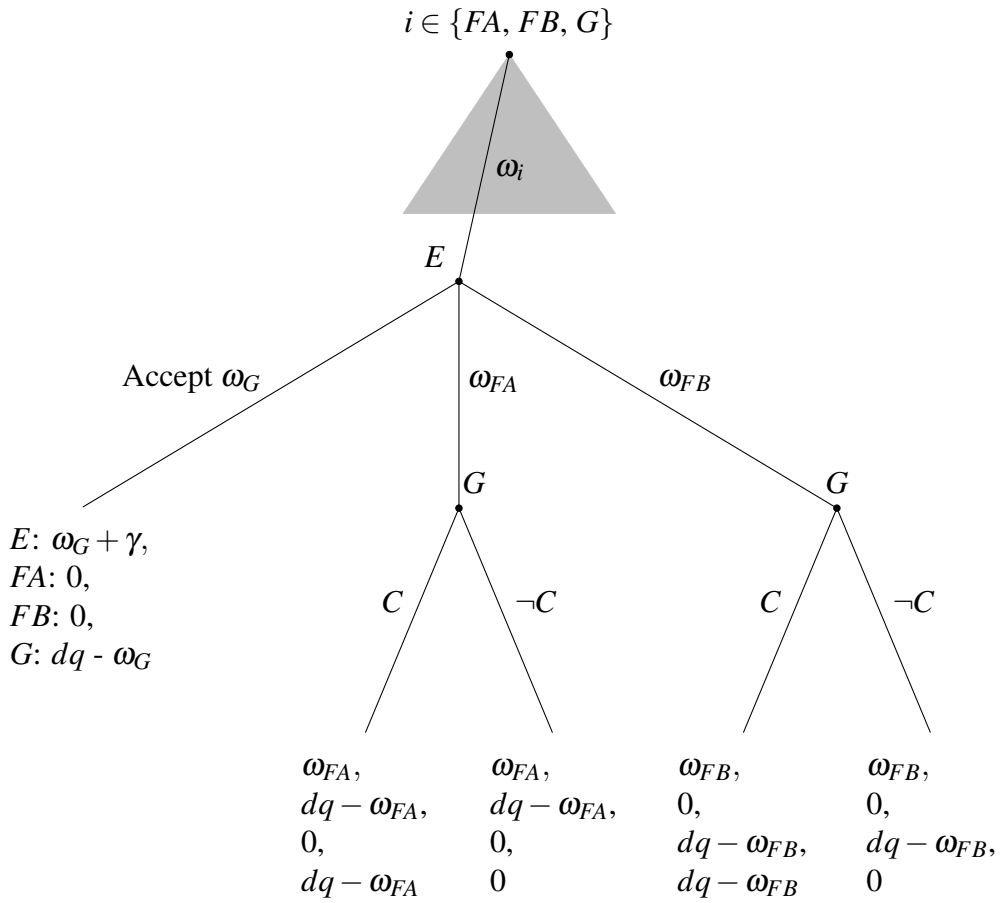

Figure B6: Public-private competition for climate expertise, with consulting stage.

services if a firm hires E.

If a firm makes the wage offer $dq - \varepsilon$, E accepts this offer, and G opts to purchase consulting services, G receives a payoff of $dq - (dq - \varepsilon) = \varepsilon$. If G offers $\omega_G = dq - \gamma$, for a total bid value of dq, E will accept the offer (as $dq > dq - \varepsilon$) and G will receive $dq - (dq - \gamma) = \gamma$. Thus, when the government's wage constraint does not bind ($\overline{\omega}_G \geq dq - \gamma$) and E is even marginally pro-social ($\gamma > \varepsilon$), G will always prefer to hire E directly instead of accessing her labor via consulting.

We may consider the possibility of a collusive equilibrium: if consulting allows both the firm and the government to purchase E's labor at a price set by the firm, a firm could maximize both its own payoff and G's payoff by offering a wage so *low* that G would prefer to offer $\omega_G = 0$, allow the firm to hire E, and pay the lower rate rather than attempting to hire the expert directly. However, this outcome is precluded by the existence of a competitor firm. Imagine that G offers $\omega_G = 0$, both firms offer $\omega_{FA} = \omega_{FB} = \gamma + \varepsilon$, E goes to both firms with equal probability, and both firms receive $\frac{dq-(\gamma+\varepsilon)}{2}$ in expectation. If either firm increased its wage offer even slightly, it would hire E outright and nearly double its payoff.

Thus, no outcome in which $\max\{\omega_{FA}, \omega_{FB}\} > \omega_G + \gamma$ and $dq - \varepsilon > \max\{\omega_{FA}, \omega_{FB}\}$ can be sustained in equilibrium.

Next, we consider the scenario in which G's wage constraint binds ($\overline{\omega}_G < dq - \gamma$). We already demonstrated in the proof of Prop. 1 that E will never accept G's offer when this condition holds, and in fact that G's wage offer is irrelevant and E's compensation is fully determined by private sector competition. Further, because both firms' equilibrium offers are equal to $dq - \varepsilon$, G's choice is simple: it can purchase consulting services and get the positive payoff of $dq - (dq - \varepsilon) = \varepsilon$ or opt not to and get 0. Therefore, when G is unable to hire E directly, it will always choose to purchase consulting services from the firm that does hire E. ■

Corollary 4

Corollary 4 states that, as demand for climate expertise increases, the government becomes more likely to purchase consulting services. This claim is premised on the previous result that G never purchases consulting services in equilibrium when $\overline{\omega}_G \geq dq - \gamma$, and always does so when $\overline{\omega}_G < dq - \gamma$. Thus, to determine the effect of an increase in d on the latter inequality's likelihood of being satisfied, we need to take the derivative of $qd - \gamma$ with respect to d. We have already done so in the proof of Corollary 1a, and demonstrated that $\overline{\omega}_G < dq - \gamma$ is more likely to be satisfied as d increases (all else equal). ■

C. IDENTIFICATION OF CLIMATE-RELATED JOBS

Our primary approach to identifying climate-related postings is based on a keyword search of job descriptions. We search for the following set of terms (note that all included a wild-card suffix to ensure that the search captured both, e.g., "air pollution" and "air pollutant"): air pollut; air quality; atmospheric; climate action; climate adapt; climate analysis; climate change; climate change adapt; climate change mitig; climate data; climate engineer; climate information; climate mitig; climate model; climate polic; climate predict; climate resilien; climate research; climate system; climate variab; climatolog; global warming; meteorolog; net zero; weather forecast; weather model.

We validate this dictionary by comparing jobs it identifies to the jobs coded by Lightcast as involving climate-related skills. We identified these skills via keyword searches of the Lightcast Open Skills Taxonomy (taxonomy version 9.19, dated June 28, 2024):

- Carbon: carbon footprint reduction, carbon accounting, carbon management, carbon markets, carbon offsets, carbon capture and storage, low carbon solutions, low carbon development

- Climate: climatology, climate policy, climate variability and change, climate resilience, climate modeling, climate change mitigation, climate change adaptation, climate prediction, climate engineering, climate change programs, climate information, climate analysis, Community Climate System Model, Climate Data Ex-

change (CDX), Action for Climate Empowerment (ACE), Climate Data Analysis Tool (CDAT)

- Emissions: vehicle emissions controls, emissions inventory, emissions calculations, emission testing, emission standards, Continuous Emissions Monitoring Systems, fugitive emissions, emissions analyzers, emissions controls, National Emissions Standards for Hazardous Air Pollutants, stack emission measurements, emissions trading, emission reduction projects, AVoided Emissions And GeneRation Tool, Michigan Air Emissions Reporting Systems, UN Race-to-Zero Emissions Breakthroughs
- Greenhouse: greenhouse gas, Regional Greenhouse Gas Initiative
- Net zero: net zero

As shown in Figure C1, trends with these measures are highly correlated (correlation coefficient of 0.95). The keyword-based measure, however, captures a significantly larger number of job postings than the skill-based measure. We prefer the keyword-based measure for this reason. This measure is also more transparent; Lightcast indicates that it uses "machine-learning algorithms" and "qualitative methods" to identify skills, but does not provide further detail (see perma.cc/4HYD-ZB5E).

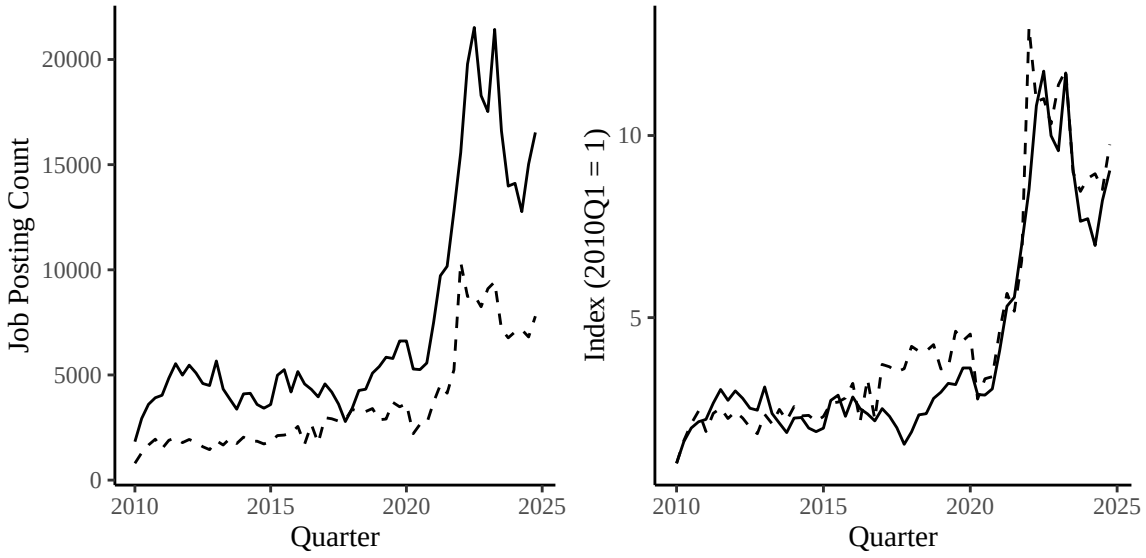

Figure C1: Counts of climate-related job postings, measured via keyword search (solid lines) and Lightcast skill coding (dashed lines).

D. SUMMARY STATISTICS

Statistic	N	Mean	St. Dev.	Min	Max
Prop. MA+ (%)	2,429	50.8	17.6	18.8	100
Quit count	2,352	135	300	0	2,856
Hire count	2,352	332	841	0	10,719
Climate-relevant bureaucrat	2,429	0.5	0.5	0	1
Firm demand	2,387	6,902	5,056	1,822	21,473
Firm demand (overlapping)	2,387	3,361	2,827	452	11,645
Firm demand (software)	2,387	73,309	26,720	23,204	150,590

Table D1: Summary statistics at the agency-year-job type level for analysis of bureaucratic quality and personnel churn, pooled across GS grades (Table 2, Figure 2). Note that quit, hire, and demand variables are not log transformed in this table.

Statistic	N	Mean	St. Dev.	Min	Max
GS grade	37,800	8	4.32	1	15
Prop. MA+ (%)	25,114	32.8	25.6	0	100
Quit count	25,872	8.21	22.0	0	313
Hire count	25,872	19.4	57.9	0	2,856
Climate-relevant bureaucrat	37,800	0.5	0.5	0	1
Firm demand	37,170	7,139	5,125	1,822	21,473
Firm demand (overlapping)	37,170	3,422	2,797	452	11,645
Firm demand (software)	37,170	72,890	26,360	23,204	150,590

Table D2: Summary statistics at the agency-year-job type-*GS grade* level for analysis of bureaucratic quality and personnel churn (Table 2, Figure 2). Note that quit, hire, and demand variables are not log transformed in this table.

Statistic	N	Mean	St. Dev.	Min	Max
Contract = Consulting	8,907,514	0.063	0.243	0	1
Contract = Environmental Consulting	8,907,514	0.012	0.109	0	1
EPA	8,921,528	0.015	0.120	0	1
Demand (log)	8,921,528	5.493	0.562	4.554	6.609

Table D3: Summary statistics at the level of individual contracts for analysis of consulting (Table 5, Table H1).

E. PROFILING THE FIRMS THAT HIRE CLIMATE EXPERTS

DV:	Federal Env. Consultant = 1			Lobbied EPA = 1		
	(1)	(2)	(3)	(4)	(5)	(6)
Postings	0.026***	0.026***	0.027***	0.025***	0.023***	0.026***
	(0.007)	(0.007)	(0.008)	(0.003)	(0.003)	(0.003)
Total assets		−0.001*	−0.001+		0.002***	0.002***
		(0.001)	(0.000)		(0.000)	(0.001)
Employees		0.001*	0.001		0.001*	0.001
		(0.001)	(0.001)		(0.001)	(0.001)
N	137,405	89,327	89,327	127,610	83,885	83,885
Adjusted R^2	0.188	0.199	0.281	0.125	0.132	0.125
Year FE	✓	✓		✓	✓	
Industry FE	✓	✓		✓	✓	
Industry-year FE			✓			✓

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table E1: Regressions of firm-year level outcomes — providing environmental consulting services for the federal government, and lobbying the EPA — on the logged number of climate expert job postings that a firm issued in a given year. Control variables are logged as well. Industry is coded at the NAICS six-digit level.

F. BUREAUCRATIC COMPOSITION: PERSONNEL CHURN BY EDUCATION

	GS: Mid Level		*GS: Upper Level*	
	DV: Quits	DV: Hires	DV: Quits	DV: Hires
	(1)	(2)	(3)	(4)
Demand × Climate-relevant	0.003	−0.002	0.161*	−0.028
	(0.083)	(0.117)	(0.058)	(0.104)
Climate-relevant bureaucrat	0.504	−2.297+	2.925**	−2.475
	(0.704)	(1.272)	(0.915)	(1.557)
N	4,996	5,519	3,568	3,595
Adjusted R^2	0.744	0.748	0.703	0.708
Software demand control	✓	✓	✓	✓
Quarter-year FE	✓	✓	✓	✓
GS-agency FE	✓	✓	✓	✓

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table F1: Regressions of logged counts of quits and hires of workers **with graduate degrees** on firm demand in the preceding quarter (logged count of job postings), interacted with the climate relevance of job type. Mid-level GS grades are GS-8 through GS-12. Upper-level GS grades are GS-13 and above. Standard errors clustered by agency.

	GS: Mid Level		*GS: Upper Level*	
	DV: Quits	DV: Hires	DV: Quits	DV: Hires
	(1)	(2)	(3)	(4)
Demand × Climate-relevant	0.026	0.071	−0.001	−0.093
	(0.069)	(0.113)	(0.070)	(0.088)
Climate-relevant bureaucrat	−0.926	−3.151*	1.506+	−1.103
	(0.859)	(1.163)	(0.830)	(1.285)
N	4,996	5,519	3,568	3,595
Adjusted R^2	0.768	0.760	0.722	0.724
Software demand control	✓	✓	✓	✓
Quarter-year FE	✓	✓	✓	✓
GS-agency FE	✓	✓	✓	✓

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table F2: Regressions of logged counts of quits and hires of workers ***without*** **graduate degrees** (i.e., a four-year college degree only) on firm demand in the preceding quarter (logged count of job postings), interacted with the climate relevance of job type. Mid-level GS grades are GS-8 through GS-12. Upper-level GS grades are GS-13 and above. Standard errors clustered by agency.

G. CDP GRADES

CDP develops its list of companies from which to request disclosures in several ways. The primary channel is through CDP's Capital Market Signatories, made up of over 640 asset owners, asset managers, banks, and insurers representing over 25% of all institutional assets globally. These signatories submit their portfolio holdings to CDP. Any firm held by a signatory becomes a requested company and is formally asked to disclose through CDP. Firms can also be selected on the basis of supply-chain membership (if a reporting firm requests disclosures from their other suppliers), the emissions intensity of their sector, and past CDP disclosure history.

Firms respond to a detailed CDP questionnaire that includes questions pertaining to climate governance structures; the identification, assessment, and management of climate-related impacts, risks, and opportunities for the business; the incorporation of climate change in overall firm strategy; environmental performance; and emissions data and methodology, and verification.

H. *DE FACTO* PRIVATIZATION: ADDITIONAL RESULTS

DV: Contract is for Environmental Consulting		
	(1)	(2)
Demand × EPA	0.065***	0.065***
	(0.012)	(0.012)
N	7,547,738	7,547,738
Adjusted R^2	0.065	0.076
Quarter-Year FE		✓
Agency FE		✓
State FE		✓

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table H1: Regressions of indicator variable equal to 1 when contract concerns environmental consulting on private sector demand, interacted with an indicator variable equal to 1 when the contracting agency is the EPA. Standard errors clustered by state.

DV:	Prop. of contracts		Count of contracts		Value of contracts	
	All	Env.	All	Env.	All	Env.
Demand × EPA	0.051***	0.063***	0.116**	0.217***	−0.389	0.412**
	(0.006)	(0.004)	(0.043)	(0.042)	(0.257)	(0.123)
N	2,581	2,581	2,581	2,581	2,581	2,581
R^2	0.655	0.850	0.958	0.963	0.753	0.859
Quarter-Year FE	✓	✓	✓	✓	✓	✓
Agency FE	✓	✓	✓	✓	✓	✓

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table H2: Regressions of three different variables—the proportion of agency-quarter-year contracts allocated to [environmental] consulting, the (logged) number of agency-quarter-year contracts allocated to [environmental] consulting, and the (logged) total dollar value of agency-quarter-year contracts allocated to [environmental] consulting—on private sector demand, interacted with an indicator variable equal to 1 when the contracting agency is the EPA.

DV: contract is for...	Consulting		Env. Consulting	
	(1)	(2)	(3)	(4)
Demand × EPA	0.042*	0.045*	0.037*	0.038*
	(0.018)	(0.017)	(0.017)	(0.017)
N	5,450,156	5,450,156	5,450,156	5,450,156
Adjusted R^2	0.013	0.065	0.052	0.063
Quarter-Year FE		✓		✓
Agency FE		✓		✓
State FE		✓		✓

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table H3: Regressions of indicator variables for various contract industries on private sector demand, interacted with an indicator variable equal to 1 when the contracting agency is the EPA. Sample restricted to contracts signed prior to 2021. Standard errors clustered by state.