AI Education as State Capacity:

Experimental Evidence from Pakistan

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In an era where the proliferation of AI is escalating the societal appetite for digital solutions, we randomize elite bureaucrats in Pakistan into AI educational workshops and find that it influences their willingness to adopt AI and their funding allocations toward digitization. Cross-randomizing them into AI fairness activism reduced this willingness and funding. To capture a uniform measure of the performance of civil servants, we utilized a digital democracy platform, where we observed that AI training enhanced dispute resolution and citizen ratings of their efforts, particularly for land disputes, while AI fairness activism diminished them. Overall, our research shows that top government officials' human capital is malleable and affects policies, attitudes, staff, and the population.

Keywords: AI Policy Dynamics, State Capacity & ICT, Peer Transmission in Governance, AI Fairness Activism & Development, Policy Training Intervention.

I. Introduction

State capacity is considered critical for economic development (Besley and Persson, 2009; Acemoglu et al., 2015). However, how important is the human capital of top bureaucrats in creating an effective state? How does the combination of physical capital, like digital infrastructure, and human capital, such as knowledge of elite bureaucrats, contribute to the development of state capacity? In this paper, we offer experimental evidence demonstrating how alteration in one component of the state capacity production function, specifically the human capital of elite bureaucrats, via AI educational workshops for policymakers, influence their policy, attitudes, staff and the population.

It is noteworthy how the scholarly examination of top bureaucrats and their production function have lagged behind the extensive academic work conducted on political and private sector leaders. Extensive attention has been devoted to scrutinizing the influence of political leaders on state and society (see for instance, Jones and Olken, 2005; Besley et al., 2011).[2] Similarly, the impact of top business leaders such as top management and CEOs have also been a subject of expansive academic investigations (see for instance, Bertrand and Schoar (2003); Bertrand (2009), Kaplan et al. (2012)). Conversely, our understanding of the driving forces propelling top bureaucrats to undertake strategic actions and the subsequent ramifications on policy and development remains relatively limited. Political leaders, private sector magnates, and top bureaucrats all preside over large organizations, thereby endowing them with the capacity to wield substantial influence over organizational performance and a broader spectrum of economic outcomes. It is therefore, no surprise that educational programs for public officials that hope to alter bureaucrat behavior and enhance state effectiveness is a multi-billion dollar endeavor (Engine, 2021). To what extent are top policymakers' attitudes and policies amenable? How do these policy priorities diffuse within the lower ranks of the state apparatus and affect the population? More broadly, how is output generated in the policy production function at the very top? These questions are particularly relevant for the

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[2] A comprehensive review of this literature is provided in Dal Bó and Finan (2018).

developing world, where sluggish and ineffective leadership in bureaucracies can act as major obstacles to economic development.[3]

This paper uses AI education as a case study, set against the backdrop of AI's rapid advancement and its pervasive applications across sectors. The rapid advancement of Artificial Intelligence (AI) — characterized by algorithms that detect patterns in unstructured data and leverage them to perform tasks typically demanding human discernment — has been nothing short of astounding. Its applications have permeated various sectors, from medicine and telecommunications to government, human resources, and even entertainment (Ford, 2015; Smith, 2019; Adachi, 2021). This widespread integration of AI into diverse industries is already triggering significant labor market repercussions (Autor and Salomans, 2018; Acemoglu and Restrepo, 2020; Acemoglu et al., 2022), with expectations to reshape the economic landscape (Autor et al., 2019; Acemoglu, 2021). Regardless of one's stance on AI's societal consequences, the academic conversation is now gravitating towards policy measures that could mitigate potential negative consequences (Agrawal et al., 2019; Beraja and Zorzi, 2022), such as ethics training. Policymakers find themselves increasingly pressured to adopt positions and make informed decisions regarding AI (Muller and Bostrom, 2014; Frey and Osborne, 2017; Arntz, 2017; Cowgil et al, 2020; Pah et al, 2022). What are the consequences of varying schools of thought on AI? How does AI training disseminate among policymakers and influence the population? These questions matter as the willingness to adopt AI may affect digitization, a precursor to AI, which has facilitated ICT technologies already rigorously documented to impact state capacity (Muralidharan et al. 2013; Fujiwara, 2015; Banerjee et al., 2020).

We answer these questions with senior deputy ministers in Pakistan. They are high-stakes decision-makers. These senior deputy ministers are top bureaucrats who advise the President, Prime Minister and Cabinet Ministers, they supervise budgets and make spending decisions on behalf of government projects with the mandate to efficiently use public resources and deliver services, including land, police, and transportation. About 1% are chosen from about 15,000 exam takers annually. Their selection procedures and training are similar to many other developing countries, especially India and Bangladesh who, like Pakistan, inherited these bureaucratic institutions during

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[3] Our work with top bureaucrats, therefore, complement recent pioneering studies focused on the importance of frontline civil servants in the Global South (see e.g. Khan et al., 2015; Bandiera et al., 2021).

the British Colonial rule of the Indian subcontinent. Pakistan, India and Bangladesh alone consist of more than a quarter of world population making this study particularly relevant for a large number of people. The Government of Pakistan launched in 2018 the National Center of Artificial Intelligence to inspire innovation, research, knowledge transfer to the economy, and training initiatives such as ours.

We delivered one of three workshops (benefits of AI, costs and solutions to AI, and a control macroeconomics training) to the deputy ministers, followed four months later with cross-randomization into AI fairness activism arguments. We identify the causal effects of the AI workshops among the deputy ministers in Pakistan using a randomized control trial. We study the impact of AI training on a policy decision involving government funding for digitization, a potential precursor for the introduction of AI technologies.[4] The ministers are randomized to attend a series of lectures coupled with self-persuasion writing exercises and structured discussions (Schwardmann et al., 2022). Each workshop includes two lectures, writing exercises and structured discussions. The three treatment conditions are as follows: the first treatment arm began with a pair of lectures dedicated to discussing the promise of AI to generate value and improve decision-making, the second treatment arm was a pair of lectures focused on the potential costs of AI and remedies, and a third treatment arm was a placebo lecture series on macroeconomics.[5] The pair of lectures is motivated by social-emotional learning pedagogy to have dosages separated by time (Walton and Cohen, 2011), so each workshop consisted of two lectures each separated by five months. The control group received a similar series of 2 lectures (but on macroeconomics). Each lecture in the workshop, including the control, was followed by writing exercises and structured discussions. Our baseline survey was conducted one week before the first lecture, a midline survey was conducted 3 months after the first lecture but before receiving the AI fairness activism arguments, and the endline 6 months after the second lecture. Annual budgetary policy decisions were made 8 months and outcomes on population were measured 13 months after the workshops.

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[4] This is because almost all AI applications require data in digitized form where paper-based records are rarely amenable to the use of AI algorithms (Sanders et al., 2019; Wehrle et al., 2020; Sturgeon, 2021).

[5] The *Benefits of AI* lectures provided examples of how AI has successfully generated value and improved policymaking in many contexts, while the *Costs and Solutions of AI* lectures discussed the costs and potential remedies, such as using unbiased data in training AI algorithms.

Recent advances in pedagogy through the use of social-emotional learning advocate sparse thinking and self-persuasion to maximize the retention, comprehension, and application of the training material. After each lecture, the ministers complete two writing exercises in class: a 200-word essay summarizing key takeaways of the lecture and another 200-word essay on how they intend to apply those lessons in their jobs. The final component of the workshop featured structured group discussions within the treatment group for 30 minutes and a one-on-one 20-minute individual discussion with the deputy minister on the main lessons of the workshop. Each minister then receives one of two books, cross-randomized, to be either emphasizing AI fairness activism or emphasizing AI benefits. The messages of the books were also reinforced with similar writing exercises and structured discussions.

We had hypothesized that the "benefits of AI" workshop would have a larger, and even opposite impact than the "costs and solutions of AI" workshop. In contrast, to our priors, we found the point estimates for the two workshops are virtually identical relative to control. Both training series on the "benefits of AI" and "costs and solutions" to AI increased ministers' willingness to provide public financing for digitization projects. This occurred amid a prominent digitization initiative shifting from paper-based land registration system to a digital system. Months after the training, in their official duties, the deputy ministers are twice as likely to allocate funds for digitization. Specifically, the treated ministers are about 0.35 standard deviations more likely than non-treated ministers to allocate funding for digitization. Both stated fiscal support, and actual funding decision, observed 8 months after the second workshop are impacted. To be sure, digitization of paper records is different from implementing artificial intelligence in policy, however, the malleability of policy support for digitization can have important implications for efficiency of State bureaucracies and economic development (see e.g. Muralidharan et al., 2019 or Banerjee et al., 2020). In terms of attitudes towards AI policy itself, we find that about 6 months following the workshop, the treated ministers are also more likely to support using AI in policymaking and perceive AI to be on the net beneficial for policy relative to the non-AI treated ministers. Amount of public funding allocated for digitization increases by about 0.25 standard deviations among the treated ministers.[6] The treated ministers also increased their support for implementing AI in their

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[6] We corroborate the qualitative accounts that digitization and implementing of AI in policy are linked by conducting a follow-up survey 15 months post-workshops. We find 85% of the ministers indicate that recent digitization initiatives

policymaking by about 0.2 standard deviations. Conversely, we find no association between AI training and deputy ministers' pretreatment (last year's) budgetary allocations for digitization. Annual funding allocations for office maintenance, a policy plausibly less linked with the use of AI algorithms is also unaffected. The effects on policy support for AI are qualitatively significant and indicate a persuasion rate of 6% (DellaVigna and Gentzkow, 2010). This rate is roughly equivalent to the impact of gaining access to independent TV (NTV) on anti-Putin voting in Russia (Enikolopov et al., 2011) or the expansion of television in the 1950's on voter turnout in the United States (Gentzkow and Shapiro, 2006).

The effects also transmit vertically to ministers' subordinates and impact the population. The subordinates or chiefs of staff of treated ministers are about 0.3 standard deviations more likely than subordinates of non-treated ministers to support AI. Put differently, the AI workshop with deputy ministers increases their subordinates' support for AI by 30% of a point on a 5-point Likert scale. Subordinates were not present at the workshop and were surveyed independently, 6 months after the workshop. We also explore the mechanisms of transmission and observe that the transmission is greater when there is a larger experience differential between the deputy minister and her subordinate. Homophily based on gender or birthplace does not appear to mediate the transmission. These results are consistent with the notion of new ideas being transmitted vertically within the bureaucracy.

We also find transmission of the AI training downstream to the citizens, using a novel data linkage of citizen complaints emanating from deputy ministers' districts. We use administrative data from the Prime Minister Citizen Portal, which connects citizens with deputy ministers via an online dashboard. We find that treated ministers resolved complaints faster, 13 months after the AI training. The largest effects are seen in land related complaints: treated ministers are rated half a point higher on a 5-point scale relative to citizens in untreated ministers' districts and close the complaints faster. Complaints related to construction works are unaffected by the treatment. Computerization, digitization, automation are actions that ministers can take to shift from paper-based pre-colonial "patwar" (village accountant) system to the online registration of ownership, transfer and tax

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in government departments are taken to pave the way to implement AI algorithms and 75% of the ministers indicated digitization and AI "related" (65 ministers) or "very related" (156 ministers).

collection on properties. These digitization efforts along with increased support for use of AI in policy is consistent with ministers' policy attitudes and decisions being shifted. We cautiously interpret the impact on citizens as suggestive evidence that the implementation of digitization policies following the AI workshop improved government processes. Our results on citizen complaints are consistent with digitization having a greater impact on improving land record-keeping in recent years, and a lesser impact on improving public construction works. These results illustrate the transmission of ideas within the state and suggest that policy decisions made upstream may have downstream effects on the population.

Four months after the program began, deputy ministers were cross-randomized to receive additional training: writing exercises to read and summarize a policy book –randomized and blinded to the experimenter– on AI fairness activism or AI benefits. This reading exercise is also augmented with identical writing exercises and structured discussions. Using survey data collected before and after the cross-randomization, we found that the AI fairness activism mitigated the effects of the training program. AI fairness activism relative to AI benefits book reduces perceived support for AI by 0.3 standard deviations and fiscal support for digitization by 50 percent. These effects also spill over to policymakers' subordinate staff, who also reduce support for AI by 0.3 standard deviations. Notably, AI fairness activism arguments reduce the effect of the AI training workshop.[7] Given the importance of digitization in expanding state capacity and acting as a precursor to use of many ICT technologies such as smart ID cards for citizens (Muralidharan et al. 2013), electronic voting (Fujiwara, 2015), and e-invoicing (Banerjee et al., 2020), the finding that AI fairness activism may reduce digitization raises concern about unintended consequences of AI fairness activism.

Three aspects of our research setting mitigate concerns that our results arise from experimenter demand. First, budgetary decisions occur via the Ministry of Planning and Development, post-training in the field, independent of the experimenter and the training institute, and resolution of citizen complaints occur through the Pakistan Citizen Portal, a prominent platform that connects citizens to public servants and contains millions of records that can be linked to the

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[7] The comparisons of AI Fairness Activism are made relative to the book on promise of AI. We, however, are able to assess how the books and their corresponding exercises augment or reduce the effects of AI Education treatment using the survey of attitudes after the first lecture, several months *before* receiving the book, and *after* the second lecture, several months after receiving the book assignments. We find the effect of the Promise of AI training amplifies the effect of AI Education training, while the AI Fairness Activism reduces the effect of the AI Education training.

deputy ministers, also independent from the experimenter. Second, the identity of the randomized book was blinded to the experimenters. Third, the fact that staff officers' support for AI and job performance measured in the citizen portal are impacted when the treatment focuses solely on the ministers. These design features support the view that our interventions had real consequences and the results are unlikely to be explained by experimenter demand.

While we observe vertical transmission through ministers' subordinates or their chiefs of staff, our deputy ministers come from 301 different *tehsils* (subdistricts), which minimizes horizontal transmission that would otherwise contaminate treatment and control, making the transmission less likely across but not within subdistricts. To be sure, even if there are spillovers or contamination of our control groups with treatment, our estimate then would be a lower bound on the impact of the treatments. Moreover, our experimental design allows us to infer the direction and extent of spillover effects, where we exploit the variation of treatment effects among treated ministers working in the same government departments. We find little evidence that treatment effects significantly differ when there is a greater share of treated ministers within a government department. The evidence suggests that spillover effects between treated and control ministers, even if they exist, are likely to be small in magnitude and hence unlikely to explain the effect sizes we observe.[8] Our focus on elite ministers who make high-impact policy decisions, also, necessitates a sample of 300 individuals, where it may be possible to detect significant effects by chance. We, therefore, study the robustness of our results by conducting randomization inference. Specifically, we scramble the data and reassign treatments to test the effect of idiosyncratic draws. Our analysis finds that the treatment effects remain statistically strong at conventional levels, suggesting that an idiosyncratic draw is statistically unlikely to explain our results on policymakers and population.

The results suggest that ideas associated with AI may have unanticipated consequences on state and society: firstly, policymakers may not become more cautious when presented with potential costs of adopting AI as evidenced by the the parallel impacts observed from both "costs and solutions" and "benefits of AI"; secondly, the policymakers may intervene in policy areas not

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[8] We also view these results as a WAVE1 insight ([List 2020](#)): we examined natural measures such as policy choices and in terms of scaling our intervention in other settings, the intervention was cheap to deliver or is potentially scalable for other high-stakes decision-makers such as judges and CEOs; however, replications need to be completed in future research.

directly related to AI, such as, digital record keeping; thirdly, AI training may impact how population perceive public servants and service delivery. Finally, AI fairness activism arguments, which may be appropriate in some circumstances, can lead to decreased digitization, prolonged resolution times for land disputes, and diminished citizen satisfaction.

Our paper contributes to several strands of the literature. First, we contribute to the nascent literature on AI and its impact. A consensus appears to be emerging that AI is already causing large societal impacts: it is facilitating public-private spillovers for innovation (Beraja et al. 2022), raising earnings (Humlum and Meyer, 2020), productivity (Adachi et al., 2020), displacing labor (Autor and Salomans, 2018; Acemoglu et al., 2022), increasing inequality (Humlum, 2019; Korinkek and Stiglitz, 2020; Hemous and Olsen, 2022) and even fostering the rise of autocratic control and a surveillance State (Tirole, 2021; Beraja et al. 2021). Yet, despite this focus on AI's societal impact, relatively little attention has been paid to policymakers that play a key role in mediating the impact of AI. We, hence, complement the growing literature on AI policy (Agrawal et al., 2019; Beraja and Zorzi, 2022). We pivot the discussion of what are the consequences of AI to the 'determinants of the adoption of AI policies', in this case, knowledge about AI. We experimentally modify the support and opposition for AI among policymakers and demonstrate how readily elite bureaucrats shift attitudes towards AI, transmit these attitudes to subordinates, and even change their policy decisions. We apply methods from self-persuasion (Schwardmann et al., 2022) to suggest potentially scalable ways to augment the training of public officials and, in this application, increase or decrease the support for AI among policymakers.

Second, we contribute to the literature on state capacity and development (see e.g. Besley and Persson, 2009; Khan et al., 2015; Bandiera et al., 2019; Finan et al., 2017; Best et al., 2022). We build upon the recent pioneering studies, particularly those providing experimental evidence on the significance of frontline civil servants in the Global South and their potential to bolster state capacity. In contrast, our research focuses on senior bureaucrats in leadership roles and demonstrates how the human capital of these leaders is malleable, potentially influences the physical infrastructure of the state, such as digitization infrastructure, and impacts citizen satisfaction with public services. More broadly, a consensus in the development economics literature appears to be emerging that ICT technologies in developing countries expands state capacity by reducing leakage in welfare programs, increasing political representation, improving health and student outcomes (Muralidharan

et al. 2013; Fujiwara, 2015; Muralidharan et al., 2019; Banerjee et al., 2020). This paper builds upon our previous research, which primarily revolves around the creation of customized training materials aimed at enabling junior policymakers (1 to 5 years of policy experience) to comprehend and modify policies in response to the training content, such as altruism (Mehmood, Naseer, and Chen, 2021) and econometrics (Mehmood, Naseer, and Chen, 2022). In contrast to our earlier investigations, our current focus shifts towards engaging with the most senior and influential civil servants in Pakistan, namely senior deputy ministers, with up to 25 years of policy experience. We illustrate how our training interventions not only affect these senior ministers' policies but also extend their impact to ministers' chiefs of staff and the broader populace. These studies indicate that the mindset of a government officer can be adaptable. This suggests a fourth dimension, joining the three other strategies - selection, monitoring, and incentives mentioned by Finan et al. (2017) - all of which are vital for economic growth. Collectively, these efforts aim to improve our comprehension of how technical knowledge can be conveyed and to develop and evaluate strategies that promote the application of evidence-based decisions by policymakers. We contribute to this literature by showing that ideas associated with AI Fairness Activism, though originally well intended and perhaps necessary to discuss in developed economies, may have unintended consequences in developing countries of reducing funding for land-record digitization and citizen satisfaction with the State bureaucracy.

Last, we contribute to the literature on peer transmission among public officials. A broad literature has identified the importance of policy diffusion (Wojcik, 2018; Zelizer, 2019; Fong, 2020; Grose et al., 2022; DellaVigna and Kim, 2022). Recent work finds that random allocation of seats in parliament shifts voting of nearby legislators in Iceland (Saia, 2018) and Europe (Harmon et al., 2019). Similar evidence using quasi-experimental designs also exists on the peer transmission among judges (Sunstein et al., 2007), and among judicial clerks and judges (Bonica and Sen 2021). Unlike these works, however, we randomized the AI training and provided evidence of transmission from a field experiment. We also show that peer transmission within the State likely occurs "vertically" with greater difference in experience among ministers amplifying the transmission; homophily by gender or birthplace do not appear to significantly increase the transmission from deputy ministers to subordinates. These findings have implications for bureaucratic organization and suggest how attitudes are not only malleable, but diffuse within the State.

The rest of the paper is organized as follows. Section II provides the background and experimental design. Section III describes the data and empirical specification. Section IV presents results on the impact of AI Education. Section V presents corresponding results on the impact of AI Fairness Activism, while Section VI reports the results on the impact on population. Section VII discusses transmission mechanisms and reports a series of sensitivity checks. A final section provides some concluding remarks. Online Appendix A discusses consent, intervention details and ethics Online Appendix B offers supplementary Figures and Tables. Appendix C provides additional information on the data, including details on surveys and vignettes.

II. Background and Experimental Design

Background. — Our experiment is the result of our collaboration with Pakistan's Federal Institute for Public Policy operated by the Federal Government of Pakistan. The Institute trains the elite cadre of bureaucrats –deputy ministers. These public officials undergo 5-month-long intense workshops at this training Institute where we embed the training. The Institute is distinct from the Civil Service Academy of Pakistan, where these bureaucrats are trained at the start of their public service, after they pass the "CSS Examination", 15 years earlier. The Institute trains senior deputy ministers in Pakistan with the explicit aim to keep policymakers abreast with the latest developments in modern societies, to formulate and implement policies "in an ever-changing global environment" (Federal Institute, 2022). The "modules" at the training Institute range from workshops in leadership, management, public procurement, governance, and ethics. Our workshop was one such module entitled "AI for Policy". Our experimental set-up is summarized in Figure A1 of Appendix A, while Tables A1 and A2 provide details on the content of the interventions.

Deputy Ministers. — The deputy ministers are officially designated as "Deputy Commission Officers" or "Assistant Commission Officers" in Pakistan. They are chosen through a competitive exam introduced by the British Colonial government in the 19th century. Currently, about 200 "officers" are chosen from 15000 test-takers annually. These public officials serve as the chief administrative heads of districts and subdistricts (*tehsils*) where they supervise policy implementation and budgetary needs assessments for the federal government. They are tasked with ensuring law and order, renovating government offices and the overall modernization of the policymaking infrastructure. Given their key role for the State, the Government of Pakistan calls

them the "key wheels on which the entire engine of the State moves" ([Federal Government of Pakistan, 2021](#)). As part of their official duties, these deputy ministers have the mandate to notify budgetary requirements for projects related to policy priorities every year. These budgetary requests are binding and become part of the federal budget. The "notification" from the Planning Ministry inviting the deputy ministers to specify budget allowances for the next fiscal year is reported in Figure B1.2. This notification is issued roughly two months before the federal budget is announced and the funding is disbursed immediately following "passing" of the budget two months later. We obtain this data on ministers' policy choices from Pakistan's Ministry of Planning and Development, with one choice related to AI (digitization allocation, a necessary precursor to implementation of AI algorithms that requires large amount of raw data) and the other largely unrelated to AI (office maintenance allocation) for pretreatment and the treatment year. The deputy ministers are also connected to citizens by an online platform called the Prime Minister Citizen Portal ([PCP, 2022](#)) that aims "to promote citizen-centric participatory governance" and links citizens with deputy ministers by an online dashboard. The portal takes complaints from citizens on government services in different districts which are then relayed to the deputy minister in charge of the district (see Panel A of Table A4 in Appendix A for a snapshot of the portal and Panel B for the online dashboard that links the complaint to the deputy minister).

Deputy Ministers' Staff Officers. — Each deputy minister has a chief of staff or a "staff officer". The staff officer is responsible for assisting deputy ministers in her day-to-day tasks. She serves as the deputy minister's policy assistant in all matters pertaining to policy implementation. Importantly, for our design, the staff officers are not trained at the Institute and stay behind in the district where the minister is posted. The staff officers are also chosen through a competitive examination and are also civil servants employed by the federal government of Pakistan. They also assist and advise deputy ministers on bureaucratic procedures and exact steps that need to be followed to implement the deputy ministers' policy agenda.

AI Education Treatment.— Using a random number generator, we randomly assign 301 deputy ministers into an AI Training workshop or a control workshop. Specifically, 100 ministers are randomly assigned to an AI Education workshop focusing on "*Benefits of AI*", 100 ministers are assigned to the "*Costs and Solutions of AI*" workshop, while 101 ministers are assigned to the control or placebo workshop. All three workshops include 2 lectures, identical self-persuasion writing

exercises and structured discussions (group and individual). Each workshop began with two distinct lectures on how AI may impact policy (or how macroeconomics may impact policy in placebo workshops). Arguments for the introduction of AI in policymaking are presented in the *Benefits of AI* workshop, and in *Costs and Solutions* workshop, the potential problems and *their solutions* while implementing AI in policymaking are discussed. In particular, the benefits of AI lectures discuss the "promise of AI" on how data may be considered "productive capital" that has the potential to generate value in policymaking. A key component of these lectures involved large-scale uses of AI in society and how to employ human-centric approaches to AI in policy that can yield welfare increases for the citizenry. The "*Costs and Solutions of AI*" lectures consisted of discussing the 'dangers of AI' for policy in issues related to privacy, security and inequality. The emphasis in this lecture is on the nature of the data that is used for AI that is critical to its effects. The major focus then was on potential ways to mitigate the problems that arise when AI algorithms are used in policy. For instance, one solution discussed targeting the right outcome for adaptive learning or using unbiased data for algorithms. Another solution discussed a hypothetical case study for judicial decision-support under cognitive constraints and the body of evidence on inconsistent decision-making. Figure A2 in Appendix A provides a snapshot of the lectures, while Table A1 in Appendix A provides hyperlinks to the complete slide decks for lectures used in the study, including the placebo macroeconomic lectures. Moreover, the ministers complete two assignments *in class* immediately following each lecture. This involves writing short summaries or "key-takeaways" for each of the 2 lectures they attended and another 200 word summary on how they may be able to apply the lessons of the lecture to their job. They get 30 minutes to complete each task. The last component of the workshop featured two structured discussions: one group discussion within the treatment groups and a one-on-one 20 minutes individual discussion on the main lessons of the workshop. In both discussions, inspired by the literature on social emotional learning, we ask questions of the following form: *What do you think were the main messages of the lecture? How do you think you may apply lessons from today's lecture in your career?* Further details on how these structured discussions were conducted are reported in Panel B of Table A1 in Appendix A, Figure B2 and Figure B3 in Appendix B.

AI Fairness Activism Treatment.— We further cross-randomized the deputy ministers with 50% of the ministers (150) receiving a prominent summary of AI Fairness Activism, the "*Weapons*

of Math Destruction" by Cathy O'Neil, while the 50% of the ministers (151) received the "*The Promise of Artificial Intelligence*" by Brian Cantwell Smith, 4 months following the first lecture. As part of this "assignment" and once again motivated by recent literature on social-emotional learning, the ministers were to read the book, provide a short 200-word summary of the book and another 200 word summary of how they would apply the book's concepts in their career. The book on AI Fairness Activism highlights the "black box" nature of the AI models, the associated algorithm biases, potential to increase disparities and facilitate government and corporate capture. In contrast, "The Promise of Artificial Intelligence" largely ignores arguments put forth in AI Fairness Activism by dismissing them as overblown fears that arise after any large technological innovation and instead argues that artificial intelligence is nowhere near developing systems and algorithms that could potentially displace human judgment. To mitigate potential concerns of experimenter demand, the assignment of the book was blinded to the experimenters and the Institute. More detailed description of the treatments and their contents can be found in Table A2 of Appendix A.

III. Data and Empirical Specification

Sample.— The sample consists of all 301 deputy ministers with 15 to 25 years of policy experience in one cohort of Pakistan's elite bureaucracy executive training program along with their 204 "staff officers" from across Pakistan.[9] None of the participants had taken part in any prior randomized evaluation to the best of our knowledge. As a result of our experimental intervention embedded within the Institute's regular training program, we essentially have zero attrition. All 301 deputy ministers that were due to be trained by the Institute in the year participated in the experiment. The book assignment with writing exercises took place 4 months after the first lecture. The second lecture, its corresponding writing exercises and structured discussions took place 5 months after the first lecture (on the same day). The baseline survey was conducted one week before the first lecture and the endline 6 months after the second lecture. Annual budgetary policy decisions were made 8 months and outcomes on population were measured 13 months after the 2nd lecture. On the training

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[9] We obtained prior consent both from the participants and their subordinates (the consent prompt the ministers and subordinates saw are reported in Appendix A1). It is also important to note, unlike all our prior work, this sample consists of not junior ministers with one year of experience but rather senior deputy ministers who have from 15 to 25 years of experience.

Institute's request, we do not mention the exact dates of the training to protect the identity of the cohort.

Outcome Variables on Policy Choices.— Our first set of outcome variables are stated and actual policy choices of deputy ministers, who as generalist bureaucrats make budgetary requests for different arms of the government. We could *only* obtain budgetary data for two policies, one related to AI (digitization spending allowance) and the other unrelated to AI (office maintenance spending allowance) that serves as the placebo policy choice. These allowances are made annually, roughly two months before the federal budget for the next fiscal year is approved, and we obtain this data for 2 years: pretreatment (last year) and the posttreatment year. The outcomes of actual fiscal support allowances are obtained from the Planning Ministry of Pakistan with post-treatment decisions taken after the ministers graduated from the Institute about 8 months after the treatment. It is for this reason, these decisions are independent from potential experimenter demand effects of both the experimenter and the Institute. Qualitative accounts suggest the digitization projects largely involved digitizing of land records in Pakistan which were introduced in large part to reduce land ownership and transfer disputes. Computerization, digitization, automation are actions that ministers can take on the path towards deploying AI algorithms. Moving away from paper-based pre-colonial "*patwar*" or the village accountant system to the online registration of land ownership and transfer can facilitate tax collection on properties and reduce citizen complaints on land disputes. A survey of the deputy ministers also reveal that 85% of the ministers consider digitization as a precursor to implementation of AI technologies.[10]

Outcome Variables on Support for AI.— Our second set of outcome variables are survey responses that ascertain support and opposition to AI in policymaking on a five-point Likert scale. The following statements are presented to policymakers and their staff officers in random order: "I support the use of AI for public policymaking.", "I oppose the use of AI technology for public

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[10] We also learn from interviews with deputy ministers that OCR (Optical Character Recognition) to convert paper land-record data to digitized data still requires a lot of structure and is hitherto limited in scope in the case of hand-written records and non-Latin alphabets as in the case of many official documents in Pakistan (see Figure B4 in Appendix B for example of raw and post-digitized data, where only the latter could potentially be used to train AI algorithms). According to one account, a deputy minister notes upon completion of the land digitization in her district: "*I truly believe the best from digitization is yet to come. Based upon our futuristic approach of transforming the manual land records management into an efficient, accountable, secure and transparent system through AI-integrated technology solutions, this property registration system is envisaged as a symbol of facilitation of AI implementation… through making meaningful innovations and making our organization healthier and sustainable.*"

policymaking", "Do you think that the use of AI technology for policy is beneficial on the net?" and "Do you think that the use of AI technology for policy is harmful on the net?" We field the same survey statements to deputy ministers and their subordinate staff officers 6 months following the treatment. The survey questions are similar to those used in recent laboratory studies of AI policy views (Cowgil et al., 2020). The baseline survey was conducted one week before the first lecture, a midline survey was conducted 3 months after the first lecture but before receiving the AI fairness activism arguments, and the endline survey was conducted 6 months after the second lecture. We also randomize the order of surveys between asking first deputy ministers and their staff officers and vice versa. More details on the survey can be found in Appendix C2.

Outcome Variables on Citizen Complaints.— The aim of this study was to study how training in promise and AI Fairness Activism impacts ministers' policy choices and performance on the job. To capture a uniform measure of performance on the job, we use Pakistan's citizen portal data, which allowed us to link deputy ministers in the treated and control group with citizen complaints infrastructure. Here, we can measure both the speed with which a minister resolves a citizen complaint as well as the citizens' rating of the civil servant upon resolution of his or her complaint. Speed and citizen satisfaction help capture the efficiency and quality dimensions of bureaucratic performance. Significantly, the data from the citizen complaints portal is the sole performance variable available to us.

We make novel linkages to construct performance metrics of the deputy ministers from administrative data and trace the impact of our training on the population. This involves linking the deputy ministers to Pakistan's Prime Minister Citizen Portal (PCP, 2022). The Prime Minister's portal is a initiative of Prime Minister's Performance Delivery Unit (PMDU); established in 2013 with the aim of connecting public officials to citizens, the PCP takes complaints from citizens on government services in different districts which are then relayed to the deputy ministers in charge of the districts via an online dashboard (see Table A4 in Appendix A for a snapshot of this portal). In 2021 the portal received over a million complaints from across Pakistan and currently has about 4 million registered citizens on its platform. Citizens rate their satisfaction of public service delivery upon closing of the complaint on a 1 to 5 scale. Using this linkage in data, we construct two proxies for deputy ministers' performance. The first is the rating on the complaint resolution experience on a scale of 1 to 5 by the citizen. The second outcome is the delay in complaint resolution, that is, the

number of days for which the complaint remains open from its original filing date by the citizen. These two measures allow us to investigate potential downstream impact of our treatment on the population.

Empirical Specification.—The impact of AI treatment can be evaluated by comparing outcomes across groups in a simple regression framework. For each outcome, the estimation equation is:

$$Y_i = \alpha + \beta \, AI \, Education_i + X_i \, \mu + \epsilon_i \tag{1}$$

where Y_i is the outcome for the respective deputy minister or her staff officer, $AI \, Education_i$ is a dummy variable equal to one if the deputy minister is assigned either component of the AI Educational training. Specifically, if the deputy minister is assigned to either *Benefits of AI* or *Costs & Solutions of AI* training our AI training treatment variable takes the value of one and zero if the minister is assigned the macroeconomics training. Even though we hypothesized that *Benefits of AI* would have a larger, and possibly opposite-signed, effect than *Costs & Solutions of AI* on perceived benefits of AI, we merged the two AI treatment arms into one because we found statistically very similar effects in both direction and magnitude of these effects. In the main text, we report the estimated equation (1), while we report results of estimating the effects of two trainings separately in Table B3 of Appendix B. The placebo group receives macroeconomics training. X_i is a vector of control variables that include all available covariates from administrative data as reported in Table 1. For more details on the treatments that we administered, see Table A1 and Table A2 in Appendix A. For further details on the variables used in the study, their description and summary statistics see Table A3 of Appendix A.

Balance and Attrition.— Before we report estimates from equation (1), we present two key diagnostic checks. First, we present evidence that randomization was successful in creating balance across treatment and control groups. Table 1 shows balance over individual characteristics, with Panel A reporting the treatment balance over deputy ministers' characteristics, while Panel B reports balance over the staff officers' characteristics. Similar results are found if we instead conduct a joint orthogonality balance test (as suggested in Bruhn and McKenzie, 2009, see Table B1). Differences across treatment groups is small in magnitude, and almost all estimated p-values are larger than 0.10, suggesting that the randomization was effective at creating balance. For instance, gender, birth in

political capital, years of experience are balanced across treatment and placebo groups for both ministers and their staff officers. Second, we present evidence against differential attrition. Embedding our training within the Institute's regular training implied we had zero attrition or 100% take-up for the deputy ministers' responses. However, since subordinates of deputy ministers were not at the Institute and surveyed independently, there is a possibility of differential attrition of ministers' subordinates. In particular, 204 out of 301 ministers' staff officers responded to our survey. The estimates on attrition are statistically no different from zero and the evidence supports that view that differential attrition is unlikely to explain the large effect sizes we observe (see Table B2 in Appendix B for these results).

IV. Impact of AI Education

Impact on Deputy Ministers.— We begin the presentation of results by focusing on the impact of the AI training on policy decisions involving budgetary support for digitization and office maintenance. Panel A of Table 2 reports the results on budgetary decisions for digitization, while Panel B reports the corresponding results for budgetary decisions for Office Maintenance Funding. AI Education increases stated fiscal support for digitization both at the extensive (whether a budgetary allocation for digitization is sought) and the intensive margin (the amount sought for the digitization). This perceived support translates to actual allocations made on behalf of the Planning Ministry, although, unsurprisingly, when the policymakers face the policy choice with real reputational costs, implementation challenges and public budgetary constraints, the corresponding effect sizes are smaller. Nevertheless, the AI Education treated ministers are still more likely to extend fiscal support for digitization than the placebo assigned group: treated deputy ministers are about 15 percentage points more likely to extend fiscal support for digitization, a 20% increase over the sample mean. The intensive margin effects are also indicative of increased allocation for digitization, with the point estimate suggesting a doubling of funds sought for digitization over the mean dependent variable. In contrast, we find not much evidence for AI Education on the deputy ministers pretreatment (last year's) budgetary allocations for digitization (Table 2, Panel A, Columns 4 and 5). If anything, coefficient estimates in this case are negative. The annual funding allocations for office maintenance, a policy plausibly less linked with the use of AI algorithms is also unaffected (Table 2, Panel B). These results –standardized to mean zero and standard deviation one– are summarized in Figures 1 and 2. Particularly, from Figure 1, we observe that the AI Education

workshop increases the deputy ministers stated fiscal support for digitization by about 0.35 and actual funding allowance by about 0.25 standard deviations. In contrast from Figure 2, we find that pretreatment fiscal support for digitization and office maintenance budgetary requests are unaffected. We also find about 6 months following the workshop, the treated ministers are more likely to support using AI in policymaking and perceive AI to be net beneficial for policy relative to the non-AI treated ministers. Panel A of Table 3 reports these results. AI Education treated ministers are about 7.5% more likely to support use of AI in policy and 10% more likely to perceive AI to be beneficial, relative to the placebo macroeconomics treated ministers. Taken together, these results indicate the treated ministers increased their fiscal support for policy that is a likely precursor to the implementation of AI, perceiving the role of AI as important and beneficial on net, while other policies under consideration in the fiscal year appear to be unaffected. Policymakers' decisions are causally impacted by the AI training.

Impact on Subordinates.— The AI training transmitted to the ministers' subordinate staff. Particularly, we find ministers' staff officers also increase their support for AI in policymaking. Panel B of Table 3 presents evidence of transmission of AI training from the ministers to their staff officers. Specifically, the AI educational workshop with deputy ministers, increases their subordinates' support for AI by about 9% over the mean rating of support by the staff officer. The opposition to AI in policymaking decreases by a similar magnitude, while the staff officers whose ministers are treated with AI Education perceive AI beneficial on net by about 10% over the sample mean, relative to the staff officers of placebo treated ministers. In standard deviation terms, results from Figure 3's Panel A indicate an increase of support for AI in policy by at least 0.35 standard deviations. AI Education training, however, appears to have no impact on subordinates' pretreatment support for AI or their perception regarding the benefits of AI. At least three issues are noteworthy about these results. First, none of the staff officers were allowed at the Institute at the time of the training. Second, the staff officers are surveyed months after the training ends making the transmission effects hold in the medium term. Finally, staff officers' support for AI is affected even when the treatment squarely focused on the ministers also makes the results difficult to reconcile with experimenter demand explanations. The AI Education workshop was transmitted to the ministers' subordinate staff officers.

Impact of AI Education by Training Components.— We consider AI Education treatment to turn on if the deputy minister is assigned to *either* the benefits of AI or solutions with costs of AI workshops. We did this for three key reasons. First, we found both workshops positively impacted policy support for digitization, perceived support for AI and perception that AI is beneficial for policy. Second, merging the two treatments provided gains in statistical power and allowed for more precise estimation. Third, the same direction of the impact also mitigates concerns about experimenter demand. Nevertheless, in Table B3 of Appendix B, we present the results distinguishing between the two AI Education training. Table B3's Panel A presents the results for deputy ministers', while Panel B of Table B3 presents the results for the subordinates. We find both workshops increase support and decrease opposition for AI in policymaking for the ministers and their subordinates. The ministers treated with either workshop also increased their policy support for digitization in their budgetary allowances sent to the Planning Ministry. The direction and magnitude are similar and we cannot reject the null of a homogeneous effect of both components of the training.

AI Training and Digitization Policy.— In the Pakistani context, the nascency of AI in policy implied that digitization of paper records would first need to be undertaken, before AI technologies could be implemented. According to ministers, "Only when the paper-based data is digitized, can we even begin to think of training and implementing AI algorithms". Therefore, based on this observation, we obtained digitization funding decisions from the Ministry of Planning and Development in Pakistan. We carefully examine the link between digitization and AI for deputy ministers by conducting a two-question follow-up survey. In this survey conducted 15 months after the treatment, we field two questions, the first one is an open-ended question: "*What is the purpose of recent digitization efforts in Pakistani government departments?*". The second question solicits a rating on a scale of 1 to 5 to the question, with 1 one being not related at all, and 5 being very related: "*How related are AI and digitization efforts in government departments?*". In Table B4 of Appendix B, we report the results. We find that most deputy ministers perceive AI and digitization to be closely linked. First, in the open-ended question, without any nudge towards AI, when surveyed more than an year after the treatment, about 85% of ministers indicated recent digitization efforts in government are introduced because it will facilitate the implementation of AI policies in the future (while only

15% indicated other reasons).[11] Second, 221 out of 301 ministers considered digitization and AI "related" (65 ministers) or "very related" (156 ministers). Both these patterns suggest that the training shifted attitudes towards AI and are consistent with the anecdotal accounts that funding for digitization was likely increased to pave the way for implementation of AI technologies.[12]

V. Impact of AI Fairness Activism

Impact on Deputy Ministers.— In contrast to the impact of AI Education training workshops, we find arguments associated with AI Fairness Activism appear to *reduce* support for AI in policymaking. Panel A of Table 4 presents the impact of AI Fairness Activism on support for AI. The treated deputy ministers in this experiment were assigned a book summarizing the AI Fairness Activism arguments. Panel A of Table 4 indicates that the assignment of the book along with the writing assignments on the book reduced support for AI in policymaking. In particular, the assignment of AI Fairness Activism is associated with a reduced perceived support for AI in policy by 0.27 standard deviations and a 0.28 standard deviation increase in perception of AI being harmful on net (relative to those assigned the Promise of AI book). This perceived reduction in support for AI maps into actual policy decisions of the ministers. Table 5 documents the causal effect of AI Fairness Activism on fiscal support for digitization and office maintenance budgetary requests. We find that the AI Fairness Activism reduces the likelihood that ministers send budgetary requests for digitization by about 60% over the sample mean and funding amounts for digitization policy by about 50% (though the latter result is imprecise). Similar to before, AI Fairness Activism has no statistically detectable effect on pre-treatment fiscal support for digitization and office maintenance funding requests. If anything, the coefficient estimates go in the opposite direction.

Impact on Subordinates.— The AI Fairness Activism also transmits to ministers' subordinate officers (staff officers). Panel B of Table 4 presents these results. We find that the ministers' treated with AI activism have staff officers who are about 0.3 standard deviation less likely to perceive AI as beneficial in policymaking and about 0.4 standard deviations more likely to oppose AI in

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[11] The remaining 15% of the ministers wrote different versions of the statement "to increase efficiency and/or citizen satisfaction" without any reference to AI.

[12] We also observe, suggestive evidence that our AI training likely made this link more salient, though it is unlikely to be enough to explain the large sample means, nor does saliency alone explain the opposite effect of AI Education and AI Fairness Activism.

policymaking. In contrast, AI activism treatment has no impact on pretreatment subordinates' support or opposition for AI in policymaking. The combination of post-treatment impact on staff officers and no pre-treatment effect, when only deputy ministers were exposed to treatment, is challenging to explain with experimental demand effects, suggesting our treatment impacted attitudes. The comparisons of AI Fairness Activism are made relative to the book and corresponding writing exercises on the benefits of AI. Nevertheless, we can assess how AI Fairness Activism interacts with the AI Education treatment and assess how books augment or reduce the effects of AI education treatment using the survey of attitudes before and after receiving the book assignments, which we do below.

AI Fairness Activism moderates the effects of AI Education training.— We observe, there is an interaction between the AI Education workshop and the AI Fairness Activism treatment. Panel A of Table 6 presents the results for deputy ministers, while Panel B reports the corresponding results for ministers' staff officers. We find that AI Fairness Activism greatly mitigates the impact of AI Education workshops with the support and perceived benefits of AI reducing for the ministers cross-randomized into both treatments (Panel A). Rather different results are found for the ministers' subordinate staff: the AI Fairness Activism treatment reduces support for AI and increases opposition to AI but reinforces the effect of AI Education to elevate support for AI and reduce opposition to AI. Since we have data on ministers' policy choices for digitization and office maintenance budgetary requests, we next explore the interaction of the two treatments on policy. Table 7 reports these results. Consistent with our results on perceived support for AI, we find that policy impact of AI education workshop is greatly reduced when interacts with the AI Fairness Activism treatment: fiscal support for digitization is reduced when ministers assigned to AI Education workshop are cross-randomized into AI Fairness Activism. These results are consistent with loss aversion where accentuated risks of AI can overcome arguments in favor of AI for efficiency. AI literacy matters, particularly the manner of argumentation surrounding AI and the specific school of thought, can shape the direction of policy.

Disentangling the Impact of AI Fairness Book from the Lecture.— We leverage the fact that the book and the associated structured discussion was randomly assigned 4 months *after* the first lecture. Therefore, the timing of the assignment of the book allows us to investigate if the book assignment itself enhanced or mitigated the impact of the full AI Education training. The survey

data on attitudes towards AI collected after the first lecture but before the book assignment and second lecture suggests that both enhancement and mitigation occurs. The left side of Figures B5 to B7 of Appendix B shows that before receiving the books, the two groups within each treatment condition – benefits of AI, costs and solutions of AI, and placebo macroeconomics – have similar means whether or not they eventually are assigned the AI Fairness Activism book or the Promise of AI book. We also see the effect of AI Education lecture by comparing the means on the left figure in Figure B5 and Figure B6 with Figure B7. When we turn to the right side of each figure, which captures the attitudes after the book assignment and second lecture, we observe that the AI benefits book amplifies the effect of AI training and the AI Fairness Activism book reduces the effect of AI Education training.[13]

VI. Impact on Population: Citizen Satisfaction and Complaint Resolution Times

Impact of AI Training.— We link deputy ministers to citizen satisfaction and days to complaint resolution in their respective districts in Pakistan's Prime Minister Citizen Portal (PCP, 2022). This is possible because the complaints are directly linked with the deputy minister in charge of the complaining citizens' district by an online dashboard (see Panel B of Table A4 for a screenshot of the dashboard).[14] This data linkage allows us to assess the downstream impact of the AI training on the population about a year after the workshop. Columns 1 and 2 of Table 8's Panel A reports these results. We find that AI Education training increases citizen satisfaction in the treated ministers' district by 30% of a point on a 5-point scale. This is equivalent to about 15% increase in citizen satisfaction rating over the sample mean. The increased citizen satisfaction may be due to a fall in average complaint resolution time: in Columns 3 and 4 of Table 8 (Panel A), we observe that treated ministers' districts have complaints resolved 17 days earlier relative to the complaint resolution in districts of macroeconomics treated ministers. This is equivalent to a 25% decrease over the sample mean. We interpret these results in conjunction with our results on treated deputy ministers funding digitization of land and anecdotal accounts that at the time of our treatment there

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[13] See Figure A1 of Appendix A to see details on the experimental set-up and the timeline.

[14] For some illustrative examples of citizen complaints, please see our verbatim and anonymized reproduction of complaints in Table A5 of Appendix A and for an example of digitized and undigitized land record, please see Figure B4 in Appendix A.

was a major land digitization drive by the Government of Pakistan. This suggests that the digitization may have reduced the delay in deputy ministers' responding to citizen complaints in land ownership disputes and in turn increased citizen satisfaction. This is also consistent with the fact that pre-land record digitization, the "patwar system" (village accountant system) has been an issue of great disconcert for citizens with paper-based land recording dubbed as "ruinous records" (Rahman, 2020) and citizens frequently complaining about lack of efficiency of the paper-based old land record system (Ur-Rehman, 2020).

Impact of AI Fairness Activism.— In contrast, AI Fairness Activism reduces citizen satisfaction and increases time to complaint resolution. The AI Fairness Activism treatment reduces the effect of AI Education workshop. These results are reported in Panel B of Table 8. Specifically, we find that the ministers treated with the AI Fairness Activism have less satisfied citizens with a 15% lower rating over the sample mean (Columns 1 and 2). The decrease in citizen satisfaction is also accompanied by an increase in time to resolution of complaints. In particular, the AI Fairness Activism increases time to complaint resolution of treated ministers' districts by about 15 days relative to the citizen complaint resolutions in placebo ministers' districts.

Impact on Complaints by Land and Construction Works.— Finally, we analyze the contents of the complaints and provide evidence on why citizens' perceptions of public service may have been impacted. First, we note that the largest fraction of complaints relate to land disputes with 30% of complaints involving "land" issues, relating to ownership, transfer and lease of residential property (plots), followed by about 20% of the complaints on school and road construction. Second, we build on anecdotal accounts that around the time of the treatment, many ministers were in process of considering or implementing "computerization of land records" with the aim of automating government property transfer processes to better resolve citizens' property disputes (Board of Revenue Report, 2022) with some anecdotes even suggesting the minister implemented digitization with the express motive to implement AI algorithms to the digitized data in the future. Third, we investigate whether our results on complaints may be explained by treated ministers differentially undertaking the digitization of land records.[15] Although, we cannot directly determine whether the

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[15] The choice of land record digitization and construction works' complaints is made based on two factors. First, these complaints consist of the majority of all complaints lodged at the portal. Second, the choice of construction work complaints as least likely to be impacted by AI is based on discussion in a focus group with deputy ministers.

individual ministers undertook computerization of land records in their respective districts, we can explore whether the results on complaints are explained by property ownership related citizens' complaints. This is because digitization of land records provides a wealth of data to implement AI based algorithms relative to the second most prevalent complaints, "schools & road construction" complaints, that are plausibly less likely to involve AI. Table 9 presents these results with Columns 1 and 2 reporting results on complaints related to land disputes, while in Columns 3 and 4, complaints categorized in the portal as school and road building are reported. For typical examples of these complaints, see the verbatim reproduction of a sample of anonymized complaints from the portal in Table A5 of Appendix A. For complaints related to land issues, we observe that AI Education treated ministers supervise the districts with 20% higher citizen satisfaction relative to the placebo workshop. AI Fairness Activism treated ministers to supervise districts that have lower citizen satisfaction relative to the Promise of AI book (Column 1 of Table 9). Likewise, these ministers also resolve these complaints faster (by about 33%) if treated with AI Education and slower (by 25%) if treated with AI Fairness Activism (Column 2 of Table 9). In contrast, complaints relating to schools and road-building projects where the scope of implementing AI algorithms is relatively limited, are not significantly affected. We interpret these results in conjunction with our results of the AI treatments impacting ministers' budgetary support for digitization: the treatments appears to have changed the ministers' policy choices regarding digitization and efforts to digitize paper-based land records, which may have led to shift in complain resolutions and service delivery in land disputes to the population.

VII. Discussion and Robustness

Transmission Mechanisms— The results reported in Table 3 and Figure 3 provide evidence for transmission from deputy ministers to their staff officers. We next explore two key channels of transmission: horizontal (homophily) transmission from deputy ministers and subordinates sharing characteristics such as gender and age or vertical transmission from top to below. We leverage available data on both the ministers and subordinates' characteristics to explore the potential mechanisms of this transmission. We do this as follows. First, to ascertain horizontal transmission we evaluate whether deputy minister and her staff officers sharing gender or birth district (which is likely to be correlated with ethnicity) are disproportionately impacted by the treatment. Second, to

ascertain vertical transmission, we explore whether there is an increase in the impact of the AI training when the experience gap between the deputy minister and her staff officer increases. Table 10 presents these results. It appears that our treatment is not amplified if the deputy minister and her staff officer share the same gender or birth district. In contrast, the evidence is consistent with a larger impact of AI Education if the experience gap between deputy minister and her staff officer increases (mean 9.8 years, standard deviation 9.6), suggesting an increase in hierarchical distance as proxied by difference in experience gap, increases the impact of the AI Training. These results survive even when we control for the experience of the minister, so seniority *per se* is not the driving factor, but rather the experience gap between the minister and the subordinate.[16] The evidence, therefore, is consistent with the anecdotal accounts of "hierarchical reverence" within the bureaucracy and suggest that vertical hierarchical transmission is a more likely mechanism, rather than horizontal transmission, to explain the transmission of attitudes we observe.

Experimental Demand.— Next, we discuss whether experimenter demand and provide arguments why it is unlikely to drive our results. First, the data on policy decisions is independent from the Institute (or the experimenter) with the funding decisions made after the conclusion of the training and "assessments", when the Institute can no longer penalize the minister. The fiscal decisions the ministers make also come with reputational costs, implementation challenges and government financing constraints so any impact on it is difficult to reconcile with experimenter demand arguments. Second, since only deputy ministers are treated and subordinates are not allowed at the premises of the Institute. Finally, our findings on the effects of the book, whose identity was blinded to the research staff delivering the books, is also inconsistent with experiment demand arguments. These arguments strongly suggest that the interventions had consequences beyond experimenter demand.

External Validity. — List (2020) notes that "all results are externally valid to some setting, and no result will be externally valid to all settings." These senior policymakers, their selection mechanisms and training are similar to many other developing countries, especially India and Bangladesh who, like Pakistan, inherited these bureaucratic institutions during the British Colonial

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[16] Results are similar though less precise when we evaluate the impact of AI Fairness Activism (Table B5). Although, even if we drop all control variables from the baseline specification reported in Table 10, the results remain as precise as those reported in Table 10 (see Table B6 for these results).

rule of the Indian subcontinent. Pakistan, India and Bangladesh alone consist of more than a quarter of world population making this study particularly relevant for a large number of people. We also follow List (2020)'s SANS (Selection-Attrition-Naturalness-Scaling) conditions in our discussion of generalizability of our results. First, in terms of selection, our sample consists of all 301 senior deputy ministers that were scheduled to be trained at the Institute in that academic year. Considering the naturalness of the setting, time frame and choice task, we use many natural measures such as ministers' policy decisions. The policymakers are not placed on an artificial margin and perform many of their natural tasks in the field. Finally, in terms of scaling our intervention to understand how AI training may be utilized in other settings, the intervention is cheap to deliver and may be particularly useful for developing countries facing strict resource constraints. The training may be scaled to other high-stakes decision makers such as judges and CEOs. We, however, view these results as a WAVE1 insight, in the nomenclature of List (2020), and replications need to be completed to understand if the effect sizes can be applied to general populations as well as high-stakes decision makers in other contexts.

   Spillovers.—Our experiment allowed us to randomly allocate treatment to 301 deputy ministers across 12 government departments. However, the ministers who are in the treated and control group may interact at the Institute, so there is potential for spillovers if individuals in the control group also end up being partially treated. First, to the extent there are spillovers or contamination of our control groups with treatment, our estimate can then be considered as a lower bound on the impact of the treatments. Second, the experimental design allows us to ascertain the extent of the spillover effects, where we exploit the variation of treatment effects among treated ministers in the 12 government departments that the ministers serve in. Table B7 in Appendix B shows no differential effects of the treatments among ministers or their subordinates working within the same government department. If a higher fraction of treated ministers leads to spillovers to control ministers within the government department, we do not see strong evidence for that spillover as evidenced by the lack of statistically significant effects for the interaction term. Last, the structure and organization of the training at the Institute makes the possibility of spillovers limited. This is because deputy ministers follow a very strict schedule at the Institute and come from across Pakistan. They are not allowed to speak to one another in class, unless through their "protocol officer" which makes interactions cumbersome. Their minute-by-minute schedule is also strictly regulated by the Institute with even lunch breaks also including assessments and professional etiquette workshops,

making relatively little opportunities for inter-colleague interactions. Taken together, the evidence suggests that spillover effects between treated and control deputy ministers, even if they exist, are likely to be small in magnitude and hence unlikely to explain the effect sizes we observe.

Sample Size and Randomization Inference. — The focus on senior deputy ministers allows us to study an elite group of high-stakes decision-makers who can potentially impact long-run economic and political outcomes. However, the selective nature of these policymakers necessitate that they are by design relatively few in number. Therefore, our sample is restricted to about 300 deputy ministers, which raises concerns about lack of statistical power. We follow Imbens and Rubin (2015) suggestion in this case, to use randomization inference to evaluate robustness of our results. That is, we scramble the data, reassign treatments, and compare the distribution of control estimates with the estimates from the experiment. The resulting p-values for 1000 iterations of this process are reported in Table B8. The treatment effects are still statistically significant at conventional levels, suggesting that an idiosyncratic draw is also unlikely to explain our results.

Multiple Hypothesis Testing. — Given that we are testing multiple hypotheses, we also examine whether our results might be explained by false positives. Under the assumption that the treatments have no effect on any of our outcomes (all our null hypotheses are true), then the probability of at least one false rejection when using a critical value of 0.05 is about 64%. Consequently, we adjust for the fact that we are testing for multiple hypotheses by using sharpened False Discovery Rate (FDR) q-values. The sharpened q-values are reported in square brackets in Table B9, which also shows standard p-values from our baseline regressions in parentheses for comparison. Similar results are obtained when we deploy List et al., (2019)'s familywise error rate correction (FWER). This extends the False Discovery Rate (FDR) method by using a bootstrapping approach to incorporate the point-dependence structure of different treatments and also allows p-values to be correlated while adjusting for multiple hypotheses. The results, also reported in Table B9, strongly suggest that false positives are unlikely to explain our results.

VIII. Conclusion

State capacity involves both physical and human capital. This paper touches on both dimensions by intervening through an AI workshop for top bureaucrats. Many countries are

introducing AI initiatives to equip policymakers and the population for the 21st century. Ideas are imported from developed countries without particular attention to potential consequences that may arise when implemented in new environments. In this paper, we randomize AI training among deputy ministers and observe its transmission among policymakers and trace its impact on the population in the 5th most populous country, Pakistan. We investigate the responsiveness of policymakers who are educated in AI benefits and fairness arguments on their attitudes, on budget allocations, on subordinates, and on citizens.

Using a randomized control trial with deputy ministers in Pakistan, we find that exposing ministers to different ideas on the use of AI in policy led to their substantially increasing budgetary allocations for digitization projects. It also shifted their attitudes, which transmitted to their subordinates, and impacted their performance as measured in the Pakistan Citizen Portal, a digital platform that connects citizens to civil servants. Ministers treated to positive ideas on AI in policymaking increase their citizen ratings by 10% and speed of resolving citizen complaints by 33%.

Several scholars, however, have warned against the potential pitfalls of uncritical acceptance of AI in our daily lives. Others, however, have welcomed the fast-paced development of AI as a major tool to assist 21st century challenges of disease, poverty and social justice. Policymakers must navigate if, when, and how much of AI will be allowed in our daily lives. We find both benefits and costs with solutions to AI increasing support for AI among policymakers. We then cross-randomized ministers to receive AI fairness activism arguments. The results show that AI fairness activism reduces the effects observed in the experiment. Specifically, when ministers were exposed to AI fairness activism arguments, it resulted in decreased budgetary allocations for digitization projects, lowered citizen ratings of minister performance, and delayed the resolution of citizen complaints. These impacts were roughly of the same magnitude as the effects observed from training ministers in AI. The subordinates, who were not part of the training, were also impacted. Difference in experience, rather than shared gender or birthplace, plays a more important role in the transmission to subordinates, which has implications for the structure of organizations, particularly the highly hierarchical bureaucracies in the Global South, when it comes to adoption of new ideas.

Exposure to AI fairness activism arguments emphasizing the inevitability of algorithmic bias led policymakers to perceive higher costs associated with AI in policymaking. This perception resulted in reduced funding for digitization initiatives. The reduced funding for digitization initiatives, caused by the awareness of algorithmic bias, might hinder crucial policy reforms like land record digitization. The obstruction of policy reforms, such as land record digitization, can ultimately diminish citizen satisfaction with government services. These unintended consequences highlight the potential negative effects that can arise from raising awareness of algorithmic bias in developing countries. Given the importance of digitization for modern ICT technologies and the findings that e-governance initiatives help build state capacity (Fujiwara, 2015; Muralidharan et al., 2019; Banerjee et al., 2020), the reduction in budget allowances for digitization raises concerns about the unintended consequences of AI fairness activism. While these arguments can be well-intentioned and appropriate in certain settings, they may hinder the implementation of other modernization policies in developing countries. Our findings, however, underscore that policymakers are significantly influenced by varying ideas about AI, which can have impact on themselves, their subordinates, and the general population. The long run welfare effects of AI policy adoption, however, remain to be seen.

This article extends our previous efforts with junior policymakers and front-line tax officers in which we crafted educational materials to enhance altruism (Mehmood, Naseer, and Chen, 2021) and deepen understanding of econometrics (Mehmood, Naseer, and Chen, 2022). This paper focuses on top bureaucrats –senior deputy ministers– in Pakistan who have up to 25 years of experience in policy-making and show that their attitudes and decisions are malleable, affect their subordinates, and has subsequent effect on the general public's contentment with the state bureaucracy. Our work hope to fill a noticeable gap in the literature studying top bureaucrats compared to politicians and private sector leaders. Given top public sector workers' substantial impact on organizational performance and economic outcomes within the State, it's essential to study these policymakers' policy production function. Further research on factors beyond the human capital of public officials will provide a more comprehensive understanding of state capacity and effective governance.

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Figures and Tables

Figure 1: Impact of AI Education on Ministers' Funding Allowances for Digitization (treatment and pretreatment year)
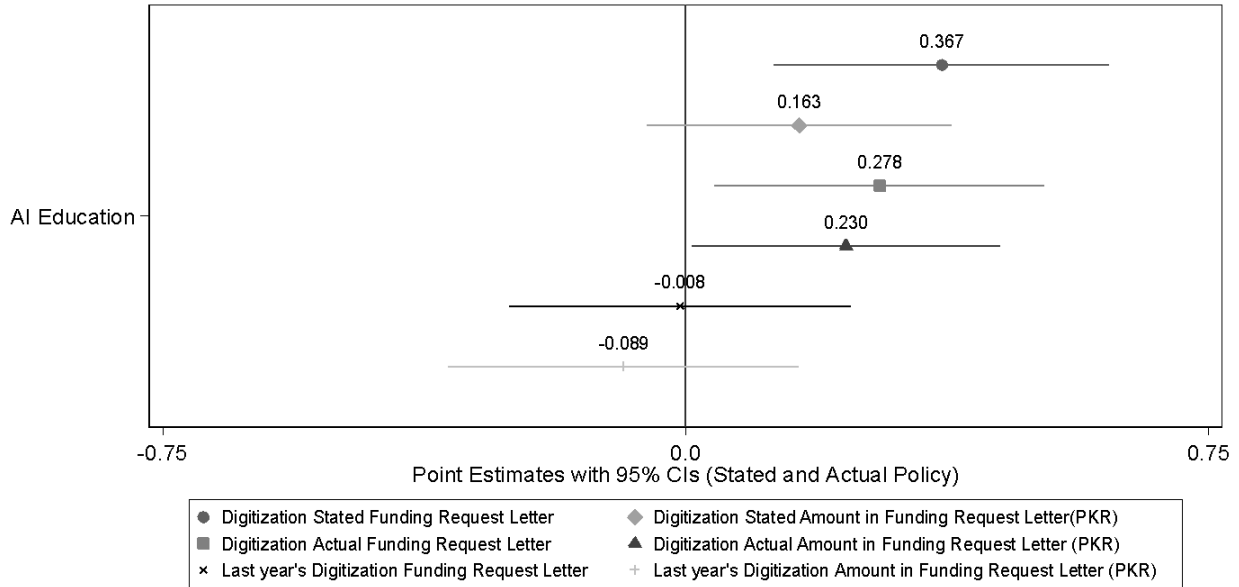
Note: The figure reports the coefficient estimates for funding allowances for digitization, standardized to mean zero and standard deviation one. The table-form representation in the original scale is reported in Panel A of Table 2. Both stated and actual allowances made by the ministers to the Ministry of Planning and Development for digitization are reported. These annual budgetary allowances are made by the deputy ministers each year just before the federal budget is announced. See Figure B1.2 for a call for application notification of such funding requests. All the dependent variables are standardized to mean zero and standard deviation one. The *AI Education* is a dummy variable that takes the value of one when the deputy ministers are assigned to the AI education workshop (lectures, writing exercises and structured discussions). The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. 95% Confidence Intervals are also reported.

Figure 2: Placebo - Impact of AI Education on Ministers' Office Maintenance Funding Request (treatment and pretreatment year)
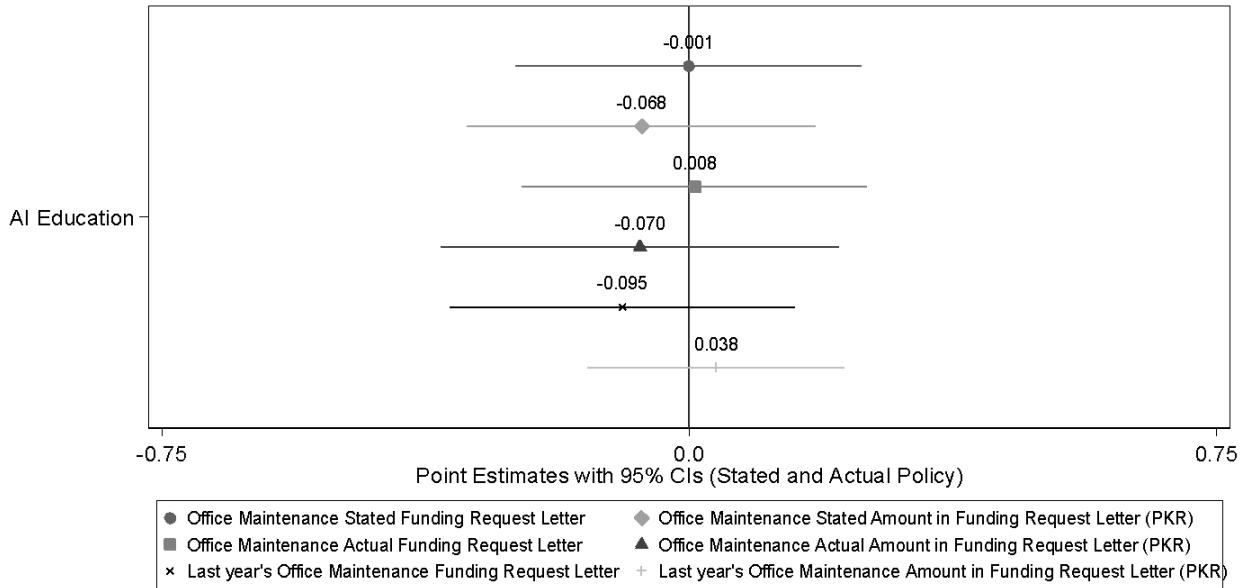
Note: The figure reports the coefficient estimates for funding allowances for deputy ministers' office maintenance, standardized to mean zero and standard deviation one. The table-form representation in the original scale is reported in Table 2's Panel B. Both stated and actual allowances made by the ministers to the Ministry of Planning and Development are reported. These annual budgetary requests are made by the deputy ministers each year just before the federal budget is announced. All the dependent variables are standardized to mean zero and standard deviation one. The *AI Education* is a dummy variable that takes the value of one when the deputy ministers are assigned to the AI Education workshop (lectures, writing exercises and structured discussions). The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. 95% Confidence Intervals are also reported.

Figure 3: Transmission of Treatment Effects on Subordinate Staff
Panel A: Impact of AI Education on Subordinates
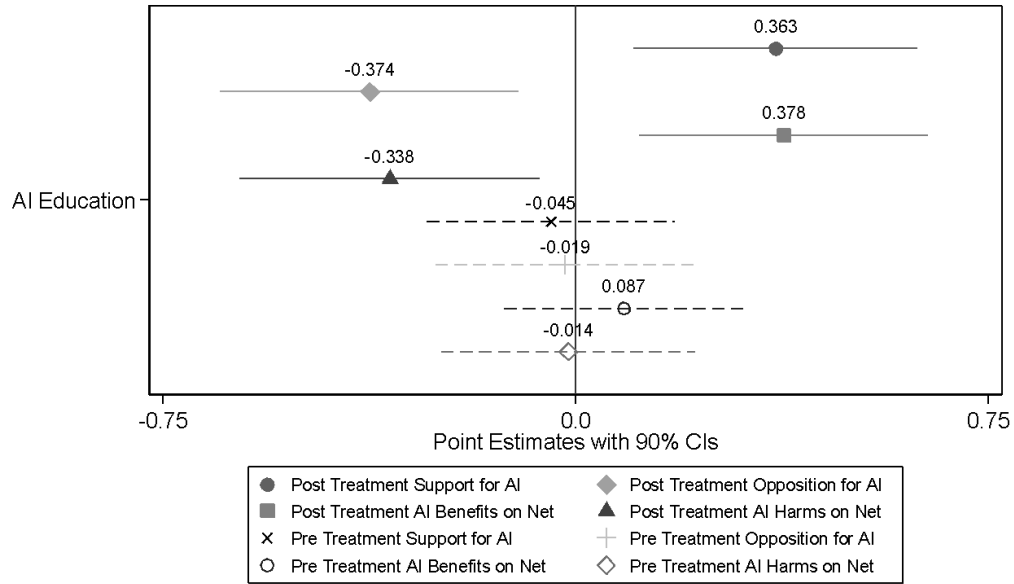
Panel B: Impact of AI Fairness Activism on Subordinates
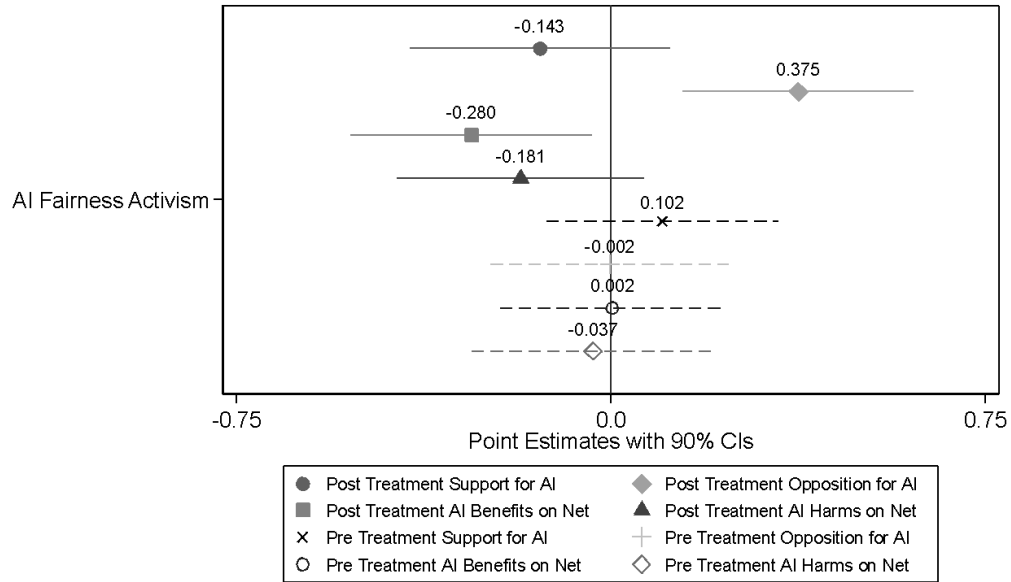
Note: The dependent variables report survey responses of deputy ministers' subordinates or staff officers". The survey statements are evaluated on a 5-point Likert scale and are as follows: "I support use of AI for public policymaking."; "I oppose the use of AI technology for public policymaking"; "Do you think use of AI technology for policy is beneficial on net?"; "Do you think the use of AI technology for policy is harmful on the net?". All the dependent variables are standardized to mean zero and standard deviation one. 90% Confidence Intervals are also reported.

Table 1: Balance Check over Deputy Ministers' and their Staff Officers Characteristics

Panel A: Ministers' Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Gender	Age	Years of Education	Birth Place	Pre-Treatment Modernization Needed	STEM Major	District Administration (PAS)	Law and Order (PSP)	Revenue Affairs (FBR)	Foreign Affairs (FSP)
AI Education	-0.068	-0.0243	-0.115	-0.0612	-0.0479	-0.040	-0.0383	0.00598	-0.008	0.0538
	(0.053)	(0.542)	(0.202)	(0.061)	(0.161)	(0.060)	(0.039)	(0.0383)	(0.038)	(0.042)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301	301	301	301	301
R-squared	0.038	0.024	0.020	0.027	0.041	0.044	0.104	0.098	0.112	0.118
Mean Dep V	0.757	46.05	16.714	0.405	3.841	0.385	0.123	0.116	0.113	0.150

Panel B: Subordinates' Characteristics

	Gender	Age	Years of Education	Birth Place	Pre-Treatment Modernization Needed	STEM Major	District Administration (PAS)	Law and Order (PSP)	Revenue Affairs(FBR)	Foreign Affairs (FSP)
AI Education	-0.013	-0.108	-0.120	-0.118	-0.0505	-0.088	-0.0038	0.0701	-0.037	0.0722
	(0.059)	(0.685)	(0.207)	(0.076)	(0.198)	(0.074)	(0.050)	(0.048)	(0.046)	(0.049)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	204	204	204	204	204	204	204	204	204	204
R-squared	0.094	0.022	0.049	0.060	0.086	0.046	0.103	0.116	0.116	0.098
Mean Dep V.	0.809	43.29	15.784	0.480	3.892	0.358	0.127	0.123	0.108	0.123

Note: Robust standard errors appear in parentheses. The *AI Education* is a dummy variable that takes the value of one when the deputy minister is assigned to the AI education workshop (lectures, writing exercises and structured discussions). Omitted category is the placebo macroeconomics workshop. The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized except the dependent variable used in the regression. For balance with AI Activism see Table B1. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 2: Impact of AI Education on Stated, Actual and Last Year's Policy Decision

	Stated Policy Decision		Actual Policy Decision		Last Year's Actual Policy Decision	
	Stated Funding Request to PlanningMinistry	Stated Amount in Funding Request (PKR)	Funding Request to PlanningMinistry	Amount in Funding Request (PKR)	Last Year's Funding Request to Planning Ministry	Last Year's Amount in Funding Request (PKR)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Digitization Funding Request						
AI Education	0.171***	215,507	0.136**	69,560**	-0.00390	-26,137
	(0.0568)	(147,370)	(0.0589)	(34,052)	(0.0618)	(37,659)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301
R-squared	0.091	0.050	0.078	0.054	0.022	0.037
Mean Dep. Variable	0.688	227881.1	0.608	71698.67	0.436	616697.7
Panel B: Office Maintenance Funding Request						
AI Education	-0.000530	-18,194	0.00387	-11,438	-0.0475	24,651
	(0.0626)	(33,958)	(0.0624)	(23,492)	(0.0625)	(59,905)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301
R-squared	0.022	0.011	0.053	0.028	0.033	0.020
Mean Dep. Variable	0.488	207515	0.528	42235.88	0.518	461534.9

Note: Robust standard errors appear in brackets. The dependent variables include stated and actual allowances that deputy ministers made for digitization and office maintenance budget. These annual budgetary requests are made by the deputy ministers each year just before the federal budget. See Figure B1.2 for a call from the Planning Ministry notification of such funding allowances. The *AI Education* is a dummy variable that takes the value of one when the deputy minister is assigned to the AI education workshop (lectures, writing exercises and structured discussions). The omitted category is the placebo macroeconomics workshop. The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 3: Impact of AI Education on Ministers' and Subordinates' Support for AI

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net
	(1)	(2)	(3)	(4)
Panel A: Deputy Ministers				
AI Education	0.305**	-0.214	0.353**	-0.195
	(0.144)	(0.159)	(0.156)	(0.160)
Controls	Yes	Yes	Yes	Yes
Observations	301	301	301	301
R-squared	0.059	0.046	0.081	0.025
Mean Dep. Variable	3.900	2.103	3.598	2.429
Panel B: Subordinates				
AI Education	0.369**	-0.382**	0.351**	-0.347**
	(0.159)	(0.168)	(0.147)	(0.170)
Controls	Yes	Yes	Yes	Yes
Observations	204	204	204	204
R-squared	0.124	0.077	0.080	0.090
Mean Dep. Variable	4.039	2.059	3.951	2.289

Note: Robust standard errors appear in brackets. The dependent variables report survey responses of deputy ministers in Panel A and their subordinates (chief of staff or "staff officers") in Panel B. The survey statements are evaluated on a 5-point Likert scale and are as follows: "I support use of AI for public policymaking."; "I oppose the use of AI technology for public policymaking"; "Do you think use of AI technology for policy is beneficial on net?"; "Do you think the use of AI technology for policy is harmful on the net?". The *AI Education* is a dummy variable that takes the value of one when the deputy minister is assigned to the AI education workshop (lectures, writing exercises and structured discussions). The omitted category is the placebo macroeconomics workshop. The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4: Impact of AI Fairness Activism on Ministers and their Subordinates

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net
	(1)	(2)	(3)	(4)
Panel A: Deputy Ministers				
AI Fairness Activism	-0.312**	0.188	-0.268*	0.369**
	(0.133)	(0.159)	(0.148)	(0.157)
Controls	Yes	Yes	Yes	Yes
Observations	301	301	301	301
R-squared	0.061	0.046	0.076	0.039
Mean Dep. Variable	3.900	2.103	3.598	2.429
Panel B: Subordinates				
AI Fairness Activism	-0.145	0.382***	-0.260*	-0.186
	(0.160)	(0.143)	(0.136)	(0.154)
Controls	Yes	Yes	Yes	Yes
Observations	204	204	204	204
R-squared	0.103	0.080	0.086	0.074
Mean Dep. Variable	4.039	2.059	3.951	2.289

Note: Robust standard errors appear in brackets. The dependent variables report survey responses of deputy ministers in Panel A and their subordinates (chief of staff or "staff officers") in Panel B. The survey statements are evaluated on a 5-point Likert scale and are as follows: "I support use of AI for public policymaking."; "I oppose the use of AI technology for public policymaking"; "Do you think use of AI technology for policy is beneficial on net?"; "Do you think the use of AI technology for policy is harmful on the net?". *AI Fairness Activism* is a dummy variable that takes the value of one when the individual is randomly assigned to read and do summarize the "Weapons of Math Destruction" book by Cathy O'Neil and zero if assigned the "The promise of artificial intelligence: Reckoning and judgment" by Brian Cantwell Smith (with writing exercises and structured discussions). The controls include all available characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5: Impact of AI Fairness Activism on Policy Decisions

	Digitization Funding Request				Office Maintenance Funding Request			
	Funding Request to Planning Ministry	Amount in Funding Request (PKR)	Last Year's Funding Request to Planning Ministry	Last Year's Amount in Funding Request (PKR)	Funding Request to Planning Ministry	Amount in Funding Request (PKR)	Last Year's Funding Request to Planning Ministry	Last Year's Amount in Funding Request (PKR)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AI Fairness Activism	-0.380***	-34,137	0.0591	21,039	-0.0670	-7,802	0.0748	136,970
	(0.0521)	(30,380)	(0.0587)	(34,927)	(0.0583)	(15,188)	(0.0597)	(87,763)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301	301	301
R-squared	0.216	0.046	0.043	0.050	0.058	0.028	0.036	0.031
Mean Dep. Variable	0.608	71698.67	0.429	616697.7	0.528	42235.88	0.518	461534.9

Note: Robust standard errors appear in brackets. The dependent variables include stated and actual allowances made by the deputy ministers for the Ministry of Planning in Pakistan for digitization of government processes and office maintenance. These annual budgetary requests are made by the deputy ministers each year just before the federal budget. See Figure B1.2 for a call for planning ministry notification of such funding allowances. *AI Fairness Activism* is a dummy variable that takes the value of one when the individual is randomly assigned to read "Weapons of Math Destruction" book by Cathy O'Neil and zero if assigned the "The promise of artificial intelligence: Reckoning and judgment" book by Brian Cantwell Smith (with writing exercises and structured discussions). The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Impact of AI Fairness Activism on Officers and their Subordinate Staff Support Perceived for AI

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net
	(1)	(2)	(3)	(4)
Panel A: Deputy Ministers				
AI Education	0.612***	-0.306	0.507**	-0.580***
	(0.209)	(0.234)	(0.242)	(0.219)
AI Fairness Activism	0.0383	0.165	-0.105	-0.117
	(0.242)	(0.240)	(0.266)	(0.245)
AI Education X *AI Fairness*	-0.586**	0.158	-0.290	0.742**
Activism	(0.286)	(0.316)	(0.322)	(0.315)
Controls	Yes	Yes	Yes	Yes
Observations	301	301	301	301
R-squared	0.094	0.069	0.097	0.060
Panel B: Subordinates				
AI Education	0.328	-0.152	0.332*	-0.201
	(0.209)	(0.199)	(0.200)	(0.222)
AI Fairness Activism	-0.220	0.730***	-0.323	0.0160
	(0.275)	(0.271)	(0.252)	(0.279)
AI Education X *AI Fairness*	0.0936	-0.509	0.0752	-0.290
Activism	(0.319)	(0.327)	(0.300)	(0.319)
Controls	Yes	Yes	Yes	Yes
Observations	204	204	204	204
R-squared	0.131	0.124	0.120	0.101

Note: Robust standard errors appear in brackets. The dependent variables report survey responses of deputy ministers in Panel A and their subordinates (chief of staff or "staff officers") in Panel B. The survey statements are evaluated on a 5-point Likert scale and are as follows: "I support use of AI for public policymaking."; "I oppose the use of AI technology for public policymaking"; "Do you think use of AI technology for policy is beneficial on net?"; "Do you think the use of AI technology for policy is harmful on the net?". The *AI Education* is a dummy variable that takes the value of one when the deputy minister is randomly assigned to an AI education workshop (lectures, writing exercises and structured discussions). *AI Fairness Activism* is a dummy variable that takes the value of one when the individual is randomly assigned to read "Weapons of Math Destruction" book by Cathy O'Neil and zero if assigned the "The promise of artificial intelligence: Reckoning and judgment" book by Brian Cantwell Smith (with writing exercises and structured discussions). The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Impact of AI Fairness Activism on Fiscal Support – Original Units

	Digitization Funding Request				*Office Maintenance Funding Request*			
	Funding Request to Planning Ministry	Amount in Funding Request (PKR)	Last Year's Funding Request to Planning Ministry	Last Year's Amount in Funding Request (PKR)	Funding Request to Planning Ministry	Amount in Funding Request (PKR)	Last Year's Funding Request to Planning Ministry	Last Year's Amount in Funding Request (PKR)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AI Education	0.287***	63,073**	-0.0606	-30,965	-0.0620	24,739	-0.149	-88,541
	(0.0726)	(31,295)	(0.0871)	(52,153)	(0.0858)	(17,175)	(0.0902)	(54,165)
AI Fairness Activism	-0.193**	-44,249*	-0.0160	13,998	-0.153	38,817	-0.0533	-6,102
	(0.0956)	(24,960)	(0.101)	(63,928)	(0.102)	(43,026)	(0.105)	(90,863)
AI Education X AI Fairness Activism	-0.286**	13,532	0.114	11,320	0.131	-70,383	0.195	216,322
	(0.113)	(62,630)	(0.125)	(76,616)	(0.125)	(51,370)	(0.127)	(150,551)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301	301	301
R-squared	0.252	0.057	0.045	0.052	0.061	0.039	0.046	0.037

Note: Robust standard errors appear in brackets (clustered at the individual level). The dependent variables include stated and actual allowances made by the deputy ministers for the Ministry of Planning in Pakistan for digitization and office maintenance. These annual budgetary requests are made by the deputy ministers each year just before the federal budget. See Figure B1.2 for a call for planning ministry notification of such funding allowances. The *AI Education* is a dummy variable that takes the value of one when the deputy minister is randomly assigned to an AI education workshop (lectures, writing exercises and structured discussions). *AI Fairness Activism* is a dummy variable that takes the value of one when the individual is randomly assigned to read and summarize the "Weapons of Math Destruction" book by Cathy O'Neil and zero if assigned the "The promise of artificial intelligence" by Brian Cantwell Smith. The controls include all available individual level characteristics: experience, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8: Impact of Training and Fairness Activism on Citizen Complaints – Original Units

	Citizen Rating Average		Resolution Days Average	
	(1)	(2)	(3)	(4)
Panel A: AI Education				
AI Education	0.312*	0.323	-18.35*	-17.09*
	(0.188)	(0.201)	(9.697)	(8.711)
Controls	No	Yes	No	Yes
Observations	95	95	95	95
R-squared	0.030	0.073	0.042	0.222
Mean Dep. Variable	2.429	2.429	65.029	65.029
Panel B: AI Fairness Activism				
AI Fairness Activism	-0.353*	-0.360*	15.60*	11.66
	(0.179)	(0.187)	(8.828)	(8.370)
Controls	No	Yes	No	Yes
Observations	95	95	95	95
R-squared	0.038	0.080	0.031	0.204
Mean Dep. Variable	2.429	2.429	65.029	65.029

Note: Robust standard errors appear in brackets. The dependent variable in Columns 1 and 2 is the average rating in the citizen portal on a scale of 1-5. The dependent variable in Columns 3 and 4 is the average number of days to the complaint resolution. The sample consists of 95 deputy ministers mentioned by full name in the Citizen Portal that matched out of our sample of 301 ministers. We average the 3007 complaints that correspond to these matched deputy ministers. The *AI Education* is a dummy variable that takes the value of one when the deputy minister is randomly assigned to an AI education workshop (lectures, writing exercises and structured discussions). *AI Fairness Activism* is a dummy variable that takes the value of one when the individual is randomly assigned to read and summarize "Weapons of Math Destruction" book by Cathy O'Neil and zero if assigned the "The promise of artificial intelligence: Reckoning and judgment" book by Brian Cantwell Smith (with writing exercises and structured discussions). The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 9: Impact of AI Education Training and Fairness Activism by Land and Placebo Schools & Road Construction Complaints

	Land and Residential Property Complaints		Placebo - Schools & Road Construction Complaints	
	Citizen Rating Average	Resolution Days Average	Citizen Rating Average	Resolution Days Average
	(1)	(2)	(3)	(4)
Panel A: AI Education				
AI Education	0.477**	-22.31**	0.203	-12.49
	(0.185)	(8.746)	(0.270)	(9.157)
Controls	Yes	Yes	Yes	Yes
Observations	95	95	95	95
R-squared	0.155	0.269	0.023	0.192
Mean Dep. Variable	1.703	65.356	2.403	63.723
Panel B: AI Fairness Activism				
AI Fairness Activism	-0.332*	15.85*	-0.373	8.512
	(0.192)	(8.709)	(0.251)	(8.617)
Controls	Yes	Yes	Yes	Yes
Observations	95	95	95	95
R-squared	0.126	0.244	0.041	0.182
Mean Dep. Variable	1.703	65.356	2.403	63.723

Note: Robust standard errors appear in brackets . The dependent variable in Columns 1 and 3 is the average rating in the citizen portal on a scale of 1-5 for land related complaints and schools & road construction related complaints, respectively. The dependent variable in Columns 2 and 4 is the average number of days for the complaint resolution involving land and schools & road construction related complaints. The *AI Education* is a dummy variable that takes the value of one when the deputy minister is randomly assigned to an AI education workshop (lectures, writing exercises and structured discussions). *AI Fairness Activism* is a dummy variable that takes the value of one when the individual is randomly assigned to read "Weapons of Math Destruction" book by Cathy O'Neil and zero if assigned the "The promise of artificial intelligence: Reckoning and judgment" book by Brian Cantwell Smith (with writing exercises and structured discussions). The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 10: Impact of AI Education on Support for AI by Subordinates - Vertical vs Horizontal Transmission

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net
	(1)	(2)	(3)	(4)
AI Education X *Diff in Experience*	0.110***	-0.0105	0.0236	-0.0633*
	(0.0396)	(0.0386)	(0.0407)	(0.0377)
AI Education X Same *Gender*	0.159	0.369	-0.318	-0.309
	(0.433)	(0.247)	(0.333)	(0.414)
AI Education X Same *Birthplace Dist.*	-0.356	0.399	-0.205	0.515
	(0.340)	(0.341)	(0.285)	(0.341)
AI Education X *Years of Experience*	0.0273	0.0257	-0.0821*	0.0175
	(0.0473)	(0.0490)	(0.0423)	(0.0519)
AI Education	-0.872	-0.208	0.615	0.149
	(0.779)	(0.737)	(0.885)	(0.894)
Difference in years of Experience	-0.0578	-0.00585	-0.00165	0.0288
	(0.0375)	(0.0358)	(0.0362)	(0.0346)
Same Gender	0.159	0.369	-0.318	-0.309
	(0.433)	(0.247)	(0.333)	(0.414)
Same Birthplace District	0.547*	-0.435	0.347	-0.339
	(0.301)	(0.288)	(0.258)	(0.298)
Years of Experience	0.00516	-0.00299	0.0343	-0.0221
	(0.0405)	(0.0335)	(0.0310)	(0.0445)
Controls	Yes	Yes	Yes	Yes
Observations	204	204	204	204
R-squared	0.222	0.111	0.157	0.151

Note: Robust standard errors appear in brackets. The dependent variables report survey responses of deputy ministers' subordinates (chief of staff or "staff officers"). The survey instrument is as follows: "I support use of AI for public policymaking."; "I oppose use of AI technology for public policymaking"; "Do you think use of AI technology for policy is beneficial on net?"; "Do you think use of AI technology for policy is harmful on net?". The *AI Education* is a dummy variable that takes the value of one when the deputy minister is randomly assigned to an AI education workshop. The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** p<0.01, ** p<0.05, * p<0.1

Online Appendix to:

The Ripple Effect of AI Training on Policymakers and Citizens: Unintended Consequences in a Developing Nation

By Sultan Mehmood, Shaheen Naseer and Daniel Chen

Contents

A. Consent, Intervention Details and Discussion of Ethics

B. Additional Figures and Tables

C. Data Appendix: Surveys and Vignette

Appendix A: Consent and Intervention Details

Consent for commissioned officers (deputy ministers):

I agreed to participate in the research study (summarized in the attached brochure). I understand the purpose and nature of this study and I am participating voluntarily. I understand that I can withdraw from the study at any time without any penalty or consequences.
- Yes
- No

I grant permission for the data generated from this survey to be used in the researcher's publications on this topic.
- Yes
- No

I grant permission to researchers to use my information for research purposes. This includes my personal and administrative data with the training institute.
- Yes
- No

For Subordinate Staff (Staff Officers):
I agreed to participate in the research study. I understand the purpose and nature of this study. I agreed to participate in the research study. I understand the purpose and nature of this study and I am participating voluntarily. I understand that I can withdraw from the study at any time without any penalty or consequences.
- Yes
- No

I grant permission for the data generated from this survey to be used in the researcher's publications on this topic.
- Yes
- No

I grant permission to researchers to use my information for research purposes. This includes my personal and administrative data with the training institute.
- Yes
- No

Figure A1: Flow Chart of the Experimental Design
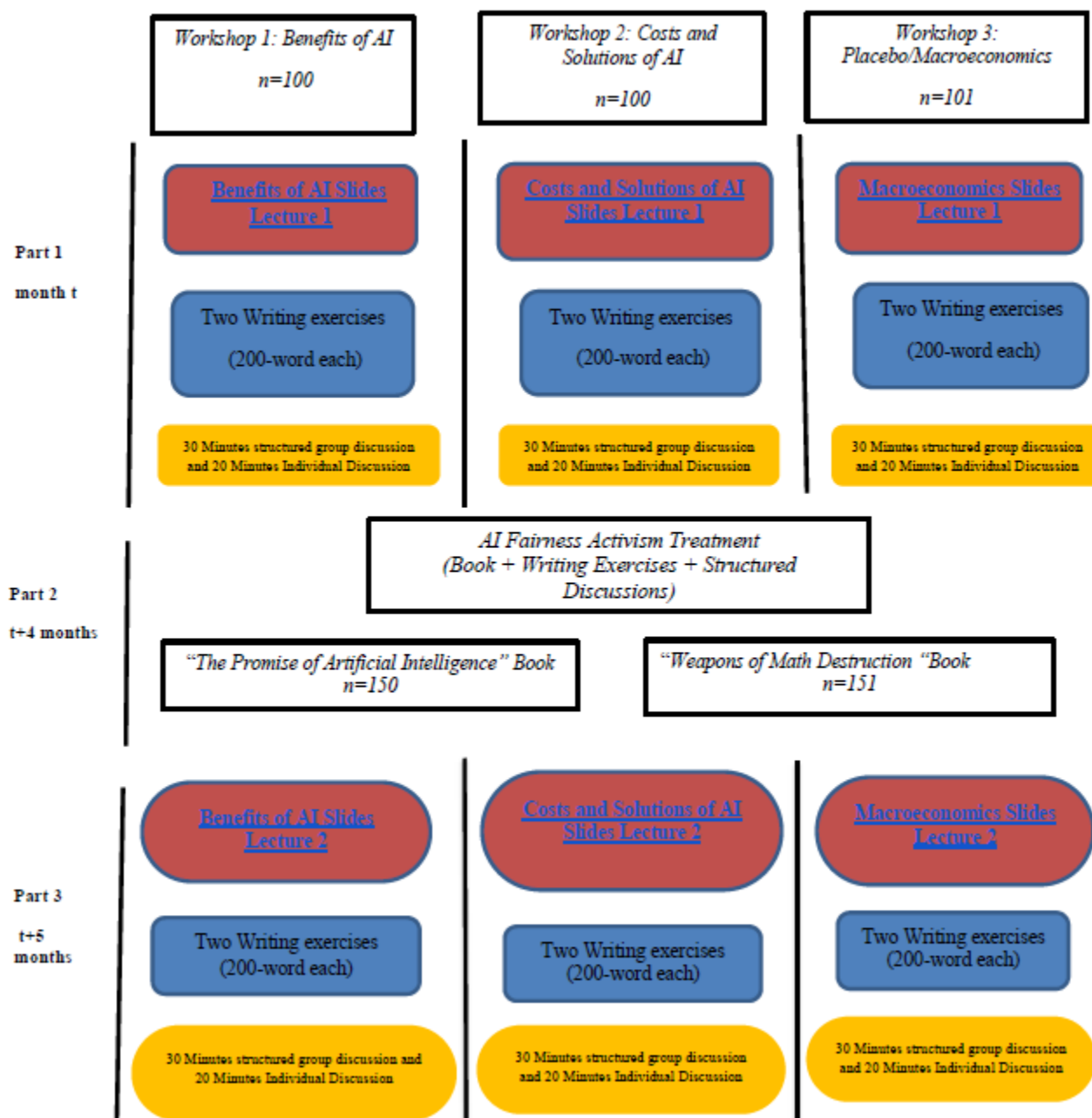
Note: The figure above displays a flow chart summarizing the experimental design. Month t is when the experiment began with the date anonymized to protect identity of the cohort. AI Fairness Activism treatment took place 4 months after the first lecture. The exact timeline of the experiment is as follows: at month *t* = Lecture 1 + Writing Exercises + Structured Discussions, *t+4* months AI Fairness Activism and Promise of AI Books + Writing Exercises + Structured Discussions, t+5 months Lecture 2 + Writing Exercises + Structured Discussions. For the complete slide deck of the lectures and details on the interventions, see Table A1 and Table A2.

Figure A2: Snapshot of Lectures

Panel A: One Slide from the Benefits of AI in the Lecture

The Promise of AI in Law

- Reduces Bias
- Increase Autonomy
- Enhance Learning
- Explainable Transparency
- Incorporate Private Information / Changed Circumstances
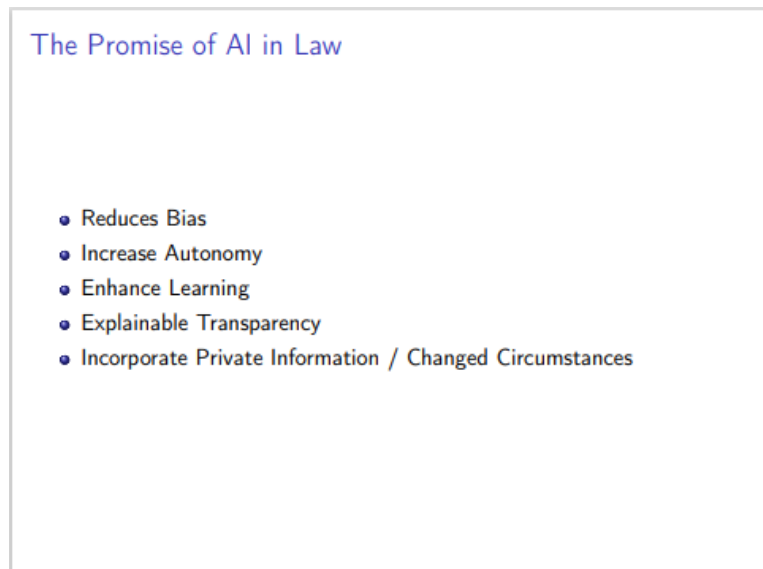
Panel B: One Slide from Costs and Solutions Lecture

Pitfalls we encountered

1. Wrong outcome variable (Jordan experiment):
   - We targeted *formal* employment, *1 month* after the intervention.
     ⇒ Little effect
   - It would have been better to target *all employment* at a *longer horizon*.
2. Wrong sample size / small effects:
   - If effects are too small, the algorithm can't adapt.
   - Benefits of adaptivity would have emerged later.
3. Wrong aggregation (refugee relocation):
   - Our simulations maximize *total employment*.
   - That led to a *decline* in employment for young non-English speakers.
   - The algorithm gave the best locations to those with the best prospects.

⇒ **CHOOSE THE OUTCOME THAT YOU ARE MAXIMIZING WISELY!**

Note: The figure above provides two summary slides from the artificial intelligence lectures on benefits and another from the costs & solutions workshop.

Table A1: Intervention Lectures' Details (links to slides)
Panel A: Slide decks of the Lectures

Intervention Workshop	Lecture Themes	Hyperlink to Slides
AI Education	Benefits of AI	Benefits of AI Slides Lecture 1 Benefits of AI Slides Lecture 2 Benefits of AI Slides (both merged)
	Costs and Solutions of AI	Costs and Solutions of AI Slides Lecture 1 Costs and Solutions of AI Slides Lecture 2 Costs of AI Slides (both merged)
Placebo	Macroeconomics	Macroeconomics Slides Lecture 1 Macroeconomics Slides Lecture 2 Macroeconomics Slides (both merged)

Panel B: Structured Discussions Post-Lectures

Each of the four training lectures were followed by two structured discussions. The first one was a 30-minute group discussion among all trainees, while the second discussion was a 20-minute individual discussion.

Group Discussion (see Figure B2 in Appendix B)

In the group discussion, the following structure was followed. After every lecture, 2 candidates from the workshop were randomly drawn to answer these two questions:

Candidate 1:

Q1. What do you think were the main messages of the lecture? Q2. How do you think you may apply lessons from today's lecture in your career? Give at least 3 examples.

Candidate 2:

Q1. What struck you most about today's lectures and why? Please be specific on what you think are the key takeaways of today's lectures. Q2. Can you give three examples on how the lessons of today's workshop could be applied in your official duties?

Individual Discussion (see Figure B3 in Appendix B)

In the individual one-on-one structured discussion that followed the group discussion, we asked each deputy minister the following two questions and then allowed them to lead the discussion:

Q1. What do you think about AI and its use for policy making? Q2. Is there any area or specific policy you may apply the lessons from the workshop in your policymaking?

Stopping rule: A first bell rang at exactly 15 minutes to signal the next policymaker is due in 5 minutes. The second bell rang to signal the conclusion of the individual discussion and arrival of the next deputy minister. The training institute kept time for this meticulously.

In case the two questions were answered and discussion concluded before the 20 minutes mark, we asked placebo questions: Q3. What are the key challenges you face in your policymaking?   Q4. What steps do you take to overcome these challenges?

Table A2. Intervention Details - Treatment Description

AI Education Workshop	Treatment Description	Treatment Details
Group 1: Workshop on Benefits of AI	In the first two lectures, the ministers received training focused on the utility or benefits of digitization in their department. This involved two lectures, one by Professor Alex Pentland from MIT and Professor Daniel Chen of Toulouse University. The lectures were for two hours each and included 30 minutes of structured discussion on questions raised in the respective lectures.	• All the participants in this group attended a workshop with lectures by two experts on AI on the benefits of AI. • After the treatment lectures, the ministers submitted another assignment summarizing the lessons of each lecture (that is the participants write two short essays of 200 words summarizing the two lectures). • Post workshop, all the participants filled out a survey questionnaire and answered vignette questions. • Post-lecture a one-on-one 20 minutes individual sessions prompting discussion exercises on benefits of AI. • We further cross-randomized the deputy ministers with 50% receiving book associate with the "Benefits of AI" i.e. "The promise of Artificial Intelligence: Reckoning and Judgment" by Brian Cantwell Smith and 50% of the ministers were randomly assigned "Weapons of Math Destruction" by Cathy O'Neil. The ministers also write a short 200 word summary of the randomly assigned book and engage in similar structured discussions.
Group 2: Workshop on Costs and Solutions of AI	The second two lectures, the ministers received training focused on potential dangers or costs of AI for policy. This involved two lectures, one by Professor Maximilian Kasy from Oxford University and Professor Daniel Chen from Toulouse University. The lectures were for two hours each and included 30 minutes of structured discussion on questions raised in the respective lectures.	• All the participants in this group attended a workshop with lectures by two experts on costs and solutions of AI for policy. • After the treatment lectures, the ministers submitted another assignment summarizing the lessons of each lecture (that is the participants write two short essays of 200 words searching summarizing the two lectures). • Post workshop, all the participants filled out a survey questionnaire and answered vignette questions. • Post-lecture a one-on-one 20 minutes individual sessions prompting discussion exercises on the costs and solutions to AI. • We further cross randomized the deputy ministers with 50% receiving book associate with the "Benefits of AI" i.e. "The promise of Artificial Intelligence: Reckoning and Judgment" by Brian Cantwell Smith and 50% of the ministers were randomly assigned "Weapons of Math Destruction" by Cathy O'Neil. The ministers also write a short 200 word summary of the randomly assigned book and engage in similar structured discussions.

Note: The table above provides details on our experiment, including description of the treatment and summary of the content of the workshops.

Table A3: Variable Description and Summary Statistics
Panel A: Variable Description

Variables	Description
Panel 1: Dependent Variables	
Support for AI	Response on 1-5 Likert scale for the following question: "I support use of AI for public policymaking."
Opposition for AI	Response on 1-5 Likert scale for the following question: "I oppose the use of AI technology for public policymaking"
AI Benefits on Net	Response on 1-5 Likert scale for the following question: "Do you think that the use of AI technology for policy is beneficial on net?";
AI Harms on Net	Response on 1-5 Likert scale for the following question: "Do you think that the use of AI technology for policy is harmful on net?"
Spending Allowance sent to Planning Ministry	Around each April of every year, before the federal budget for the next fiscal year is announced, the deputy ministers participate in a "spending assessment" where they write to the Federal Ministry of Planning the funding allowance for policies they want to focus on the following year. This funding is made after a "notification" by the ministry of planning and is binding on the planning ministry. The text of this annual notification can be found in Appendix B3. This variable is a dummy variable of this request that is made for a certain policy and zero otherwise.
Amount in Spending Requirement Allowance Request (PKR)	Around each April of every year, before the federal budget for the next fiscal year is announced, the deputy ministers participate in a "spending assessment" where they write to the Federal Ministry of Planning the funding allowance for policies they want to focus on the following year. This funding is made after a "notification" by the ministry of planning and is binding on the planning ministry. The text of this annual notification can be found in Appendix B, Figure B1.2. This variable is a continuous variable with an amount denominated in Pakistani Rupees.
Citizen Rating	This is a post-resolution rating on a scale of 1 to 5 (1 star to 5 star) by the citizen after the "closing" of the complaint. The source for this data is the Prime Minister's Performance Delivery Unit who gave access to the Prime Minister Citizen Portal. This data is matched with the CVs of public officials obtained from the Establishment Division of Government of Pakistan and administrative data on deputy ministers from the Institute.
Citizen Complaint Resolution Time	This is the total days the complaint is "opened" by the citizen and the final date when it "closes". The source for this data is also the Prime Minister's Performance Delivery Unit who gave access to the Prime Minister Citizen Portal. This data is matched with the CVs of public officials obtained from the Establishment Division of Government of Pakistan and administrative data on deputy ministers from the Institute.

Panel 2: Explanatory Variables

Gender	Dummy variable equals to 1 if Female and 0 if Male (self-identified as male or female)
Age	Age of the Deputy Minister in years
Years of Education	Years of education attained. The source is administrative data.
Birth Place	1 if belong to Federal, Punjab, or Sindh; 0 if belong to KPK, Balochistan, AJK, or GB. (information for deputy ministers)
Age	Age of subordinate in years
Pre-Treatment Modernization	Would you say that Pakistan's Civil Service needs to be modernized? [Likert Scale question 1-5 (same as the one for dependent variables)]
STEM Major	1 if Degree in Natural Sciences, Engineering, Medical ; 0 if Degree in Law, Humanities, or Social Sciences
District Chiefs (PAS)	1 if the occupation group is Pakistan Administrative Service (PAS), previously known as the District Management Group (DMG). It is a general management cadre of Pakistan's civil services. The officers of this cadre act as managers at district, provincial and finally at the policy-making levels in the highest echelons of the Federal bureaucracy; 0 otherwise
Police Chiefs (PSP)	1 if the occupation group is Police Service Pakistan (PSP). The PSP officer works as a superintendent police (SP), Deputy inspector general (DIG), IG and many others high ranked posts in Police department, government of Pakistan.; 0 otherwise
Federal Revenue Chiefs (FBR)	1 if the occupation group is the Federal Board of Revenue (FBR). The FBR officer works as Tax inspector; 0 otherwise
Diplomats (FSP)	1 if the occupation group is Foreign Service of Pakistan (FSP). It consists of civil servants who represent Pakistan at the international stage; 0 otherwise

Note: Panel 1 of this table provides the summary statistics for outcomes variables, while Panel 2 presents the descriptive statistics for baseline characteristics.

Panel B: Summary Statistics - Deputy Ministers

Variables	Observations	Mean	SD	Min	Max
Panel 1. Dependent Variables					
Support for AI	301	3.900	1.168	1	5
Opposition for AI	301	2.103	1.383	1	5
AI Benefits on Net	301	3.598	1.291	1	5
AI Harms on Net	301	2.429	1.341	1	5
Spending Allowance sent to Planning Ministry	301	0.608	0.489	0	1
Amount in Spending Requirement Allowance (PKR)	301	71698.67	302322.6	0	4500000
Citizen Rating	95	2.429	0.895	1	5
Citizen Complaint Resolution Days	95	65.029	44.058	1	208
Panel 2. Baseline Characteristics					
Gender	301	0.757	0.429	0	1
Age	301	46.053	4.370	35	59
Birth Place	301	0.405	0.492	0	1
Years of Education	301	16.714	1.626	14	21
Modernized	301	3.841	1.312	1	5
STEM Major	301	0.385	0.487	0	1
District Administration (PAS)	301	0.123	0.329	0	1
Law and Order (PSP)	301	0.116	0.321	0	1
Revenue Affairs (FBR)	301	0.113	0.317	0	1
Foreign Affairs (FSP)	301	0.150	0.357	0	1

Note: Panel 1 of this table provides the summary statistics for outcomes variables, while Panel 2 presents the descriptive statistics for baseline characteristics.

Panel C: Summary Statistics - Staff Officers - Subordinates

Variables	Observations	Mean	SD	Min	Max
Panel 1. Dependent Variables					
Support for AI	204	4.039	1.016	1	5
Opposition for AI	204	2.059	1.020	1	5
AI Benefits on Net	204	3.951	0.930	1	5
AI Harms on Net	204	2.289	1.027	1	5
Panel 2. Baseline Characteristics					
Gender	204	0.809	0.394	0	1
Age	204	43.294	4.411	35	55
Birth Place	204	0.480	0.501	0	1
Years of Education	204	15.784	1.355	14	21
Modernized	204	3.892	1.316	1	5
STEM Major	204	0.358	0.481	0	1
District Administration (PAS)	204	0.127	0.334	0	1
Law and Order (PSP)	204	0.123	0.329	0	1
Revenue Affairs (FBR)	204	0.108	0.311	0	1
Foreign Affairs (FSP)	204	0.123	0.329	0	1

Note: Panel A of this table provides description of all variables. Panel B provides the summary statistics for deputy ministers (301) and Panel C provides the corresponding descriptive statistics for their staff officers (204) used in this study.

Table A4: Prime Minister Citizen Portal

Panel A: The Pakistan Citizen Portal
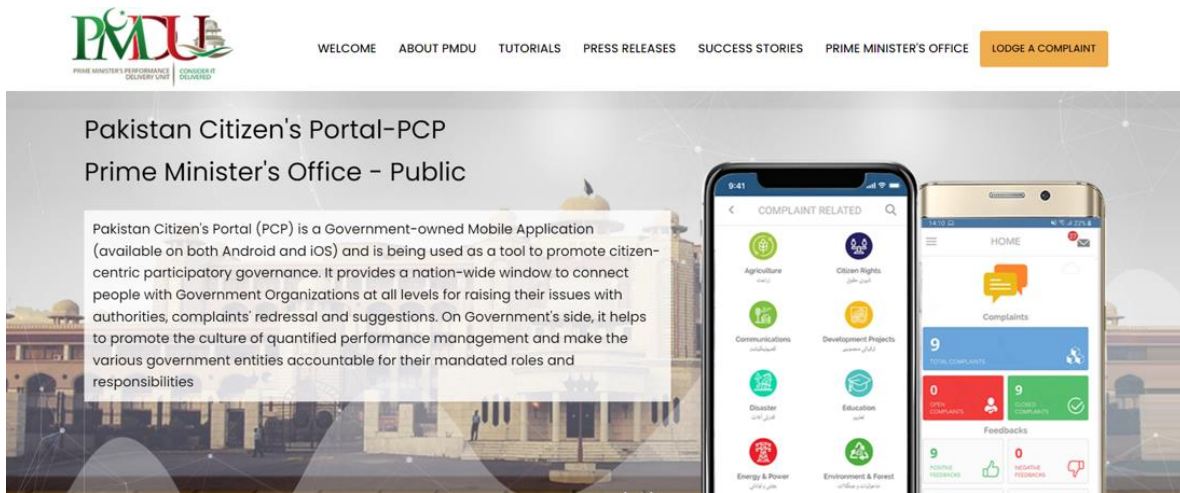
Panel B: Deputy Minister Dashboard with two-way communications between the Citizen and the Deputy Minister
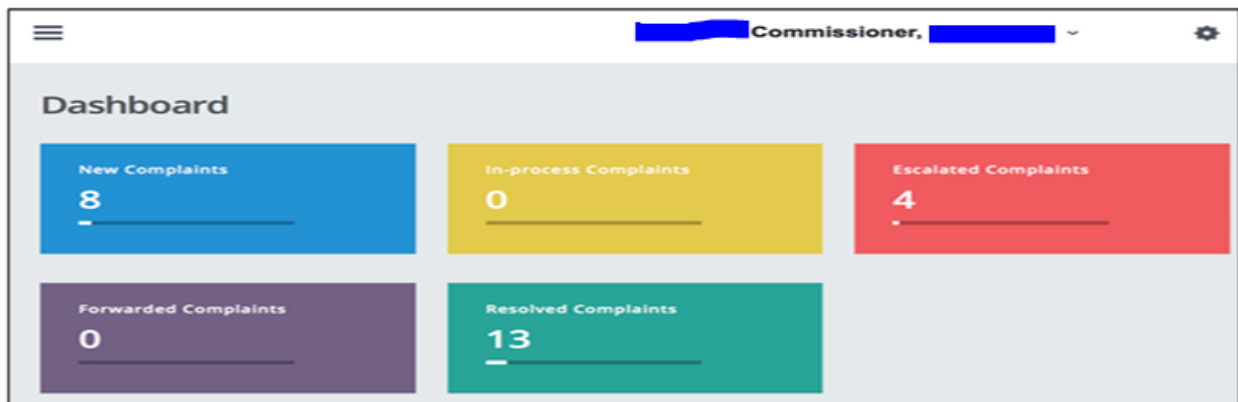
Note: Above are screen shots for the Prime Minister Citizen Portal and complaint dashboard of what the deputy minister sees on her online dashboard. For more details on the portal, please visit the PCP official website: https://citizenportal.gov.pk/

Table A5: Examples of Land and Placebo Schools & Road Construction Complaints

Verbatim reproduction of Land Complaints from the Citizen Portal:

Complaint 1. "To Prime Minister of Pakistan Respected Sir, I have one plot situated at Irrigation Cooperative Housing Society. Plot area is one kanal. I wrote too many application to society management please give me the possession of plot according to actual and approved map. I also visited society office too many times and meet with secretary and president of the society but they are not giving me the possession or even not issuing me the possession letter.In my poor opinion they are giving favour to someone else due to that they are disturbing my plot. I am requesting please help me to get the possession of my plot according to actual map."

Complaint 2. "My 6-0 M plot in Al Barket Town is occupied by Land Mafia by force. I have all legal documents which is attached with file .please release my land from land Mafia and take action by law against them .i will be very thankful for such remarkable action against these land mafia."

Complaint 3. "Sir, I had earlier made a complaint regarding encroachment in public street of mohallah Shahi Bagh near Wali Swat Banglaw. Deputy Commissioner Swat forwarded the complaint to AC and AC forwarded it to Tehsildar. The outcome was zero. No one visited the place nor the issue was investigated. So, finally it has been concluded that revenue staff under AC and DC is somehow involved in illegal land transfer. So, it is requested to look into the matter. Thank you"

Complaint 4."I am pakistani citizen working in UAE as a civil engineer. With my hard money I have purchased a resdential plot in sukh chain housing scheme. After 3 year of my purchase still there is no single facility(electricity,sewage ,water ,road) provided by the contractor/society administration. All residents are suffering with a lot of difficulties with children's due to unavailability of basic facilities. Hence we request to our prime minister kindly look into our case seriously and advise to concern authority to resolve our issue at earliest."

Verbatim reproduction of Road and School Construction Complaints from the Portal:

Complaint 1. "I regret to inform you for the 3rd time that Kohat Hangu road construction is still not completed and the timelines have exceeded already. vehicles are almost scrapped. The construction quality is also not good and the newly constructed road is tempered in different locations (never feels as if it was newly constructed). Kindly take notice and oblige."

Complaint 2. "We have an issue of road construction and sewerage of drainage. this road was surveyed in 2017 but still construction is not started. Sir please resolve our issue because pedestrian have many problems while walking trough this drain water"

Complaint 3. "Restpected Sir it is stated that there is a street in front of my house which is connecting 6 houses and there is need of proper concrete road there but contractor is under the effect of some powerful people here and he took their advice and started making road on a new route where is only a single house of that person. Kindly look into this matter."

Complaint 4. "It is stated that Our School GPS Loyal Dara was full damaged in Earth quake and was fallen by the Department in May 2017 for re-construction. Now in 2021 the school is not yet constructed. The students of the school are in a rent building but the building is not enough for them. They are sitting in open ground. 2nd this area is sensitive to security threats. This issue is discussed twice in the ""Kule Kachehri"" and other Departments but not yet solved. There fore kindly take a serious action on contractor to construct the concern school building so that the students may safe and continue their study."
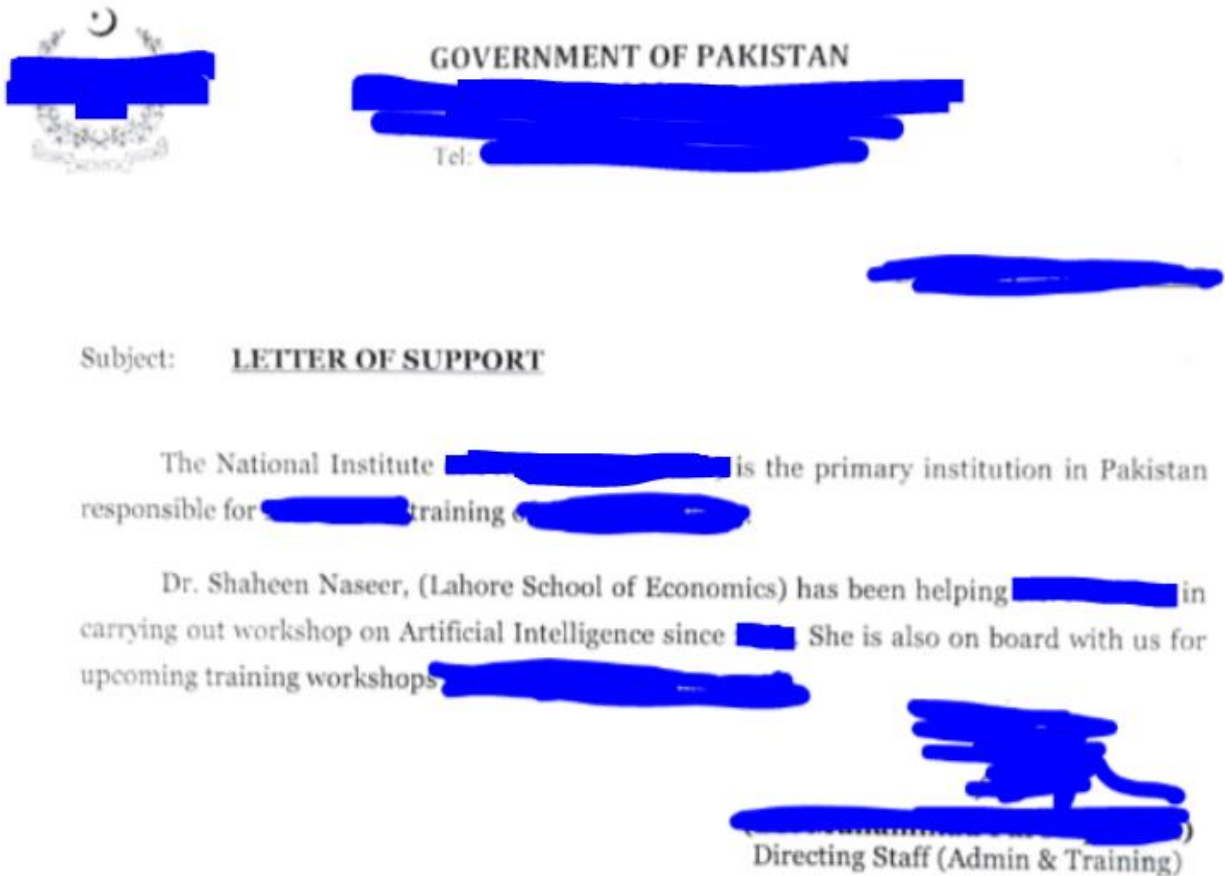
Table A6: Ethics of the Experiment

Ethical considerations are paramount, as the implications of AI adoption in governance are profound and multifaceted. While we secured approval from the Institutional Review Boards (IRB) of a local university in Pakistan, we acknowledge that ethical concerns may arise that are not fully encompassed by IRB oversight. In this discussion, we will address these broader ethical issues, guided by the principles outlined in Asiedu et al. (2021), to ensure a comprehensive evaluation of the ethical landscape surrounding our study on AI policy dynamics and state capacity.

- **Institutional Review Board (IRB) Approval**: The study received approval from both local and foreign IRBs, ensuring adherence to ethical standards and participant protection. This dual approval process reinforces the study's commitment to ethical research practices across different jurisdictions.
- **Policy Equipoise and Unintended Consequences**: To mitigate concerns about unintended consequences, we engaged with local policymakers and the training institute (National Institute of Public Policy) for elite bureaucrats to tailor the workshops to the specific context of Pakistan. This collaboration aimed to balance the potential benefits and risks, ensuring that the content was relevant and sensitive to the local policy environment.
- **Role of Researchers and Cultural Sensitivity**: The research team's local Pakistani scholars played a crucial role in ensuring cultural sensitivity. Their insights helped to design and implement the study in a manner that respects local customs and practices, thereby minimizing the risk of cultural insensitivity or ethical breaches.
- **Potential Harms to Participants or Nonparticipants**: The research team was vigilant in monitoring the workshops for any signs of harm to participants or nonparticipants. A response plan was in place to address any adverse effects promptly, ensuring the well-being of all involved. Direct feedback by directors and faculty at the training institute helped in this.
- **Financial and Reputational Conflicts of Interest**: The researchers' declaration of no financial or reputational conflicts of interest was actively managed by maintaining transparency throughout the study and by instituting checks and balances to prevent any potential bias from influencing the research outcomes.
- **Intellectual Freedom**: The research team's intellectual freedom was protected by establishing clear agreements with stakeholders that guaranteed the right to publish findings without censorship or undue influence, thus upholding the integrity of the research.
- **Feedback to Participants or Communities**: Feedback mechanisms were established to provide participants, including senior deputy ministers, with the study's results. Additionally, connections to support resources were facilitated, ensuring that participants had access to further information and assistance if required.

Appendix B: Additional Figures and Tables

Figure B1.1: Letter of Support from the Training Institute

GOVERNMENT OF PAKISTAN

Tel:

Subject: **LETTER OF SUPPORT**

The National Institute ▮▮▮▮▮▮▮▮ is the primary institution in Pakistan responsible for ▮▮▮▮ training ▮▮▮▮▮

Dr. Shaheen Naseer, (Lahore School of Economics) has been helping ▮▮▮▮▮ in carrying out workshop on Artificial Intelligence since ▮▮▮ She is also on board with us for upcoming training workshops▮▮▮▮▮▮▮▮

Directing Staff (Admin & Training)

Note: The information on this support letter is anonymized to protect the identity of the key stakeholder that ensured the training ran smoothly, however, the full letter, with exact institute name, site of training, the directors of training is available to the editor on request subject to signing a non-disclosure agreement.

Figure B1.2. Transcript of Notification from the Planning Ministry to Deputy Ministers

GOVERNMENT OF PAKISTAN

••••••••••

SUBJECT: NOTIFICATION

Dear Officers,

This notification requests your project funding requirements for inclusion in the next federal budget.

Please ensure that this is sent with your full name, occuptional group and BS Grade.

Copy to:

-
-
-
-
-
-
-

C.C

-
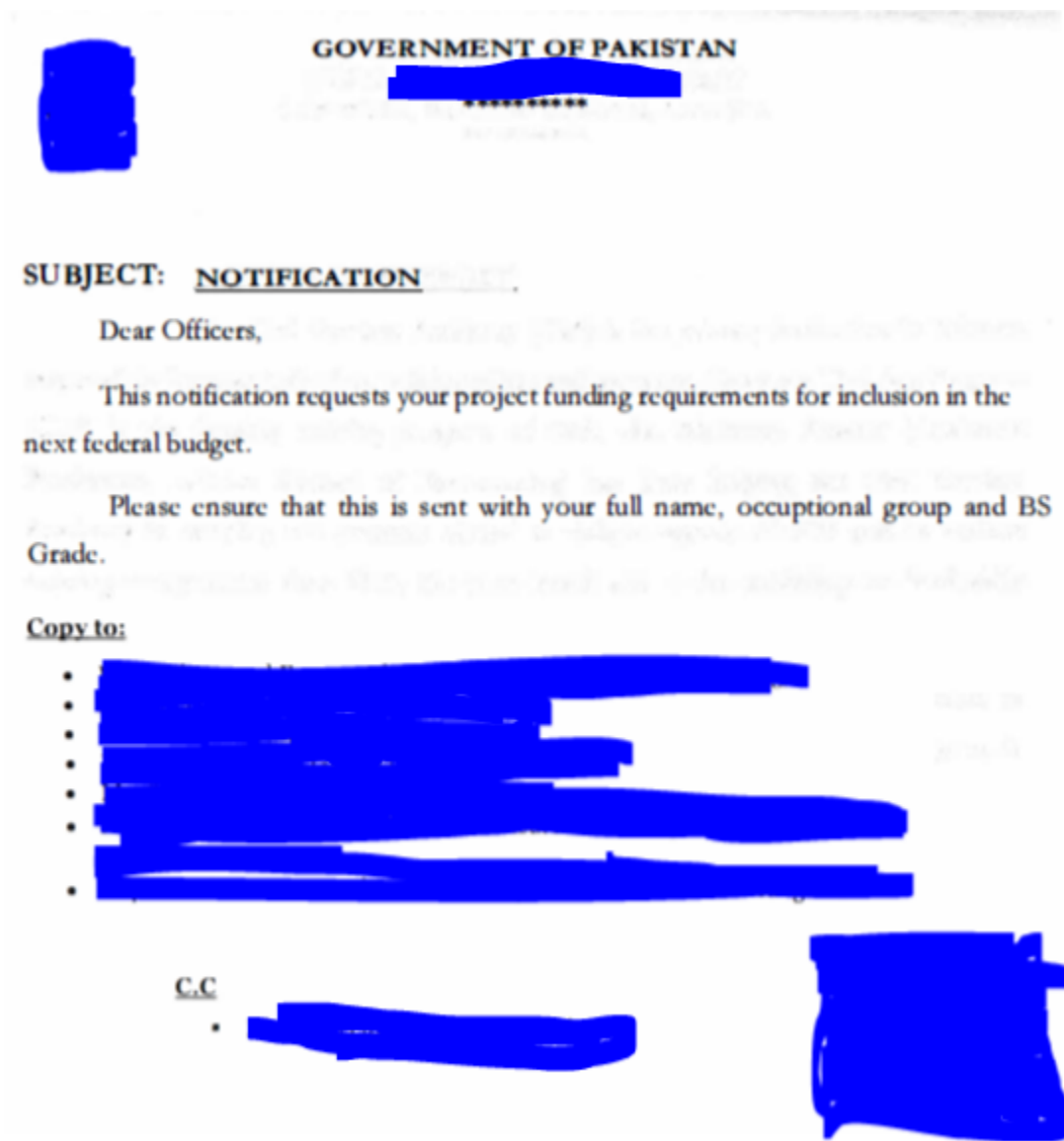
Note: The information on this support letter is anonymized to protect the identity of the senior minister (secretary) who issues this notification upon his/her request. This anonymized letter is shared with her/his consent.

Figure B2: Group structured discussion for 30 minutes

Note: The figure above was taken during the structured discussion where the following questions were asked in the group: What do you think were the main messages of the lecture? Q2. How do you think you may apply lessons from today's lecture in your career? Give at least 3 examples.

Figure B3: One-on-one individual structured discussion session

Note: The figure above was taken during the structured discussion where the following questions were asked from the officers: Q1. What do you think are the key benefits of AI? Please discuss in light of the assigned book you read. Q2. What do you think are the key challenges AI might pose? (the question order was randomized within the treatment arms)

Figure B4: Manual Land Ownership or Title Document vs System Generated Digitized Land Ownership Document

Note: Picture on the left shows a manual "fard" or property ownership document, while the picture on the right shows a system generated property ownership or title document following the land record digitization.

Figure B5: Ministers Assigned the "Benefits of AI" lectures (Pre vs Post Book Assignment)
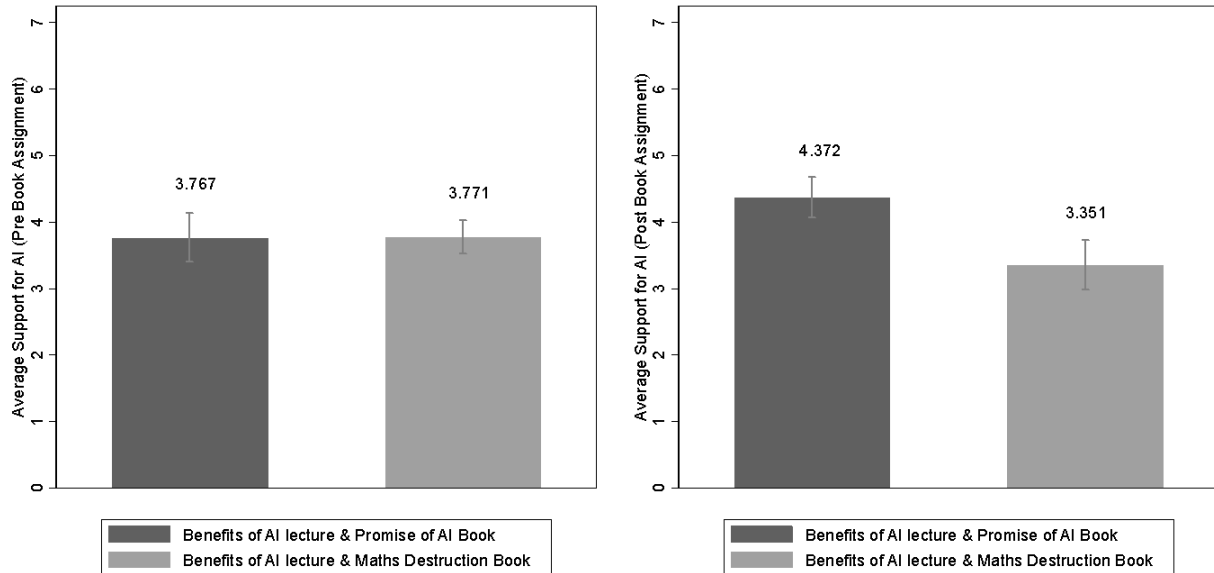
Note: The figure above shows ministers assigned the benefits of AI lectures divided into those who were assigned the "Promise of AI" book versus those that were assigned the "Weapons of Math Destruction" book. The bar charts on the left depict ministers' average support for AI before the allocation of the book but after the first lecture on the benefits of AI. The bar charts on the right show ministers' average support for AI post second lecture and book assignment. Support for AI is measured on a 1 to 5 point Likert scale. 95% Confidence Intervals are also reported.

Figure B6: Ministers Assigned the "Costs and Solutions of AI" lectures (Pre vs Post Book Assignment)

Note: The figure above shows ministers assigned the costs and solutions of AI lectures divided into those who were assigned the "Promise of AI" book versus those that were assigned the "Weapons of Math Destruction" book. The bar charts on the left depict ministers' average support for AI before the allocation of the book but after the first lecture on benefits of AI. The bar charts on the right show ministers' average support for AI post book assignment. Support for AI is measured on a 1 to 5 point Likert scale. 95% Confidence Intervals are also reported.
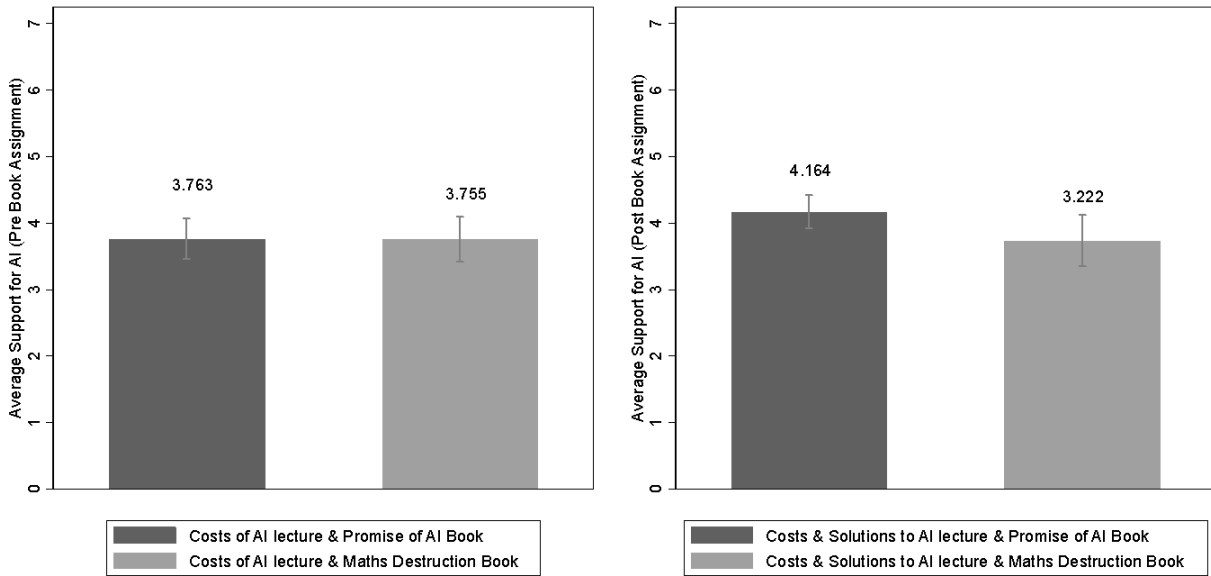
Figure B7: Ministers Assigned the "Macroeconomics lectures" (Pre vs Post Book Assignment)
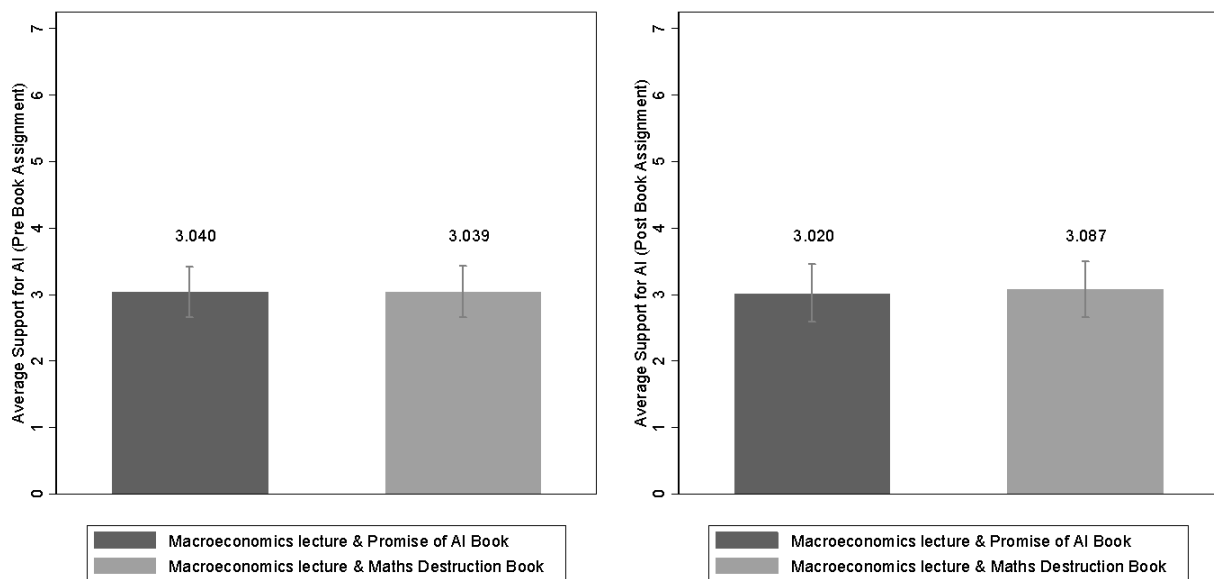
Note: The figure above shows ministers assigned the macroeconomics lectures divided into those who were assigned the "Promise of AI" book versus those that were assigned the "Weapons of Math Destruction" book. The bar charts on the left depict ministers' average support for AI before the allocation of the book but after the first lecture on the benefits of AI. The bar charts on the right show ministers' average support for AI post book assignment. Support for AI is measured on a 1 to 5 point Likert scale. 95% Confidence Intervals are also reported.

Table B1: Joint Orthogonality table with and without controls for AI Education and AI Fairness Activism

	Deputy Ministers		Subordinates	
	AI Education	AI Fairness Activism	AI Education	AI Fairness Activism
	(1)	(2)	(3)	(4)
Gender	-0.0843	0.0148	-0.0204	-0.0441
	(0.0650)	(0.0689)	(0.0883)	(0.0929)
Year of Education	-0.00972	0.0356**	-0.0141	0.0240
	(0.0170)	(0.0181)	(0.0250)	(0.0264)
Age	-0.000285	0.000204	-0.000717	0.0224***
	(0.00636)	(0.00675)	(0.00759)	(0.00798)
Birth Place	-0.0568	0.0445	-0.0625	-0.0330
	(0.0565)	(0.0599)	(0.0682)	(0.0717)
Pre-Treatment Modernization Needed	-0.00634	0.0128	-0.00870	0.0246
	(0.0214)	(0.0227)	(0.0263)	(0.0276)
STEM Major	-0.0389	0.0339	-0.0838	-0.00182
	(0.0575)	(0.0610)	(0.0703)	(0.0740)
District Administration (PAS)	-0.0864	-0.0322	-0.0121	-0.127
	(0.0880)	(0.0934)	(0.105)	(0.110)
Law and Order (PSP)	0.0141	-0.0610	0.161	-0.193*
	(0.0900)	(0.0955)	(0.106)	(0.112)
Revenue Affairs (FBR)	-0.0192	-0.00170	-0.0806	-0.0598
	(0.0919)	(0.0975)	(0.113)	(0.119)
Foreign Affairs (FSP)	0.104	-0.0118	0.154	-0.0120
	(0.0816)	(0.0866)	(0.105)	(0.111)
Observations	301	301	204	204
R-squared	0.023	0.019	0.038	0.067
F Statistics (Joint Significance)	0.680	0.570	0.770	1.390

Note: Robust standard errors appear in brackets. The dependent variable in Columns 1 and 3 is *AI Education,* the treatment dummy variable that takes the value of one when the deputy minister is randomly assigned to the AI education workshop. In Columns 2 and 4, the dependent variables is *AI Fairness Activism* the treatment dummy variable that takes the value of one when the individual is cross-randomized within each treatment arm to read and summarize "Weapons of Math Destruction" book by Cathy O'Neil and zero if assigned the "The promise of artificial intelligence: Reckoning and judgment" book by Brian Cantwell Smith. The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table B2: Testing for Differential Attrition

	Attrition			
	Attrition of Subordinates Data		Attrition of PCP Data	
	(1)	(2)	(3)	(4)
Panel A: *AI Education*				
AI Education	-0.0365	-0.0570	0.0912	0.0856
	(0.0577)	(0.0556)	(0.0580)	(0.0588)
Controls	No	Yes	No	Yes
Observations	301	301	301	301
R-squared	0.001	0.112	0.009	0.054
Mean Dep. Variable	0.322	0.322	0.684	0.684
Panel B: *AI Fairness Activism*				
AI Fairness Activism	0.0491	0.0500	0.0570	0.0574
	(0.0540)	(0.0536)	(0.0537)	(0.0555)
Controls	No	Yes	No	Yes
Observations	301	301	301	301
R-squared	0.003	0.112	0.004	0.055
Mean Dep. Variable	0.322	0.322	0.684	0.684

Note: Robust standard errors appear in brackets. The dependent variable is a dummy that switches on if the subordinate had not picked up the survey phone call or did not provide the consent to participate in the study. The *AI Education* is a dummy variable that takes the value of one when the deputy minister is randomly assigned to an AI education workshop. *AI Fairness Activism* is a dummy variable that takes the value of one when the individual is cross-randomized within each treatment arm to read and summarize "Weapons of Math Destruction" book by Cathy O'Neil and zero if assigned the "The promise of artificial intelligence: Reckoning and judgment" book by Brian Cantwell Smith. The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table B3: Impact of AI Education on Ministers' and Subordinates' support for AI and digitization Funding *by Training Components*

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net	Digitization Funding Request to Planning Ministry	Digitization Amount in the Funding Request (PKR)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Deputy Ministers						
Benefits AI	0.338**	-0.283	0.388**	-0.322*	0.133*	60,783
	(0.166)	(0.182)	(0.182)	(0.190)	(0.0682)	(51,319)
Costs & Solutions AI	0.272*	-0.145	0.318*	-0.0693	0.139**	78,328***
	(0.164)	(0.199)	(0.177)	(0.191)	(0.0679)	(27,373)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301
R-squared	0.059	0.048	0.082	0.031	0.078	0.054
Mean Dep. Variable	3.900	2.103	3.598	2.429	0.608	71698.67
Panel B: Subordinates						
Benefits AI	0.365**	-0.366**	0.365**	-0.318*	-	-
	(0.169)	(0.173)	(0.178)	(0.177)	-	-
Costs & Solutions AI	0.356*	-0.401**	0.309**	-0.386*		
	(0.184)	(0.195)	(0.153)	(0.197)		
Controls	Yes	Yes	Yes	Yes	-	-
Observations	204	204	204	204	-	-
R-squared	0.132	0.093	0.077	0.090	-	-
Mean Dep. Variable	4.039	2.059	3.951	2.289	-	-

Note: Robust standard errors appear in brackets. The dependent variables report survey responses of deputy ministers in Panel A and their subordinates (chief of staff or "staff officers") in Panel B. The survey instrument is as follows: "I support use of AI for public policymaking."; "I oppose the use of AI technology for public policymaking"; "Do you think that the use of AI technology for policy is beneficial on net?"; "Do you think that the the use of AI technology for policy is harmful on the net?". The *Benefits of AI* is a dummy variable that takes the value of one when the individual is randomly assigned to take a lecture on the benefits of AI by world renowned specialists of AI. The *Costs & Solutions of AI* is a dummy variable that takes the value of one when the individual is randomly assigned to take a lecture on the Costs of AI by world renowned specialists of AI. The controls include all available individual level characteristics: age, years of education, dummies for STEM major, gender, and government department the deputy minister serves in and a pretreatment dummy for whether the bureaucracy should be modernized. *** p<0.01, ** p<0.05, * p<0.1.

Table B4: Impact Ministers' perception on Relationship between Digitization and AI

	Purpose of Digitization in Government?		Relevance of AI and Digitization in Government?	
	(1)	(2)	(3)	(4)
Panel A: AI Education				
AI Education	0.0783*	0.0812*	0.279*	0.270*
	(0.0425)	(0.0436)	(0.160)	(0.161)
Controls	No	Yes	No	Yes
Observations	301	301	301	301
R-squared	0.013	0.039	0.011	0.034
Mean Dep. Variable	0.884	0.884	4.037	4.037
Panel B: AI Fairness Activism				
AI Fairness Activism	-0.0753**	-0.0758*	-0.288*	-0.283*
	(0.0381)	(0.0399)	(0.148)	(0.151)
Controls	No	Yes	No	Yes
Observations	301	301	301	301
R-squared	0.020	0.041	0.013	0.036
Mean Dep. Variable	0.884	0.884	4.037	4.037

Note: Robust standard errors appear in brackets. The dependent variable in Columns 1 and 2 is a dummy variable that switches on if the deputy minister writes that digitization projects facilitate implementation of AI in policy to an open-ended question: "What is the purpose of recent digitization efforts in Pakistani government departments?". The dependent variable in Columns 3 and 4 is constructed based on a rating on a scale of 1 to 5 to the question "How related are AI and digitization efforts in government departments?" (With one being not relevant at all, and 5 being very relevant). In the open-ended question, 85.7% of ministers indicated digitization efforts in government are introduced because it will facilitate the implementation of AI policies in the future (while 15% indicated some version of "to increase efficiency and citizen satisfaction" without any references to AI. 221 out of 301 ministers considered digitization and AI to be "related" (65 ministers) or "very related" (156 ministers). For more details, see Appendix C2.1.2. The controls and main variables of interest are identical to other tables. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table B5: Impact of AI Fairness Activism - Vertical vs Horizontal Transmission

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net
	(1)	(2)	(3)	(4)
AI Fairness Activism X *Diff in Experience*	0.0316*	-0.0201	-0.000869	-0.0159
	(0.0162)	(0.0174)	(0.0166)	(0.0173)
AI Fairness Activism X *Same Gender*	0.0438	0.544	0.297	0.677*
	(0.366)	(0.341)	(0.314)	(0.406)
AI Fairness Activism X *Same Birthplace District*	-0.286	-0.179	0.199	-0.167
	(0.283)	(0.291)	(0.262)	(0.297)
AI Fairness Activism X *Years of Experience*	0.0361	-0.0661	0.00177	-0.0131
	(0.0542)	(0.0602)	(0.0478)	(0.0509)
AI Fairness Activism	-0.903	0.976	-0.556	-0.287
	(0.886)	(0.810)	(0.798)	(0.901)
Difference in Experience	0.0117	-0.00807	0.0211	-0.0143
	(0.0120)	(0.0113)	(0.0128)	(0.0122)
Same Gender	0.0660	-0.123	-0.229	-0.819***
	(0.282)	(0.252)	(0.209)	(0.298)
Same Birthplace District	0.428**	-0.0904	0.186	0.111
	(0.189)	(0.163)	(0.178)	(0.214)
Years of Experience	-0.00290	0.0423	-0.00648	0.00204
	(0.0456)	(0.0514)	(0.0414)	(0.0419)
Controls	Yes	Yes	Yes	Yes
Observations	204	204	204	204
R-squared	0.191	0.145	0.159	0.146

Note: Robust standard errors appear in brackets. The dependent variables report survey responses of deputy ministers in Panel A and their subordinates (chief of staff or "staff officers") in Panel B. The survey instrument is as follows: "I support use of AI for public policymaking."; "I oppose use of AI technology for public policymaking"; "Do you think use of AI technology for policy is beneficial on net?"; "Do you think that the use of AI technology for policy is harmful on net?". The *AI Education* is a dummy variable that takes the value of one when the deputy minister is randomly assigned to an AI education workshop. *AI Fairness Activism* is a dummy variable that takes the value of one when the individual is randomly assigned to read "Weapons of Math Destruction" book Cathy O'Neil and zero if assigned the "The promise of artificial intelligence: Reckoning and judgment" book by Brian Cantwell Smith.*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table B6: Exploration of Transmission Mechanisms - Vertical vs Horizontal Transmission - *Without Controls*

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net
	(1)	(2)	(3)	(4)
AI Education X *Diff in Experience*	0.125***	-0.00202	0.0201	-0.0644*
	(0.0417)	(0.0369)	(0.0399)	(0.0382)
AI Education X Same *Gender*	-0.233	-0.215	0.149	-0.237
	(0.459)	(0.323)	(0.374)	(0.475)
AI Education X *Birthplace District*	-0.276	0.328	-0.267	0.502
	(0.320)	(0.331)	(0.288)	(0.326)
AI Education X *Years of Experience*	0.0564	0.0380	-0.0821**	0.0140
	(0.0464)	(0.0486)	(0.0410)	(0.0541)
AI Education	-1.342*	-0.406	0.738	0.190
	(0.794)	(0.725)	(0.863)	(0.911)
Difference in years of Experience	-0.0674*	-0.0160	0.00390	0.0332
	(0.0396)	(0.0349)	(0.0358)	(0.0354)
Same Gender	0.297	0.408	-0.233	-0.263
	(0.422)	(0.249)	(0.333)	(0.425)
Same Birthplace District	0.454	-0.379	0.404	-0.322
	(0.285)	(0.286)	(0.253)	(0.280)
Years of Experience	-0.0210	-0.0197	0.0376	-0.0119
	(0.0395)	(0.0334)	(0.0302)	(0.0466)
Controls	No	No	No	No
Observations	204	204	204	204
R-squared	0.164	0.068	0.130	0.123

Note: Robust standard errors appear in brackets (clustered at the individual level). The dependent variables report survey responses of deputy ministers in Panel A and their subordinates (chief of staff or "staff officers") in Panel B. The survey instrument is as follows: "I support use of AI for public policymaking."; "I oppose use of AI technology for public policymaking"; "Do you think that the use of AI technology for policy is beneficial on net?"; "Do you think that the use of AI technology for policy is harmful on net?". The *AI Education* is a dummy variable that takes the value of one when the deputy minister is randomly assigned to an AI education workshop. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table B7: Fraction of More intensely Treated Group does not have a differential effect -
Assessing Spillovers

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net	Petition to Planning Ministry	Amount in Petition (PKR)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Deputy Ministers						
AI Education X Fraction Treated	-3.009	0.0594	-4.795*	0.371	0.947	-454,183
Within Occupational Group	(2.682)	(3.174)	(2.847)	(3.103)	(1.085)	(977,825)
AI Education	2.291	-0.265	3.519*	-0.452	-0.490	368,265
	(1.794)	(2.095)	(1.889)	(2.046)	(0.718)	(673,911)
Fraction Treated Within Occupational Group	1.689	7.356	2.218	6.948	0.152	935,508
	(3.705)	(4.565)	(4.055)	(4.341)	(1.610)	(702,181)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301
R-squared	0.063	0.057	0.090	0.036	0.081	0.057
Panel B: Subordinates						
AI Education X Fraction Treated	-1.042	-2.891	-1.102	0.874	-	-
Within Occupational Group	(3.033)	(3.773)	(2.834)	(3.232)	-	-
AI Education	1.052	1.521	1.087	-0.926	-	-
	(2.013)	(2.479)	(1.885)	(2.113)	-	-
Fraction Treated Within Occupational Group	-1.647	7.322*	-1.246	-2.179	-	-
	(4.270)	(4.287)	(4.005)	(4.355)	-	-
Controls	Yes	Yes	Yes	Yes	-	-
Observations	204	204	204	204	-	-
R-squared	0.126	0.085	0.080	0.089	-	-

Note: Robust standard errors appear in brackets. The dependent variables in columns 1-5 report the responses of officers on 1-5 likert scale for the following questions: "I support use of AI for public policymaking."; "I oppose the use of AI technology for public policymaking"; and "Do you think that the use of AI technology for policy is beneficial on net?"; "Do you that the think use of AI technology for policy is harmful on net?". The dependent variable in column 5 reports the dummy variable that switches one if the officer, on behalf of his/her department, puts forward a request for funds to the Planning Ministry (signed with your name) recommending use of digitization in their department. The dependent variable in column 6 reports the amount of funds in PKR the officers requested from the Ministry of Planning for the fiscal year to introduce digitization in their department. The *AI Education* is a dummy variable that takes the value of one when the individual is either randomly assigned to take a lecture on the benefits of AI by world renowned specialists of AI or to take a lecture on the Costs of AI by world renowned specialists of AI. The controls include all available individual level characteristics: Age, Gender, Years of Education, Birth Place, Pre-Treatment Modernized, STEM Major, and occupational group dummies (District Chiefs (PAS), Police Chiefs (PSP), Tax Chiefs (FBR), Diplomats (FSP)). *** p<0.01, ** p<0.05, * p<0.1.

Table B8: Randomization Inference

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net	Petition to Planning Ministry	Amount in Petition (PKR)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Officers						
AI Education	0.305	-0.214	0.353	-0.195	0.136	69,560
	(0.035)**	(0.179)	(0.025)**	(0.222)	(0.021)**	(0.042)**
	{0.040}**	{0.213}	{0.018}**	{0.229}	{0.028}**	{0.031}**
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301
R-squared	0.059	0.046	0.081	0.025	0.078	0.055
Panel B: Subordinates						
AI Education	0.369	-0.382	0.351	-0.347	-	-
	(0.021)**	(0.024)**	(0.018)**	(0.042)**	-	-
	{0.062}*	{0.050}**	(0.046)**	{0.072}*	-	-
Controls	Yes	Yes	Yes	Yes	-	-
Observations	204	204	204	204	-	-
R-squared	0.124	0.077	0.080	0.090	-	-

Note: Robust standard errors appear in brackets. The dependent variables in columns 1-5 report the responses of officers on 1-5 likert scale for the following questions: "I support use of AI for public policymaking."; "I oppose the use of AI technology for public policymaking"; and "Do you think that the use of AI technology for policy is beneficial on net?"; "Do you think that the use of AI technology for policy is harmful on net?". The dependent variable in column 5 reports the dummy variable that switches one if the officer, on behalf of his/her department, puts forward a request for funds to the Planning Ministry (signed with your name) recommending use of digitization in their department. The dependent variable in column 6 reports the amount of funds in PKR the officers requested from the Ministry of Planning for the fiscal year to introduce digitization in their department. The *AI Education* is a dummy variable that takes the value of one when the individual is either randomly assigned to take a lecture on the benefits of AI by world renowned specialists of AI or to take a lecture on the Costs of AI by world renowned specialists of AI. The controls include all available individual level characteristics: Gender, Years of Experience, Years of Education, Birth Place, Pre-Treatment Modernized, STEM Major, and occupational group dummies (District Chiefs (PAS), Police Chiefs (PSP), Tax Chiefs (FBR), Diplomats (FSP)). *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table B9: Multiple Hypothesis Testing

	Support for AI	Opposition for AI	AI Benefits on Net	AI Harms on Net	Petition to Planning Ministry	Amount in Petition (PKR)
	(1)	(2)	(3)	(4)	(5)	(6)
AI Education	0.305	-0.214	0.353	-0.195	0.136	69,560
Standard p-values	(0.035)**	(0.179)	(0.025)**	(0.222)	(0.021)**	(0.042)**
Sharpened q-values	{0.068}*	{0.078}*	{0.068}*	{0.080}*	{0.068}*	{0.068}*
FWER p-values	[0.096]*	[0.135]	[0.077]*	[0.135]	[0.074]*	[0.106]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301
R-squared	0.059	0.046	0.081	0.025	0.078	0.055

Note: Robust standard errors appear in brackets. The dependent variables in columns 1-5 report the responses of officers on 1-5 likert scale for the following questions: "I support use of AI for public policymaking."; "I oppose the use of AI technology for public policymaking"; and "Do you think that the use of AI technology for policy is beneficial on net?"; "Do you think that the use of AI technology for policy is harmful on net?". The dependent variable in column 5 reports the dummy variable that switches one if the officer, on behalf of his/her department, puts forward a request for funds to the Planning Ministry (signed with your name) recommending use of digitization in their department. The dependent variable in column 6 reports the amount of funds in PKR the officers requested from the Ministry of Planning for the fiscal year to introduce digitization in their department. The *AI Education* is a dummy variable that takes the value of one when the individual is either randomly assigned to take a lecture on the benefits of AI by world renowned specialists of AI or to take a lecture on the Costs of AI by world renowned specialists of AI. The controls include all available individual level characteristics: Age, Gender, Years of Education, Birth Place, Pre-Treatment Modernized, STEM Major, and occupational group dummies (District Chiefs (PAS), Police Chiefs (PSP), Tax Chiefs (FBR), Diplomats (FSP)). *** p<0.01, ** p<0.05, * p<0.1.

Appendix C: Data Appendix: Surveys and Vignettes

Information on Surveys and Vignettes available at this link