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An Experimental Evaluation of Deferred Acceptance: Evidence from Over 100 Army Officer Labor Markets

Jonathan M.V. Davis
Kyle Greenberg
Damon Jones

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MIT Department of Economics
77 Massachusetts Avenue, Bldg. E53-390
Cambridge, MA 02139

National Bureau of Economic Research
1050 Massachusetts Avenue, 3rd Floor
Cambridge, MA 02138

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Jonathan M.V. Davis *University of Oregon*
Kyle Greenberg *West Point*
Damon Jones *University of Chicago*

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Abstract

Internal labor markets are increasingly important for matching workers to jobs within organizations. We present evidence from a randomized trial that compares matching workers to jobs using the deferred acceptance (DA) algorithm to the traditional manager-directed matching process. Our setting is the U.S. Army's internal labor market, which matches over 14,000 officers to units annually. We find that DA reduces administrative burden and increases match quality as measured by reduced justified envy, increased truthful preference reporting, and officers' and units' preferences over their matches. The overall impact of DA on officer retention and performance in the two years after officers started their new jobs is limited by strategic preference coordination between officers and units. However, DA leads to significant improvements in officer retention and promotions in markets with inexperienced managers. Our findings suggest that cross-market communication between agents in internal labor markets can attenuate the benefits of strategyproof matching algorithms.

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1 Introduction

While the importance of worker to firm matching is a key question in organizational and labor economics, the analogous process of matching workers to jobs within the firm has received much less attention (Baker and Holmstrom, 1995). Research has shown that this internal worker to job matching can influence productivity and career progression (Coraggio et al., 2022; Minni, 2023). Internal labor markets feature prominently in many organizations, including Google, Walmart, the State Department, the World Bank, and the IMF (Cowgill et al., 2024) and are likely to become increasingly important as firm size continues to grow (Kwon et al., 2024). Matching workers to jobs within these markets has typically been implemented by managers or HR professionals but has increasingly involved the use of assignment algorithms. The deferred acceptance (DA) algorithm has emerged as one of the most common market design tools because of its strategic simplicity for market participants and because of its well-regarded use in the re-design of the National Resident Matching Program, or NRMP (Roth and Peranson, 1999; Roth, 2008). Despite the popularity of DA, there is no theoretical guarantee that it will produce the optimal assignment: workers may not know where their skills are most needed and managers may try to hoard talent (Cowgill et al., 2024). An organization might better achieve its objectives by dictating matches.

It is therefore important to empirically assess the effects of the DA algorithm. Our goal is to estimate both the immediate and longer-term effects of DA, as well as identify contexts where DA's benefits are most pronounced or limited. Estimating the causal effects of matching workers to jobs with DA is complicated by the fact that it is a market-level intervention. A credible empirical analysis requires many treatment markets that use DA and suitable control markets. Most studies feature a single market switching to DA from another mechanism. Moreover, the analysis requires data on match quality and organizational objectives that can be measured after workers start their new jobs, while many studies only analyze the initial matches and not subsequent outcomes.

We overcome these challenges by running a randomized controlled trial set within the United States Army's internal market of officers and units. Officers and potential positions at units are segmented into 115 disjoint markets based on their rank and military occupation. We randomly assigned a subset of markets to a treatment group where officers and units were matched using an officer-proposing DA algorithm, subject to the review of and possible adjustment by human resources professionals, or "career managers," who

oversee the matching process. The remaining markets were assigned to a control group where officers and units were matched according to the Army's traditional process, which involves a career manager manually making match decisions using officer and unit preferences, without the aid of any specific algorithm. We pair this randomization *at the market level* with rich data on officer and unit preferences, surveys on strategic preference reporting and match satisfaction, details on the HR career managers, and longitudinal data on officers' retention, performance evaluations, and promotions.

We find that matching with DA provides clear benefits to both agents and the organization. DA reduces the incidence of justified envy—cases where a unit and an officer are matched even though another officer both ranked the job higher and was ranked higher by the unit. DA increases truthful preference reporting and leads to better quality matches to the extent that officers' and units' submitted preferences are correlated with their true preferences. DA also substantially reduces the administrative burden of matching workers to jobs: career managers in DA markets made 0.49 fewer match changes per officer than managers in control markets, a statistically significant 35 percent reduction relative to the control group mean of 1.38 match changes per officer ($p < 0.001$).

However, the impact of DA on officer retention and performance is more mixed. Matching with DA reduces attrition in the first post-match year by a statistically significant 1.1 percentage points (pp), a 16.7 percent reduction relative to the control group's attrition rate ($p = 0.03$). However, by two years out, matching with DA only reduces attrition by a statistically insignificant 0.3 pp. Matching with DA has precise zero effects on the probability that an officer receives the highest possible performance evaluation, with confidence intervals ranging from a 2.2 pp reduction up to a 1.0 pp increase in the first year and from a 3.2 pp reduction up to a 1.2 pp increase in the second year. We find similarly precise zero effects on the likelihood that an officer is promoted to the next rank and on officers' promotion board percentile ranking relative to other officers considered for promotion.

Beyond average treatment effects, we find significant heterogeneity in the effects of DA depending on the career manager's experience. Part of the appeal of algorithmic matching, as compared to administrator-directed matching, is its scalability and robustness to heterogeneity and biases found in human decision-making (Ludwig and Mullainathan, 2021). Given the extensive literature documenting returns to experience (e.g. Mincer, 1958; Becker, 1994; Heckman et al., 2003; Bandiera et al., 2020; Best et al., 2023), we might expect DA to be particularly effective when the counterfactual involves being matched by an in-

experienced career manager. Indeed, the data support this hypothesis. Among officers in markets with inexperienced career managers, matching with DA increases retention in the first post-match year by 1.9 pp ($p = 0.001$), increases the likelihood of promotion by 2.9 pp ($p = 0.035$), and increases promotion board percentile rankings by 2.2 percentiles ($p = 0.030$). DA also lowers the administrative burden of inexperienced managers, allowing them to finalize matches 6.5 days faster. These estimates are statistically distinguishable from their corresponding estimates of the effect of matching with DA among markets managed by experienced career managers, both in the case of officer outcomes ($p < 0.05$) and administrative burden ($p = 0.003$).

While DA is particularly effective in certain cases, the average effect of DA on officers' long-term retention and performance is attenuated in our setting because DA and career manager-directed matching yield many of the same matches. This could be because officers and units strategically coordinate to guarantee a particular match, regardless of the matching mechanism. Leveraging a unique feature of our setting—identical jobs at the same unit—we present evidence that officers and units engage in such coordination, rather than simply reporting their "true" ranking. In this case, the benefits of DA will be compromised—a phenomenon referred to as "stage 4 unraveling" (Roth and Xing, 1994). To demonstrate the implications of this unraveling, we measure heterogeneity in DA's effects along a proxy for coordination costs: a market-level measure of unit participation in matching. Consistent with coordination limiting DA's impact, we find that DA is more effective when communication and coordination costs are higher. In markets with higher coordination costs, DA leads to more truthful preference reporting, greater retention two years after officers start their new jobs, and higher promotion board rankings.

Our study makes several contributions to the fields of organizational and personnel economics and market design. First, it provides the first causal evidence on the impact of internal worker-to-job matching using DA through a novel experimental design. Existing studies often rely on time series comparisons within a single market (Niederle and Roth, 2003b), cross-sectional comparisons between markets (Niederle and Roth, 2003a), and difference-in-differences methods (Davis, 2024). Our randomization of matching mechanisms *at the market level* addresses a key gap in this literature, providing a framework for future research on recruitment and assignment in real-world organizational settings.[1]

[1]Of note is the work of Khan et al. (2019), who randomize groups of property tax inspectors in a one-sided market to a treatment group that matches inspectors to job locations by a performance-ranked serial dictatorship or to a control group where matches are determined by the status quo. Incentivizing perfor-

Second, we leverage our rich dataset to shed light on why DA's theoretical advantages are not fully realized in practice. A unique feature of our setting–identical job postings within the same market and unit–and rich survey data enable us to test for strategic preference coordination, which can lead to market unraveling (Roth and Xing, 1994; Antler, 2015). Our results suggest that participants in two-sided markets often engage in strategic communication to secure favorable rankings, undermining DA's strategyproof properties. This finding is consistent with evidence from other markets, such as the NRMP, where nearly half of doctors match to their top choice (Anderson et al., 1999; Carek et al., 2000; Teichman et al., 2000; Sbicca et al., 2010, 2012; Berriochoa et al., 2018), or the medical matching market in Denmark where there is a high degree of interdependence between prospective medical students' preferences and the medical programs they are applying to (Friedrich et al., 2024).[2] Similarly, in centralized school choice markets, students and schools may strategize over rankings despite the use of strategyproof mechanisms (Abdulkadiroğlu et al., 2009; Figueroa et al., 2018). By highlighting the conditions under which DA may fall short, our findings offer valuable insights for improving the design of matching mechanisms in various organizational and policy settings.

Additionally, this research adds to the literature on personnel considerations within military organizations. Several papers have studied the assignment of cadets to branches of the military (Sönmez, 2013; Sönmez and Switzer, 2013; Schlegel, 2015; Jagadeesan, 2019; Greenberg et al., 2024). Lewis et al. (2022) study the assignment of Coast Guard servicemembers to ships. Our study contributes by evaluating how DA impacts officers' postmarket outcomes.

2 The Internal Matching Market for Army Officers

Mirroring other large organizations, the U.S. Army has a formal internal talent marketplace to facilitate the rotation of roughly 14,000 officers to new assignments. Since 2017, the Army has used an online, interactive module to match most officers to positions at Army units within an internal labor market. The online marketplace, known as the Army Talent Alignment Process (ATAP), allows officers to build profiles that units can

mance through merit-based postings leads to large productivity gains in their setting.

[2]Other explanations could also contribute to preference coordination in these settings. For example, Echenique et al. (2022) posit that doctors' preferences for hospitals deviate from the truth in part because of the requirement that doctors only rank hospitals that they interview. Friedrich et al. (2024) show that Danish medical programs tend to rank students who live close to their campuses, which could occur even in the absence of preference communication.

see (and vice-versa),[3] permits officers who are scheduled to change assignments within 6 to 9 months to submit preferences over available jobs, and allows units to submit preferences over officers expected to move. The Army's human resources division, known as the Human Resources Command (HRC), manages the marketplace and partitions all officers and jobs within the marketplace into distinct markets. Each market is defined by a combination of officer rank and officer occupation (e.g. a market for "infantry captains" and a separate market for "logistics majors").

In addition to being associated with a specific rank and a specific occupation, each job also belongs to one of roughly 500 different Army units. Although the distinct markets within the marketplace are many-to-one in the sense that multiple officers can match to a single unit, in practice officers submit preferences over specific jobs at a unit as part of a one-to-one market. For example, if a market has 10 units that each have 5 distinct jobs within the market, then each officer in that market can rank up to 50 jobs. Units provide descriptions for each job listed in the online marketplace, and job descriptions may vary when a market contains multiple job listings that belong to the same unit. Units with multiple job listings in the same market must submit separate rank-order lists of officers for each listing, and these preferences need not be identical across listings, even when such job listings have identical descriptions.

Each cycle of the online marketplace is open for 6 to 8 weeks, during which time officers may submit preferences for all jobs within their (rank-by-occupation) market. Officers can adjust their preferences for jobs at any time while the marketplace is open. Likewise, units may submit preferences over officers and can change their preferences at any time. Officers are not required to rank-order all jobs in their market and jobs are not required to rank-order all officers. The final version of their preference lists at the market's scheduled closing date are used to determine (for DA) or inform (for control markets) matches.

Officers' exact preferences over jobs and units' exact preferences over officers are hidden from each other. However, units can observe a signal if an officer ranks one of the unit's jobs among the officer's top 10 percent of all possible choices, regardless of how many jobs the officer leaves unranked. On the other side of the market, officers observe a signal if a unit ranks them anywhere on their rank-ordered list for a job in the officer's market. Offi-

[3]Officer profiles include assignment histories, civilian and military education information, military awards, and self-reported previous civilian employment, professional skills and certifications, cultural experiences, and travel. Units can provide specific descriptions for each job in the marketplace, contact information for the job's current incumbent or point of contact, and general information about their unit.

cers and units are permitted to conduct informal interviews and to communicate outside of the online marketplace, but there is no strict requirement to do so.[4] Officers can submit preferences over all jobs in their market regardless of whether they have interviewed (and vice-versa for units).

Career managers at HRC are responsible for clearing markets by matching officers to jobs within distinct markets. These managers are officers who serve two to three years at HRC, before typically returning to a non-HRC position within their normal military occupation. After career managers clear a distinct market, they place officers on orders to move to their assigned units in the coming months. Between 6 and 9 months after the marketplace closes, officers report to a new unit. Depending on the timing of their contracts, officers can decide not to renew and exit the Army if they are unhappy with the match. In particular, some may exit before they begin their next assignment.

3 Experimental Design

Drawing on prior research on the impacts of the deferred acceptance algorithm on match outcomes (Davis, 2024) and personnel economics within the context of the military (e.g., Greenberg et al., 2022; Bruhn et al., 2024; Greenberg et al., 2024), the research team suggested that the Army test the impact of matching using DA with a randomized controlled trial. The Army, however, implemented the matching mechanisms and maintained final decision-making authority over all aspects of the matching.

Our experiment took place during the officer marketplace open from October 11th through December 6th, 2019. Our experimental sample includes 9,577 officers assigned to 115 distinct markets.[5] Before the marketplace opened, we worked with the Army to randomly assign these disjoint markets to either a treatment or control condition. Randomization was stratified by the rank of officers in the market and "skill clusters." The Army decided on skill clusters so as to group markets with similar skill requirements. For example, infantry and armor officers comprise one skill cluster, and officers with occupations related

[4]The Army's online platform does not have a functionality that allows officers and units to request and schedule interviews. As such, we are unable to observe which officers interviewed with which units.

[5]Our pre-analysis plan originally indicated 118 distinct markets. However, prior to the listing of the marketplace, HRC made the decision not to execute two markets during the assignment cycle. A third market included zero officers. Additionally, prior to the randomization, the Army decided to exclude roughly 4,000 officers in specialty occupations (medical service professionals, lawyers, chaplains, and some cyber and aviation officers with specific qualifications) and another roughly 400 officers who were part of special markets scheduled to move outside the Army's regular assignment cycle.

to logistics, finance, and acquisitions comprise another skill cluster. Strata defined by rank and skill cluster included between 2 and 10 markets.

Career managers matched officers in control group markets to jobs according to the Army's traditional matching process, which was neither automated nor reliant on a specific algorithm. Managers paired officers to jobs with an emphasis on officer and unit preferences, while ensuring that officers with unique assignment considerations—such as those with exceptional family considerations or spouses also in the Army—paired to jobs at locations that accommodated their needs. For the marketplace that took place during our experiment, the Army further instructed career managers to attempt to honor first-to-first pairings in control group markets—i.e. jobs where the officer ranked the job number 1 and where the unit ranked the officer number 1. This was consistent with how career managers traditionally matched officers to jobs, as these pairs are relatively easy to observe.[6] Although each manager had leeway to pair officers to jobs according to their own process within these guidelines, our conversations with managers of control markets suggest that most typically focused first on pairing officers with unique assignment considerations to jobs. Then career managers moved on to implementing first-to-first pairings or other scenarios where officers and units had mutually high ratings for each other. Finally, career managers matched remaining officers to jobs according to a process of the manager's choosing. While this process is somewhat of a black box, it is similar to human resources-driven assignment at other large organizations.[7]

For officers in treatment markets, career managers first matched officers with unique assignment considerations to jobs, then career managers executed an officer-proposing deferred acceptance (DA) algorithm to match all remaining officers to remaining jobs in the market. Importantly, managers of treatment markets reviewed all potential matches to ensure no officers matched to jobs for which they were not qualified. This review resulted in the adjustment of roughly 5 to 10 percent of officers in treatment markets.

By design, every market in both the treatment and control groups had at least as many job listings as officers. Before matching officers to jobs in both treatment and control group markets, HRC reduced the number of job listings in the marketplace to match the number

[6] We often use the term "first-to-first pairing" and "first-to-first match" synonymously. However, career managers were not obligated to honor all first-to-first pairings that existed at the close of the marketplace.

[7] For example, the World Bank's staff policy manual states "Staff Members in positions at grades GF-GH whose professional disciplines are utilized in more than one department may be subject to planned periodic reassignment" but does not explain the assignment procedure (World Bank, 2019).

of officers. Moreover, for markets in the treatment group, HRC imputed missing preferences for any jobs that officers left unranked and for any officers that units left unranked.[8] As a result, it was not possible for an officer to go "unmatched" due to a surplus of applicants or a lack of demand for officers. HRC's choice of which jobs to fill and which jobs to leave vacant were functions of the baseline vacancy rates across units, which were not directly influenced by officer and unit preferences.

4 Empirical Methods and Data

We estimate treatment effects using the following officer-level regression:

$$Y_i = \alpha + \beta DA_{m(i)} + X_i'\gamma + \delta_{b(m(i))} + \varepsilon_i, \tag{1}$$

where i indexes individual officers and $m(i)$ indicates officer i's market (determined by the officer's rank and occupation). Y_i is the outcome, and $DA_{m(i)}$ is an indicator for whether the market was randomly assigned to use deferred acceptance or the status quo matching mechanism. The coefficient β is the causal impact of being in a market randomly assigned to match officers to jobs using DA instead of the status quo manager-driven approach, or the intent-to-treat effect of the experiment. X_i is a set of pre-randomization officer characteristics including indicators for sex, race and ethnicity, family structure, birth year, source of commission, baseline performance, and years in rank. These pre-registered controls are not necessary for identification because treatment was randomly assigned, but are included to improve statistical power. $\delta_{b(m(i))}$ represents a set of strata or block fixed effects, which account for any incidental differences in treatment probabilities across strata. We cluster standard errors by market because treatment status is randomly assigned at the market level (Abadie et al., 2023). Table D.1 shows versions of inference using the wild bootstrap (Cameron et al., 2008) or adjustments for multiple hypothesis testing (Anderson, 2008).

[8] In both cases, missing preferences were either randomly imputed or determined by the Army's preferences over jobs (or a combination of randomization and Army preferences), with the requirement that initially unranked positions or officers be ranked as less preferred than ranked positions or officers. We do not observe the imputed preferences.

4.1 Data

Our data include the rank and occupation of each officer and job in the marketplace, allowing us to reconstruct each officer's full choice set of jobs and each job's full choice set of officers. We observe each officer's preferences over all jobs in their respective market and each job's preferences over all officers in the job's market. The ability to reconstruct choice sets allows us to observe when an officer leaves a job unranked and when a job leaves an officer unranked. We also observe the specific mapping of jobs to units. Army service records indicate the specific location and unit an officer is assigned to and allow us to observe if an officer is still on active duty. These records also include each officer's age, race, sex, marital status, parental status, and source of commission (e.g. the Reserve Officer Training Corps [ROTC], West Point, etc.).

We also observe several performance measures. Our first measure of officer performance is based on evaluation reports up to September 2022. Officers are required to receive at least one evaluation report every 12 months, though additional reports can be given if there is a change in their rater (direct supervisor) or senior rater (the supervisor of their direct supervisor), such as when the officer changes jobs. We define strong performance as receiving a "Most Qualified" rating on these reports. A senior rater can only give the "Most Qualified" rating to a maximum of 49 percent of the officers they evaluate, a constraint that helps explain why "Most Qualified" ratings are highly predictive of eventual selection for promotion to the next higher rank (see Table D.2).[9] Since evaluation reports are primarily limited to distinguishing between "above median" and "below median" officers, we complement this performance measure with the promotion board percentile rankings of officers considered for promotion between October 2020 and September 2022. Officers are only considered for promotion every five or six years, so board rankings are missing for two-thirds of our sample.

We link administrative officer data with responses to two surveys. The first was a mid-market survey that HRC administered before the marketplace closed. During the final three weeks of the marketplace, while officers and units were still eligible to update their

[9] Performance evaluations are subjective and may therefore reflect influence activities that are not necessarily aligned with organizational goals (De Janvry et al., 2023). Similar to other public sector settings, the Army does not have common worker-level or firm-level metrics like sales or profit margins that we could use as more objective performance measures. However, the strong relationship between evaluations and future promotion is similar to how De Janvry et al. (2023) document the correlation between supervisors' assessments and eventual promotion to "tenured" College Graduate Civil Servant positions in China.

preferences, HRC required all officers who logged into the marketplace to complete this survey. Officers were not permitted to view or change their preferences for jobs until they completed the survey, resulting in a high response rate (88 percent). The survey inquired about the truthfulness of officers' preferences over jobs and about officers' perceptions of the marketplace. The second survey was a shorter post-market survey administered by HRC when officers learned of the job with which they had matched, typically 2 or 3 months after the conclusion of the marketplace.[10] Importantly, one question in this post-market survey inquired about the truthfulness of officers' preferences. Table D.3 contains the precise wording of each survey question reported on in our analysis.

4.2 Baseline Summary Statistics and Balance Tests

Table 1 presents summary statistics of baseline officer and market characteristics separately for the treatment group (column 1) and the control group (column 2). Officers in both treatment and control groups are predominately male, married, and born in 1982 or later (with an average age of 36 at the start of the market). Roughly 16 percent of officers are Black, 10 percent are Hispanic/Latino, and 65 percent are White. The typical market had around 80 to 85 officers and between 110 and 120 jobs. All officers are required to have a 4-year college degree, and most have responsibilities commensurate with those of mid-level managers or technical experts in large organizations. The average officer's wage (not shown in the table) equals the 77th percentile of the distribution of wages for U.S. civilians with similar education levels and ages (Smith et al., 2020).

Officers in the experimental marketplace held diverse roles that closely parallel those in the civilian labor market, along with a core set of responsibilities that are shared across the Army, such as planning operations, coordinating logistics, mentoring subordinates, and leading training. Roughly 14 percent of officers were logisticians, 11 percent were intelligence analysts, and 9 percent were signal officers responsible for maintaining information technology networks (see Table D.4). Deployments to combat zones like Iraq and Afghanistan were rare in 2020 and later, but officers were still responsible for preparing their units for potential combat through regular training exercises and noncombat operations.

[10] Officers learned the job with which they were matched just before completing the post-market survey, but could not obtain their orders until they completed the survey. However, only 54 percent of officers completed the post-market survey due to a technical delay in the survey prompt. Responses to both officer surveys are balanced across DA and control group markets.

To formally test for baseline differences in covariate means between treatment and control groups, column (3) of Table 1 reports estimates from a regression of the covariate in the left column on an indicator for whether the officer (or market) was part of the treatment group and fixed effects for market strata (defined by rank and skill cluster). Columns (4) and (5) report the standard error and p-value from the same regressions. Among the 23 comparisons, two are statistically significant at the 10 percent level and one is significant at the 5 percent level, consistent with what we would expect from random chance. Joint tests of significance among the officer characteristics and among the market characteristics fail to reject the null hypothesis that treatment and control groups are balanced.[11]

5 Impacts of DA on Immediate and Longer-Run Outcomes

In this section, we present results on compliance with market matching methods and their impact on the initial features of matches. We then document the effects of matching with DA on officers' retention, performance, and promotions during their first two years in their new position.

5.1 Immediate Impacts on Matching Methods and Matches

5.1.1 Impacts on Matching Mechanisms

We first document compliance with random assignment in treatment and control markets. Table 2, Panel A shows the effect of randomly assigning a market to use DA on the likelihood that non-first-to-first matches within the market were made using the DA.[12] We exclude first-to-first matches even though DA will always match a pair that ranks each other first because they were also prioritized by career managers in the control group (see Section 3). Markets in the treatment group are 76.4 pp more likely to match with DA than control group markets, with a corresponding F-statistic of 123.33.

Table 2, Panel B shows the impact of being in a market randomly assigned to match with DA on officers' match types. Nearly 46 percent of matches in both treatment and control markets are first-to-first matches. For non-first-to-first matches, we observe a flag for whether matches were directly determined by DA. As expected, matches in DA markets are 27.1 pp more likely to have a non-first-to-first match determined by DA than

[11] The joint test uses versions of covariates with missing values imputed as zero, along with indicators for missingness included as additional controls. Our main regressions include the same controls.

[12] No markets in our sample had exclusively first-to-first matches.

officers in control markets, which only have a DA match about 1 percent of the time. This difference is significantly different from zero ($p < 0.001$). Because the process in control markets might still result in the same match as would have occurred under DA, our measure is best interpreted as a measure of manager compliance, as opposed to a deviation from a DA counterfactual.

5.1.2 Impacts on Justified Envy

A theoretical benefit of DA is that it produces a stable match. A match is stable if no officer and job prefer to be matched together over their assigned match. When this is not the case, we say that the officer has "justified envy." The first row of Table 2, Panel C shows 9.6 percent of officers in control markets have justified envy for at least one position. Matching with DA reduces the prevalence of justified envy by 3.2 pp. This proportionally large (one-third) and statistically significant ($p < 0.001$) reduction confirms that random assignment to matching with DA caused a material change in matches. Relatedly, DA reduced the average number of jobs for which an officer has justified envy by 0.053, from a baseline average of 0.139 in the control group.

If all matches were determined by DA, we would expect justified envy to be eliminated. Non-compliance with random assignment at the market level (see Section 5.1.1) explains some justified envy. Scaling by the "first stage" of 0.76 (i.e. the treatment's effect on the likelihood that a market has at least one non first-to-first DA match), suggests that DA reduced justified envy by roughly 50 percent. Non-compliance with DA-recommended assignments explains the remaining instances of justified envy.

Career managers could overrule the DA assignment and place an officer in a different match if deemed necessary. It is unlikely that such changes were driven by officers lobbying for different placements because officers do not observe matches until the finalized list is released. Instead, deviations from DA are driven by officers being moved to meet certain constraints—such as ensuring only qualified officers are assigned to positions that involve training other officers—or to satisfy other Army objectives. Although the remaining 8 to 9 percent of jobs in the treatment group where officers have justified envy may be interpreted as a significant deviation from the algorithm, it is important to note that even a single changed match can create justified envy for many officers if the position was desirable and the moved officer was not ranked highly by the new assignment. Such deviations from official DA assignments are not unique to our setting. For example, there

are waivers in the NRMP[13] and some school choice markets reserve slots for principals to allocate as they see fit.[14]

5.1.3 Impacts on Match Rank, Match Satisfaction, and Truthful Reporting

The officer-proposing version of DA used in our study yields the officer-optimal stable match. Therefore, we expect officers, and possibly units, in DA markets to be happier with their matches. As a first test of this hypothesis, Table 3 shows the impact of DA on match outcomes determined at the time of the match, including officers' and units' satisfaction with their assigned match based on their stated preferences and officers' responses to the post-market survey.[15]

Panel A shows that about 85 percent of officers in both DA and control group markets were matched with a unit that they ranked. Among this subset of officers, officers in control markets ranked their match 7.9, on average, and officers in DA markets ranked their match 6.6, on average, for a statistically significant difference of 1.3 ranks ($p = 0.040$).[16] To the extent that rankings reflect true preferences, officers in DA markets matched to slightly more preferred jobs. Truthful reporting is only a dominant strategy within DA markets. Nonetheless, we can interpret a ranked match that is more preferred as an outcome closer to an officer or unit's strategic goal.

Panel B reports the impact on officers' answers to three questions from the post-market survey inquiring about their satisfaction. Responses to these questions were reported on a 5-point Likert scale. We standardize responses using the control group mean and standard deviation (SD). We find positive, but statistically insignificant and economically modest treatment effects on officers' responses to questions about how satisfied they are with the match they received, how satisfied they are with the marketplace overall, and how likely they are to stay in the Army.

Panel C shows the impact of DA on *units'* stated preferences over matches. Officer-proposing DA is not strategyproof for units (Roth, 1982), so these estimates are less likely to reflect the impact of DA on units' satisfaction with the outcomes. In both DA and control group markets, about 70 percent of units match to an officer they ranked. Units in

[13] https://www.nrmp.org/policy/requesting-a-waiver/ (accessed 10 April 2025).

[14] https://chicagoschooloptions.com/forums/topic/spring-2023-sehs-principals-discretion/ (accessed 10 April 2025).

[15] Appendix A discusses the determinants of officers' and units' preferences.

[16] Table D.1 shows that this significance is sensitive to using the wild bootstrap or making adjustments for multiple hypothesis testing.

DA markets prefer their matches by 0.4 ranks, which is statistically significant ($p = 0.014$) and 15% as large as the average match ranking of units in the control group (2.7).

Panel D shows the impact on self-reported truthful preference reporting. Matching with DA increases truthful preference reporting: treatment group officers are 2.4 pp more likely to report that their submitted preference reports always reflect their true preferences, relative to a control group mean of 23.8 percent. However, the vast majority of officers in both the treatment and control group report some preference manipulation despite DA being a strategyproof mechanism.

5.1.4 Impacts on Career Managers' Administrative Burden

Table 3, Panel E shows that managers of markets matched by DA spent significantly less time and effort matching officers to jobs than managers of markets that did not use DA. Career managers in DA markets made 0.49 fewer match changes per officer than managers in control markets, a statistically significant 35 percent reduction relative to the control group mean of 1.38 match changes per officer ($p < 0.001$). Additionally, matches of officers in the treatment group were finalized 3.4 days earlier than matches of officers in the control group ($p = 0.014$). This 13 percent reduction in the time it takes to finalize which jobs officers match to is nontrivial as it allows officers more time to plan their upcoming moves while freeing up career managers to focus on other responsibilities.[17]

5.2 Longer-Run Impacts

5.2.1 Officer Retention

Table 4, Panel A reports the effect of being assigned to match with DA on retention. The experimental marketplace closed in December 2019 and officers began receiving orders for their next assignment starting in February 2020, with instructions to report to follow-on assignments in the summer of 2020. The onset of the COVID-19 pandemic in the United States in Spring 2020 delayed some moves, but nearly all officers moved by September 2020. Our three primary retention outcomes are (1) an indicator for still being in the active duty Army as of September 30th, 2020, which measures any attrition that might occur after officers learn the results of the marketplace; (2) an indicator for still being in the Army as of September 30th, 2021, which we broadly interpret as the primary "first-year"

[17] Our data do not permit us to estimate how DA impacts officers' and units' search costs, partly because we cannot observe login data and partly because many of the more time-consuming aspects of search (e.g. interviews) are conducted outside of the online marketplace platform.

retention outcome; and (3) an indicator for still being in the Army as of September 30th 2022, which we interpret as "second-year" retention.[18]

The first row of Panel A indicates that relative to officers in control markets, officers in treatment markets that matched with the DA algorithm were a statistically insignificant 0.3 pp more likely to be in the Army through September 2020. However, matching with DA increases retention one year after the match by a statistically significant 1.1 pp ($p = 0.025$). One-year retention in the control group is high (93.4 percent). Our treatment effect therefore implies DA reduces attrition by 16.7 percent. These effects fade-out by the second year. Matching with DA increases retention through the second year (September 2022) by only 0.3 pp. The 95 percent confidence interval around this estimate rules out increases in retention larger than 1.5 pp or reductions in retention of more than 0.9 pp.

5.2.2 Performance Outcomes

Panel B of Table 4 reports impacts on performance evaluations that officers received during the first year in their new match. Officers receive evaluation reports whenever their supervisor changes or after serving under the same supervisor for a total of 12 months. Most officers moved in the summer of 2020 and should, therefore, have received at least one evaluation report from their new position by September 2021. The first row of Panel B indicates that officers in DA markets were slightly more likely to have received a performance evaluation with rating periods ending between October 2020 and September 2021, consistent with the positive effects we observed on one-year retention in Panel A. The second row of Panel B suggests that matches resulting from DA did not lead to improved performance evaluations in the subsequent assignment relative to matches in control markets. Officers in treated markets were 0.6 pp less likely to receive a "Most Qualified" evaluation than officers in control markets (control mean of 48.3 percent). This estimate is indistinguishable from 0, with the 95 percent confidence interval ranging from a 2.2 pp reduction to a 1.0 pp increase. In Table D.5 we show that this finding is not sensitive to how we treat missing performance evaluations. Panel C shows the impact on evaluations in officers' second year in the position (October 2021 through September 2022). We again find precise zero effects on the impact of matching with DA on officers' performance evaluations in the second year after an officer moves.

Panel D reports the impact of matching with DA on officers' promotion outcomes.

[18] Our pre-analysis plan said we would measure retention through July of each year. We extended the window to September because of the COVID-19 delays.

About 30 percent of officers in control group markets had been promoted in their first two years in the match. Mirroring the performance evaluation results, our estimated impact of DA on promotions is a precise zero. We dig deeper into the promotion outcome by looking at officers' percentile ranks by their official promotion boards. We only observe this outcome for 32 percent of our sample, primarily because officers are typically only considered for promotion once every five or six years, but there is no difference between treatment and control markets. Among officers where we can observe promotion board outcomes, matching with DA increased an officer's promotion board ranking by less than 1 percentile and this is not statistically significant.

Taken together, the results from this section suggest that matching with DA has relatively modest effects on officer retention and no detectable effects on officers' performance. That DA appears to perform as well, if not better than, career managers suggests that officers and units in our setting have as much information about the quality of potential matches as managers, and concerns about officers being uninformed about where they are needed most or units attempting to hoard talent do not create detrimental effects. In fact, DA likely has a high rate of return here because it is easier to implement and performs as well as career manager-led matching on these retention and performance metrics.

6 Understanding the Benefits and Limitations of DA

In this section, we test whether DA is more effective in markets managed by inexperienced career managers and explore whether strategic preference coordination limited the benefits of matching with DA in our setting.

6.1 DA is More Beneficial When Career Managers are Inexperienced

A large literature has underscored the importance of manager quality in shaping organizational and worker outcomes (Coraggio et al., 2022; Minni, 2023) and performance improvements associated with experience (Bandiera et al., 2020; Fenizia, 2022; Best et al., 2023). Building on this, we hypothesize that DA is more effective in markets managed by inexperienced career managers. By serving as a baseline for matching, DA may reduce administrative burden and mitigate inconsistencies in decision-making, enabling less experienced managers to achieve outcomes comparable to their experienced counterparts. Our analysis confirms this heterogeneous impact of DA by showing how matching out-

comes differ based on the experience level of career managers.

We observe the full set of career managers who match officers to jobs in each market and the career histories of these managers.[19] Career managers generally only serve in a manager position for two or three years before receiving another Army assignment, and each year has only one major annual marketplace. Just over half of the career managers in our study were new to their positions in the year of the experiment, implying that the experimental marketplace was the first time they had to match officers to jobs. We therefore identify a career manager as being experienced if the manager had been in the position for a year or longer. We interact an indicator for having an experienced manager with the treatment to test for heterogeneous effects by manager experience.

The results reported in Table 5 indicate that matching with DA caused significant increases in first-year retention, promotions, and promotion board percentile rankings among markets with inexperienced career managers. Specifically, for officers with inexperienced career managers, matching with DA increases first-year retention by 1.9 percentage points, which is both statistically significant ($p = 0.002$) and statistically distinguishable from DA's impact among markets with experienced career managers ($p = 0.044$), where we fail to reject the null of no effects of DA. We observe similar patterns in the likelihood that officers are promoted and officers' promotion board percentile rankings, again with treatment effects among inexperienced career managers being statistically distinguishable from treatment effects among experienced career managers (promotions, $p = 0.038$; percentile ranking, $p = 0.030$).

DA also substantially reduces the administrative burden of inexperienced career managers, permitting them to finalize matches at the same speed as an experienced career manager, as seen in panel E of Table 5. DA has no detectable effect on the number of days it takes experienced managers to clear their market, although it does reduce the number of changes experienced career managers make to the assignments of officers in their marketplace. Additionally, differences in the impact of DA by career manager experience are not likely to be driven by differences in compliance with random assignment. Panel A of Table D.6 shows that DA has equally large effects on the overall likelihood of being matched by DA ($p = 0.952$) and equally large reductions in justified envy ($p = 0.952$),

[19] Specifically, we can see the career manager responsible for matching an officer to a job and any career manager who is responsible for modifying a match before it is finalized. For the 34 markets where more than one manager matches an officer to the job, we classify the market as having an experienced manager if the majority of officers in the market are matched by an experienced manager.

regardless of career manager experience.[20]

Overall, our analysis of heterogeneity based on career manager experience indicates that DA may enable inexperienced managers of internal labor markets to achieve efficiency levels comparable to those of their experienced counterparts. The benefits of DA may be smaller in markets with more experienced managers because their accumulated expertise may enable them to effectively identify high-quality matches without the aid of an algorithm. Moreover, our estimated effects of DA on retention and performance outcomes suggest that implementing DA with inexperienced managers poses minimal risk—and may even offer benefits—to workers.

6.2 Strategic Preference Behavior May Limit the Benefits of DA

Some communication across market sides is usually necessary in two-sided markets. While jobs and programs are often prohibited from asking workers directly about their preferences, as was true in our setting and in the NRMP, workers may still find it beneficial to signal their interest in certain jobs.[21] This coordination/unraveling negates the strategyproof benefits of DA by encouraging officers to enter into informal agreements with units rather than submitting their true preferences (Roth and Xing, 1994; Antler, 2015).

A straightforward way for officers and units to coordinate is to agree to rank each other first.[22] This guarantees a match when DA is used and likely even when DA is not used, given the Army's commitment to honoring first-to-first matches. A high rate of first-to-first matches, however, is not necessarily evidence of coordination. It could reflect a high degree of correlation in officers' and units' true preferences for each other. To overcome this potential confound, we focus our attention on units with multiple, identical jobs[23] and officers who ranked one of the identical jobs first and were also ranked first by one of the jobs. Within a set of identical jobs within the same unit, the correlation between officers' and units' true preferences is held constant.

[20] Table D.7 reports differences in officer, market, and career manager characteristics between markets with experienced managers and markets with inexperienced managers. Table D.8 verifies that heterogeneous effects by career manager experience are not explained by differential effects of DA by career manager age or sex, two characteristics that are correlated with career manager experience.

[21] See for example: https://blog.matcharesident.com/residency-programs-number-one-choice/ (accessed 10 April 2025).

[22] Appendix B uses a simple example to show how preference communication can undermine strategyproofness.

[23] Table D.9 provides examples of identical job descriptions.

We test the null hypothesis that officers' top choices are uniformly distributed over identical positions using randomization tests separately in treatment and control markets. Holding unit preferences fixed, we randomize which of the identical jobs the officer ranks first 10,000 times. We calculate the share of first-to-first pairings in each randomization and then calculate a p-value using the share of randomizations with a first-to-first matching rate at least as large as the observed rate. Figure 1 shows the results. In both DA (right panel) and control markets (left panel), the observed share of first-to-first matches is more than double what we would expect if officers were randomizing over identical jobs. The observed rates are more than 40 pp larger than even the largest first-to-first rate in the simulations. These tests provide strong evidence against the null hypothesis that officers randomize over identical jobs, suggesting that officers and units coordinated which jobs to rank first in DA markets and control markets.[24]

To explore whether DA is more effective in settings where coordination is less likely, we test for heterogeneity in DA's effects along a proxy for coordination costs: a market-level measure of unit participation. For each unit-market combination, we define this proxy as the share of officers in other markets that are ranked by the unit, i.e. a leave-out-mean of active unit engagement in the matching process. The results from this exercise, reported in Table D.10, are broadly consistent with the notion that DA is more effective when communication and coordination costs are higher. Matching officers by DA leads to more truthful preference reporting among officers in markets with low unit participation (higher coordination costs), an estimate that is statistically distinguishable from the impact of DA in markets with high unit participation ($p = 0.050$). Similarly, the positive effects of DA on officer retention are more pronounced in markets with lower unit participation, including a retention effect that persists out to two years after officers start their new jobs. DA also causes a positive 2.3 percentile increase on promotion board percentile rankings among officers in markets with less unit participation.[25] Finally, Table D.13 reports on the impact of matching with DA among the four combinations of career manager experience and unit participation. Although power is limited, the results generally indicate that DA is most effective in markets with inexperienced career managers and where a greater share of jobs belong to units that tend to have low participation.

[24] Appendix C.2 shows rates of first-to-first matching increased in the markets that occurred one and two years after the experiment despite efforts by the Army to limit coordination.

[25] Table D.11 reports balance on officer, market, and career manager characteristics by market-level unit participation. West Point (i.e., USMA) graduates are more likely to be in markets with less unit participation, but Table D.12 verifies that this difference does not explain heterogeneity along our proxy for coordination costs.

7 Conclusion

This paper reports results from a randomized controlled trial of the impact of using a deferred acceptance algorithm to match workers to jobs in the U.S. Army. Involving nearly 10,000 officers across 115 disjoint markets, the large sample allows precise estimation of treatment effects. We use high-quality administrative data on preferences and market outcomes, linked to surveys on strategic preference manipulation and satisfaction with matches. This unique design enables credible measurement of DA's impact on immediate and longer-term outcomes, including retention and job performance.

Matching with DA offers clear benefits to both agents and organizations.[26] DA reduces justified envy, promotes truthful preference reporting, and improves match quality to the extent that preferences align with true priorities. It also significantly reduces the administrative burden, particularly for inexperienced managers, allowing them to finalize matches more quickly. While DA modestly reduces short-term attrition, its impact on long-term retention and performance is more limited, with precise zero effects on top performance evaluations, promotion likelihood, and promotion board rankings. However, DA is particularly effective in markets managed by inexperienced career managers, improving retention, promotion outcomes, and administrative efficiency. These gains may be smaller in markets with more experienced managers who—by virtue of their accumulated knowledge—may already be adept at identifying high-quality matches under traditional systems. Overall, the advantages of DA align with its scalability and ability to mitigate biases and heterogeneity in human decision-making, yielding benefits comparable to those of experienced career managers under traditional assignment processes.

We also present evidence that communication and coordination of preference reports across the two sides of the market may attenuate DA's impact on workers' outcomes. Even in settings where preference coordination may limit some of DA's potential benefits, DA might still be optimal from an organization's perspective because it is straightforward to implement and easy for workers and managers to navigate. Given that DA is a cost-saving intervention, it will be beneficial for the Army so long as it does not have negative effects. Revealed preference would suggest this is the case: the Army chose to adopt DA for all markets in the years after this RCT.

[26] Appendix C discusses the external validity of our results.

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Table 1: Baseline Balance

	Treatment Mean	Control Mean	Regression Adj. Difference	SE	P-Value	N
Female	0.149	0.133	0.001	0.017	0.944	9,577
White	0.650	0.675	-0.024	0.017	0.151	9,577
Black	0.160	0.139	0.026**	0.013	0.043	9,577
Hispanic	0.096	0.097	-0.007	0.006	0.292	9,577
Married	0.740	0.762	-0.002	0.010	0.828	9,577
Children	0.609	0.639	-0.004	0.014	0.776	9,577
Married with Children	0.561	0.593	-0.007	0.014	0.640	9,577
Birth year 1962-1966	0.008	0.00	0.004*	0.002	0.056	9,577
Birth year 1967-1971	0.038	0.040	0.006	0.005	0.233	9,577
Birth year 1972-1976	0.106	0.118	0.011	0.008	0.178	9,577
Birth year 1977-1981	0.219	0.254	-0.012	0.011	0.257	9,577
Birth year 1982-1986	0.287	0.294	-0.003	0.015	0.842	9,577
Birth year 1987-1991	0.213	0.182	-0.009	0.009	0.325	9,577
Birth year 1992-1996	0.127	0.105	0.003	0.008	0.664	9,577
ROTC	0.537	0.522	-0.013	0.011	0.246	9,577
USMA	0.138	0.142	0.001	0.014	0.931	9,577
Performance Quartile 1	0.235	0.199	0.008	0.012	0.505	8,759
Performance Quartile 2	0.243	0.249	-0.002	0.009	0.794	8,759
Performance Quartile 3	0.260	0.262	0.004	0.008	0.623	8,759
Performance Quartile 4	0.262	0.290	-0.009	0.014	0.485	8,759
More than 3 years in the current rank	0.498	0.503	0.002	0.014	0.900	9,565
Joint Test, Officer Characteristics					0.107	9,577
Panel B: Market Characteristics						
Number of Officers	81.373	85.286	-1.629	15.749	0.918	115
Number of Jobs	109.585	123.750	-9.150	21.319	0.669	115
Joint Test, Market Size					0.877	115

Notes: The sample includes 9,577 officers. Treatment coefficients and standard errors are estimated from a regression of each covariate on a treatment indicator and strata fixed effects for every combination of rank and skill group (described in Section 4.1). Standard errors are clustered by market. The joint test is from an F-test on the null hypothesis that all of the baseline covariates in the panel are zero in a regression of a treatment indicator on the baseline covariates and strata fixed effects with inference clustered by market. For the joint test, missing values of each covariate are imputed with the mean of the covariate within the market and a missing indicator is added to the covariates included in the joint test. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 2: Compliance with Random Assignment

Outcome	N	Control Mean	Coefficient	SE	*P*-value
Panel A: Market Mechanism					
Market Used DA	115	0.143	0.764***	0.069	0.000
Panel B: Type of Match					
First-to-First Match	9,577	0.455	-0.008	0.011	0.497
DA Match (Not First-to-First)	9,577	0.013	0.271***	0.020	0.000
Panel C: Justified Envy					
Justified Envy For Any Job	9,574	0.096	-0.032***	0.008	0.000
Count of Jobs Where Officers Have Justified Envy	9,574	0.139	-0.053***	0.012	0.000

Notes: This table summarizes the impact of treatment on market matching mechanisms, match type and justified envy. Panel A shows the impact of being randomly assigned to the treatment group on the market matching mechanism. Panel B shows the impact on officers' match types. Panel C shows the impact on the extent to which officers' have justified envy. An officer has justified envy for a job if the officer prefers the job over her assigned match and the job similarly prefers the officer over its match. Three officers did not submit any preferences and are excluded from all analyses using preference reports. All regressions control for baseline covariates described in Section 4 and block fixed effects. Standard errors clustered by market. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 3: Impact of DA on Immediate Outcomes

Outcome	N	Control Mean	Coefficient	SE	*P*-value
Panel A: Officers' Preferences Over Match					
Ranked Match	9,574	0.848	0.006	0.011	0.596
-1(Rank of Match)	8,129	-7.851	1.315**	0.633	0.040
Ranked Match First	9,577	0.533	-0.003	0.011	0.763
Panel B: Officers' Reported Satisfaction					
Is the officer in the survey data at all? (Feb 2020)	9,577	0.529	0.013	0.040	0.741
Rate your overall satisfaction with the assignment you received (Standardized)	5,224	0.000	0.048	0.051	0.343
Rate your overall satisfaction with the AIM2 marketplace (Standardized)	5,223	0.000	0.045	0.032	0.168
How likely are you to stay active in the US Army (Standardized)	5,135	-0.000	0.004	0.040	0.930
Panel C: Units' Preferences Over Match					
Ranked Match	9,967	0.702	0.003	0.014	0.822
-1(Rank of Match)	7,034	-2.740	0.366**	0.147	0.014
Panel D: Officer Survey Responses on Strategic Behavior					
Is officer in the survey data? (Nov 2019)	9,577	0.874	0.004	0.010	0.653
If guaranteed, would job be ranked #1?	8,354	0.844	0.012*	0.006	0.061
Extent preferences reflect your truth? (Standardized)	8,350	0.000	0.050***	0.017	0.005
Submitted preferences always reflect true preferences	8,427	0.238	0.024***	0.007	0.001
Did you rank any job higher because units see if in your top 10%?	8,356	0.545	-0.026***	0.010	0.010
If guaranteed, would job be ranked #1? (Feb 2020)	5,223	0.694	-0.004	0.015	0.768
Panel E: Market Clearing Outcomes					
Any Changes by Career Manager	9,301	0.663	-0.225***	0.023	0.000
Number of Changes by Career Manager	9,301	1.381	-0.486***	0.117	0.000
Days From Market Close to Final Change	9,301	25.000	-3.371**	1.349	0.014
Days From First Slate Change to Final Change	9,301	7.984	-1.692**	0.814	0.040

Notes: This table summarizes the impact of matching with DA on outcomes determined at the time of the match, including officers' and units' preferences over matches, truthful preference reporting, and market clearing outcomes. Panel A shows the impact on officers' preferences over matches. Panel B shows the impact on officers' self-reported satisfaction with the match and the marketplace from the post-market survey. Panel C shows the impact on units' preferences over matches (based on their reported preferences). Three officers did not submit any preferences and are excluded from all analyses using preference reports. We multiply officers' rankings of jobs (jobs ranking of officers) by -1 so that a positive point estimate implies the officer matched to a job the officer preferred more (the unit matched to an officer the unit preferred more). Panel D shows the impact on officers' truthful preference reporting. Panel E shows the impact on market clearing outcomes. All regressions control for baseline covariates described in Section 4 and strata fixed effects (Equation (1)). Standard errors clustered by market. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 4: Impact of DA on Longer-Run Outcomes

Outcome	N	Control Mean	Coefficient	SE	*P*-value
Panel A: Retention					
Still in Army as of 30 September 2020	9,577	0.985	0.003	0.002	0.147
Still in Army as of 30 September 2021	9,577	0.934	0.011**	0.005	0.025
Still in Army as of 30 September 2022	9,577	0.849	0.003	0.006	0.582
Panel B: Performance in First Year					
Officer Received an Evaluation (Sept 2021)	9,577	0.890	0.014*	0.008	0.081
Share Evals "Most Qualified" (Sept 2021)	8,646	0.483	-0.006	0.008	0.462
Panel C: Performance in Second Year					
Officer Received an Evaluation (Sept 2022)	9,577	0.806	0.014	0.009	0.116
Share Evals "Most Qualified" (Sept 2022)	7,868	0.498	-0.010	0.011	0.364
Panel D: Promotion Outcomes					
Promoted (Sept 2022)	9,577	0.296	0.005	0.010	0.642
Has Promotion Percentile (Sept 2022)	9,577	0.321	0.002	0.009	0.844
Promotion Board Percentile (Sept 2022)	3,083	0.497	0.008	0.007	0.254
Promotion Board Percentile w/ Board FE (Sept 2022)	3,083	0.497	0.007	0.006	0.224

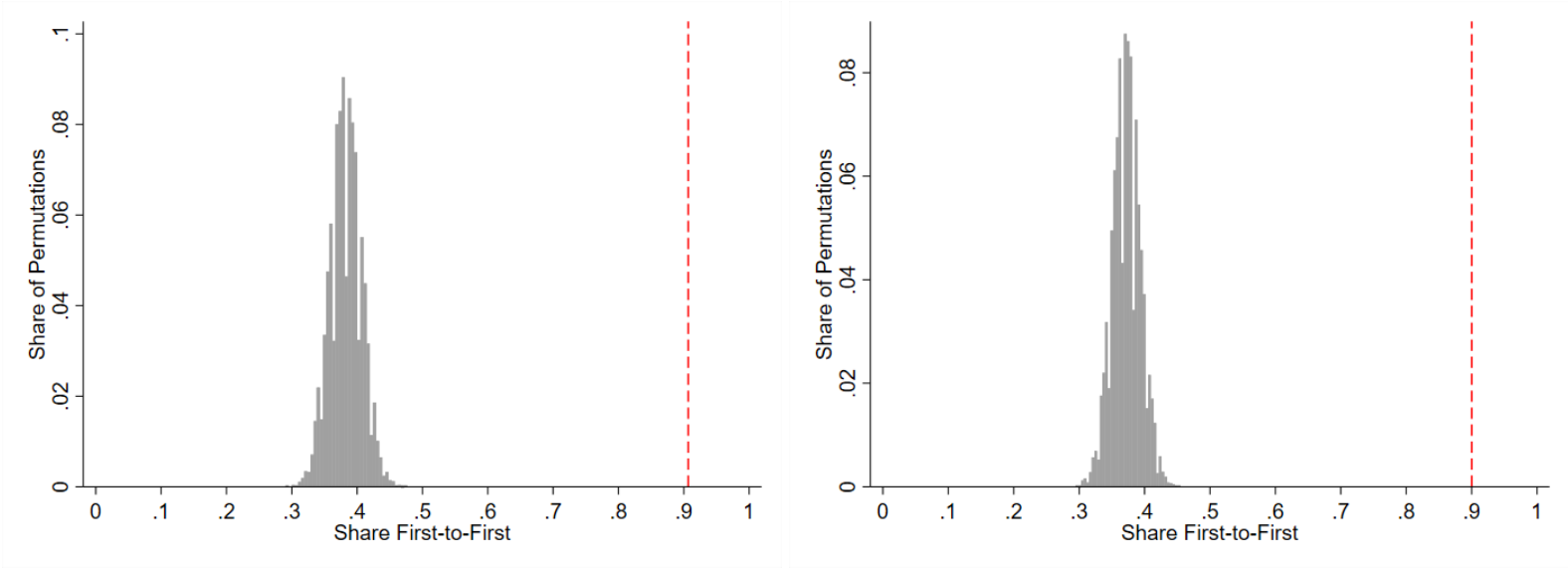
Notes: This table shows the impact of matching with DA on retention (Panel A), performance (Panels B and C), and promotions (Panel D). Retention is measured as an indicator variable for being in the army on September 30th of 2020 (the year the new match started), 2021 (one year after the new match started), or 2022 (two years after the new match started). Performance is measured using officers' evaluation reports (see Section 4.1). All regressions control for baseline covariates described in Section 4 and strata fixed effects (Equation (1)). Standard errors clustered by market. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 5: Career Manager Heterogeneity on Longer-Run and Market Clearing Outcomes

Variable	Control Mean (1)	Effect of DA Inexperienced Managers (2)	Effect of DA Experienced Managers (3)	P-value (2) v. (3) (4)	Experienced Manager Effect (5)
Panel A: Retention					
Share in Army in September 2020	0.985	0.010***	-0.009**	0.005	0.005
		(0.004)	(0.004)		(0.004)
Share in Army in September 2021	0.934	0.019***	-0.006	0.044	-0.005
		(0.006)	(0.010)		(0.009)
Share in Army in September 2022	0.849	0.006	-0.003	0.526	-0.007
		(0.007)	(0.011)		(0.009)
Panel B: Performance in First Year					
Officer Received an Evaluation (Sept 2021)	0.890	0.021*	-0.002	0.214	0.012
		(0.011)	(0.012)		(0.011)
Share Evals "Most Qualified" (Sept 2021)	0.483	-0.003	-0.016	0.544	-0.000
		(0.012)	(0.016)		(0.015)
Panel C: Performance in Second Year					
Officer Received an Evaluation (Sept 2022)	0.806	0.032***	-0.019	0.018	0.007
		(0.011)	(0.017)		(0.014)
Share Evals "Most Qualified" (Sept 2022)	0.498	-0.026	0.011	0.274	-0.039**
		(0.017)	(0.023)		(0.019)
Panel D: Promotion Outcomes					
Promoted (Sept 2022)	0.296	0.029**	-0.030	0.038	0.028*
		(0.014)	(0.021)		(0.016)
Has Promotion Board Percentile (Sept 2022)	0.321	0.003	0.005	0.937	-0.002
		(0.010)	(0.019)		(0.016)
Promotion Board Percentile (Sept 2022)	0.497	0.022**	-0.017	0.030	0.022**
		(0.010)	(0.011)		(0.009)
Panel E: Market Clearing Outcomes					
Any Changes by Career Manager	0.663	-0.233***	-0.232***	0.991	-0.036
		(0.027)	(0.035)		(0.034)
Number of Changes by Career Manager	1.381	-0.656***	-0.322*	0.146	-0.558***
		(0.154)	(0.167)		(0.187)
Days From Market Close to Final Change	25.000	-6.525***	1.333	0.003	-5.192**
		(1.628)	(2.090)		(2.139)
Days From First Slate Change to Final Change	7.984	-3.776***	0.892	0.000	-5.244***
		(0.862)	(1.041)		(1.089)

Notes: This table shows the impact of matching with DA on retention (Panel A), performance (Panels B and C), promotions (Panel D), and market clearing outcomes (Panel E) when markets are managed by inexperienced career managers and when markets are managed by experienced career managers. Each row reports estimates from a regression of the outcome variable identified in the left column on the interaction of an indicator for being in a DA market with an indicator for the market being managed by an inexperienced manager, another interaction of an indicator for being in a DA market with an indicator for the market being managed by an experienced manager, and a separate main effect that indicates if an experienced manager manages the market. All regressions control for baseline covariates described in Section 4 and strata fixed effects, similar to Equation (1), and exclude 49 observations from 6 markets where we are unable to identify the market's career manager. We identify a career manager as being experienced if the manager has been in the position for a year or longer at the start of the marketplace. If more than one manager matches officers to jobs within a market, we classify the market as having an experienced manager if the majority of officers in the market are matched by an experienced manager. Standard errors, clustered by market, are reported in parentheses. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Figure 1: Preference Coordination Test: Simulated First-to-First (solid histogram) vs. Actual First-to-First (dashed line)



(a) Control Markets

(b) DA Markets

Notes: These figures test the null hypothesis that officers' top choices are uniformly distributed over identical positions using separate randomization tests in treatment and control markets. Holding unit preferences fixed, we randomize which of the identical jobs the officer ranks first 10,000 times. The solid bars show the distribution of the share of first-to-first matches (where the officer ranks the job number 1 and the unit ranks the officer number 1) across iterations. The vertical dashed lines show the actual share of first-to-first matches in this sample. The sample is restricted to officer-job group combinations with potential first-to-first matches because the officer ranked one of the jobs first and at least one of the identical jobs ranked the officer first. Two or more positions are identical if they belong to the same unit, have identical job descriptions, are in the same location, and are in the same market (and will therefore be positions for the same rank).

Online Appendix

A Officer and Unit Preferences

Our rich administrative data allows us to reconstruct each officer's full choice set of jobs and each job's full choice set of officers and their preferences over all of the potential matches in their market.

Officers rank their preferred positions from most to least preferred, without being required to rank all positions in their choice set. Unranked positions are assumed to be less preferred than ranked ones, but they are treated as equally preferred to one another. Additionally, officers can indicate positions they would not like to match with. These undesirable positions are considered the least preferred overall, ranking below both ranked and unranked positions.

A.1 Pairwise Rank Correlations

When preferences are more heterogeneous, there is more of an opportunity to match officers to jobs in a way that makes officers happier. Figure D.4, Panel A documents preference heterogeneity by showing the distribution of pairwise rank correlations between all officers in the same markets for all officers in our sample. These pairwise rank correlations suggest there is substantial heterogeneity in officers' preferences over jobs in both treatment and control markets. The average pairwise correlation is 0.06 in treatment markets and 0.09 in control markets. Only 55 percent and 63 percent of the pairwise correlations are positive in treatment and control markets, respectively.

These rank correlations assume that officers truthfully report their preferences. However, we saw that many officers misreport their preferences in both treatment and control markets, and have particularly strong incentives to misreport their first choice. Figure D.4, Panel B shows that the results are quite similar if we drop the top 5 percent of most preferred jobs before calculating the pairwise rank correlations. The average rank correlations are unchanged at 0.06 and 0.09 in treatment and control markets, respectively.

As a further test of the potential impact of strategic preference manipulation on these estimates, Figure D.4, Panel C shows analogous results using preference data from the 2019 market that took place the year before our experimental market. Unit participation was much lower in this market, so it functioned like a one-sided market where officers ranked jobs but units took a passive role. As a result, officers had less incentive to coordinate

with units in this market. Here, we continue to see substantial heterogeneity across officer pairs, but a more positive correlation. The average pairwise rank correlation is twice as high, 0.17, and 78 percent of the correlations are positive.

A.2 Determinants of Officers' Preferences

Table D.20 presents estimates of the relationship between officers' preferences and job characteristics.[A.1] Each column reports the results of a regression of the specified outcome on the covariates shown in the table and officer fixed effects. The first three columns show estimates in DA markets where a strategyproof mechanism was used. The final three columns show estimates in control markets where truthful preference reporting was not necessarily a dominant strategy. Within each set of columns, the preference measure varies across columns. Column 1 uses officers' reported preferences, excluding unranked and unacceptable positions. We multiply officers' rankings by negative one so that positive estimates indicate that a covariate makes a job more appealing. Column 2 uses on an indicator for ranking a position first. Column 3 uses an indicator for ranking a position second, excluding the position ranked first.

We focus our discussion on the impact of covariates on officers' submitted preference reports because covariates are less predictive of which jobs are ranked first or second. The first three characteristics are officer specific, including indicators for being in the officer's birth state, for being in the officer's spouse's birth state (if the officer is married), and for being in both the officer's and spouse's birth state. Officers in DA and control markets rank positions in their birth state 7 and 13 ranks better and positions in their spouse's birth state about 10 and 8 ranks better, respectively. There is not a statistically significant difference in these effects if the officer and the officer's spouse are from the same state.

The next two characteristics indicate if the job belongs to an operational unit, as opposed to a training or support unit, and if the job belongs to an airborne unit, an arguably more elite form of operational unit. Officers in DA markets rank operational units about 6 ranks higher and do not have strong preferences for airborne units relative to other operational units. In contrast, officers in control markets rank operational units 18 ranks better than training units and airborne units 19 ranks higher than other operational units.

[A.1] This analysis uses information about job locations collected from public databases (Chetty et al., 2018; Clarke et al., 2025; Office for Coastal Management, 2025; U.S. Census Bureau, 2023, 2021; U.S. Department of Housing and Urban Development, Office of Policy Development and Research, 2022).

The next six characteristics capture the impact of the region of the position on officers' preferences, including indicators for being in the Midwestern, Southern, or Western regions of the United States or for being in Asia, Europe, or the Global South (including Africa, South America, or Central America) with the Northeastern region of the United States being the omitted category. Officers in both DA and control markets have similar geographic preferences. Europe is most preferred with jobs being ranked 42 to 44 ranks higher than jobs in the Northeast. Asia is the least preferred region, with jobs being ranked 6 ranks lower in DA markets and a statistically insignificant 3 ranks lower in control markets. In most cases, these vertical geographic preferences are larger in magnitude than the horizontal preferences from officers preferring their and their spouse's home states.

The next row shows that officers prefer coastal counties within the United States by about 20 ranks in both DA and control markets. The remaining rows display the effects of county demographic, economic, and weather characteristics. These characteristics are defined for positions within the United States and are normalized to 0 for international positions. This implicitly assumes that international positions have average demographic, economic, and weather characteristics. These are all standardized so that estimates are interpretable as the impact of a one standard deviation change in the characteristic. Officers in both DA and control markets prefer higher income, more populous with lower winter temperatures. The minor differences between preferences in DA and control markets are that officers in DA markets prefer counties with higher average summer temperatures and officers in control markets prefer counties with a higher share of college graduates.

A.3 Determinants of Units' Preferences

Table D.21 shows analogous estimates of how officer characteristics affect units' preferences. The first three columns show preference estimates for units in DA markets and the last three columns show estimates for units in control markets. Within these market groups, the first column shows estimates using units' ranking of officers, excluding unranked officers, multiplied by negative one so that positive estimates indicate preferable traits. The second column uses an indicator for whether or not the unit ranked the officer. The third column uses an indicator for whether the unit ranked the officer first.

We focus our discussion on the estimates on units' preference reports. In both DA and control markets, units' preferences are most responsive to officers' performance evaluations. Officers in the 2nd and 3rd quartiles of the performance distribution are ranked

about 0.7 to 0.8 ranks better than officers in the bottom quartile. Officers in the top quartile are ranked a full rank better. Units in DA markets rank women about half a rank better than men and rank Black officers about 0.4 ranks higher than white officers. In contrast, units in control markets are indifferent between men and women and rank Black officers about 0.4 ranks lower than white officers. The estimates indicate that officers who are married with children are ranked about 0.9 ranks higher, but this basically offsets negative but statistically insignificant main effects on being married and having children.

B A Model of DA with Preference Signaling

Standard models of DA implicitly assume that preferences are independent of the actions of the other agents in the market. Antler (2015) extends the standard model by assuming that each agent's preference reports are common knowledge and may have an endogenous effect on other agents' preferences. This generalization allows for an officer to potentially benefit from sharing that he or she is ranking a unit as its top choice. Antler (2015) shows that DA is not guaranteed to yield a stable match if an agent's preferences can endogenously depend on other agents' preference reports.

Using a simple counterexample, we show that preference communication can also undermine strategyproofness. In the example, officers can win favor with particular units by ranking that unit first.

Suppose that there are three workers (1,2,3) and three jobs (A,B,C). All workers' true preferences are $u_j(A) > u_j(B) > u_j(C)$ for $j = 1, 2, 3$. Let R^* denote the true ranking of A, B, and C in that order of preference. Let $R^{A \leftrightarrow B}$ be the rank order list that instead moves B to first, A to second, while leaving C in third place. We assume that jobs A and C are indifferent between all workers and randomize their rank-ordered lists. Job B, however, prefers workers who rank it first to other workers, but randomizes within these two groups. This feature of job B's preferences is a deviation from standard DA models.

Assume workers 2 and 3 truthfully report their preferences in their rankings. Worker 1 must decide how to rank the jobs. The only potentially beneficial manipulation is misreporting B as their first choice instead of A.

Denote worker 1's expected utility from submitting preference list R by $EU_1(R)$. If worker 1 truthfully reports their preferences, R^*, their expected utility is:

$$EU_1(R^*) = \frac{1}{3}u_1(A) + \frac{1}{3}u_1(B) + \frac{1}{3}u_1(C),$$

because all workers have the same preferences and all jobs randomize their rank-ordered lists.

If instead, worker 1 submits $R^{A \leftrightarrow B}$, their expected utility is $EU_1(R^{A \leftrightarrow B}, 1) = u_1(B)$. That is, job B will rank worker 1 first because worker 1 is the only worker who ranked job B first. Worker 1 and job B will therefore be a first-to-first match. If $2u_1(B) > u_1(A) + u_1(C)$, worker 1 is better off misreporting their preferences and ranking job B first than they would be if they had truthfully reported their preferences. This demonstrates that worker-proposing DA is not necessarily strategyproof for workers if even a single job views workers more favorably who rank it highly.[B.1]

This example shows that, in theory, workers may have incentives to strategically coordinate with units that are not their top choice in order to arrange a first-to-first match. Here, we have assumed that preference reports are common knowledge to simplify the analysis. In practice, workers may need to tell a job that they are ranking it first and jobs must assess the credibility of this report. This type of communication is likely common in most labor market matching problems. For example, both doctors and residency program directors report frequent communication about rankings after interviews even though this type of communication is prohibited by the NRMP's code of conduct (Anderson et al., 1999; Carek et al., 2000; Teichman et al., 2000; Sbicca et al., 2010; Carek, 2012; Berriochoa et al., 2018). Whether this communication is credible or just cheap talk may depend on the potential social consequences of being caught lying. These consequences are likely higher in our setting than in other labor markets. Nevertheless, doctors mention exactly these types of concerns: "It's a small world, especially if you're applying to a competitive specialty or applying heavily to a certain geographic area. If you tell Program A you're ranking them #1, and they rank you back #1, but you actually rank Program B #1 and end up there, Program A's likely going to notice you lied when you don't end up on their list... maybe three years from now you'll apply for a job or fellowship affiliated with Program A and they might remember 'the kid we really liked a few years ago until he lied to us."'[B.2]

[B.1] The particular Nash Equilibria of this game are of less interest than this result. If workers are identical, however, two workers truthfully reporting and a single worker misreporting is a Nash Equilibrium if $2u_1(B) > u_1(A) + u_1(C)$ and $\frac{2}{3}u_1(A) + \frac{1}{6}u_1(C) > u_1(B)$.

[B.2] Message board post, Jul 23, 2013 Letters of Intent - what's the deal (accessed 16 December 2024).

C External Validity

An important question is whether the results from our randomized trial are likely to extend to other settings. In this section, we attempt to point out why some of the key benefits of DA, such as reduced administrative costs and potentially better outcomes for agents with inexperienced managers, are likely to extend to other large organizations. We then present additional evidence for why DA's benefits to agents on the proposing side of the market may be limited in firms or other organizations that have two-sided matching markets with frequent communication between sides, complementing our general theoretical model for why preference communication can undermine strategyproofness (Appendix B) and evidence that DA may lead to slightly better outcomes for officers in markets where communication is likely less common (Subsection 6.2).

C.1 Officers Resemble Mid-Level Managers Across a Variety of Settings

Army officers serve in a wide array of leadership, technical, and administrative roles and occupations that frequently align closely with positions found in the civilian workforce. To give a better sense of this, Table D.4 below lists the 10 largest occupations among officers in our sample. Logisticians comprise the largest occupation (14.4% of officers), then intelligence analysts (11.4%), followed by signal officers (9.3%).

Many officers belong to military occupations that are similar, if not identical, to that of skilled professionals, such as the roughly 5% of officers in the aviation branch who serve as pilots and have their own internal labor market. Roughly half of the engineer officers in our sample (5.5% the sample) will likely serve in roles that require them to manage and lead construction projects. And about a third of signal officers are in technically oriented specialties that include network engineers and information system engineers, while the rest are in markets for jobs that will typically require them to have a high degree of technical expertise in order to effectively lead information technology teams that are responsible for maintaining information networks and data management systems within large Army organizations. Human resource officers and military police officers are also among the ten largest officer occupations in our sample. Additionally, although they are not among the 10 largest occupations included in the table below, another 7.5% of officers in our sample serve as operations research analysts, acquisitions officers, finance officers

(e.g., comptrollers), or foreign area officers (similar to foreign service officers).

Only about 25% of officers in our sample belong to traditional combat-oriented occupations that do not have as many immediate parallels to the civilian labor market, such as the infantry (ground operations on foot or light vehicles), armor (ground operations on tanks), or artillery.[C.1] Yet even officers in combat-oriented occupations perform tasks that require skills that are relevant to many leadership positions within civilian firms. For example, about half of infantry officers in our sample are in a market where they can expect to match to a unit that will require them to serve as commanders of military companies that typically consist of 100 to 120 personnel. Commanders must lead and prepare their units for frequent training exercises, noncombat deployments that often include training, advising, and assisting military forces from other countries, and even occasionally deployments to combat zones.[C.2]

We also find that the effects of DA do not depend on officer characteristics lending suggestive evidence to the notion that our findings might generalize to a variety of workers in non-Army settings (Hoffman and Stanton, 2024). Specifically, we test for differential effects of DA according to officers' sex, race, marital status, baseline performance levels, years of experience, and broad occupational categories (i.e., combat occupations or noncombat occupations). We do not find evidence of heterogeneity along these various dimensions (see Tables D.14 and D.15).

C.2 Preference Coordination In Post-Experiment DA Markets

The high first-to-first match rate and evidence of coordination during our experimental market could potentially be due to officers in DA markets not fully understanding that truth-telling is an optimal strategy, a common problem in other settings that use DA (Chen and Sönmez, 2002; Hassidim et al., 2017; Rees-Jones, 2018; Rees-Jones and Skowronek, 2018; Gonczarowski et al., 2024). We are not able to observe exactly how the DA mechanism was explained to officers during our experiment and we were not permitted to add questions measuring understanding to officer surveys. However, we believe officers and units would have strategically coordinated rankings during our experiment even if most officers understood that truth-telling is an optimal strategy in DA markets. Even though

[C.1] Combat occupations such as infantry, armor, field artillery, and air defense artillery tend to have a disproportionate share of enlisted personnel (i.e. privates and sergeants) and junior ranking officers (i.e., lieutenants) who do not obtain positions through the Army's officer talent marketplace.

[C.2] Only 8% of officers deployed to a combat zone within two years (see Section 4.2).

the Army did not adopt standardized messaging that differed for officers in treatment and control markets, career managers knew if their market was part of the treatment or control group and were permitted to communicate their market's matching process to officers and units. As discussed above, the small but statistically significant increase in truthful preference reporting as indicated through the mid-market officer survey is consistent with officers in treatment markets having some understanding that DA is strategyproof.

For more evidence, we turn to markets that occurred one year after (October - December 2020) and two years after (October - December 2021) the randomized trial. The Army adopted DA for all markets after the randomized trial. Officers in more recent markets have had more time to learn the implications of DA from publicly available sources (e.g., Greenberg et al. (2020)) and from career managers.[C.3] Additionally, prior to the 2021 marketplace, the Army adopted a user agreement modeled after the NRMP's Match Codes of Conduct in part to address concerns that units and officers were not respecting the confidentiality of preferences. All officers and units were required to acknowledge the user agreement, shown in Figure D.2, the first time they entered the marketplace. Similar to how the NRMP Match Codes of Conduct asks program directors not to request an applicant to disclose ranking preferences or intentions, the Army's user agreement instructs officers and units not to ask the other side to disclose their preferences.[C.4]

Despite these efforts, the incidence of first-to-first matching actually increased in more recent markets, as seen in Figure D.3. Furthermore, relative to officers in the experimental marketplace, officers in the marketplaces that occurred one and two years later were more likely to acknowledge that their highest-ranked job was not their true first preference.[C.5]

Survey responses from officers participating in marketplaces one and two years after the randomized trial also revealed that a majority of officers acknowledged altering their preferences in order to achieve a first-to-first match (see Tables D.16 and D.17).Officers

[C.3] For example, before the October - December 2021 marketplace, one career manager sent an e-mail to moving officers with the following message: *"Finally, when you make your final adjustments to your preferences when the market closes, be sure to put down your TRUE preferences…don't be afraid to put a job #1 even if you're not sure you will get it."*

[C.4] The NRMP Match Codes of Conduct for Programs is available at https://www.nrmp.org/wp-content/uploads/2022/08/NRMP-Match-Code-of-Conduct_Programs_Final.pdf (accessed 28 July 2023).

[C.5] Among officers in treated markets of the randomized trial who responded to the post-market survey, 30 percent acknowledged their first choice job was not their true first preference (see Table 3, Panel D). Among officers in markets corresponding to treatment group markets (according to officers' rank and occupation) that took place one year later and two years later, 46 percent and 38 percent, respectively, acknowledged that their first choice job was not their true top preference (See Tables D.16 and D.17).

who altered their preferences to achieve a first-to-first match were also more likely to acknowledge that their stated first choice assignment was not their true first choice (Tables D.18 and D.19), suggesting that strategic preference coordination is not only the result of officers naturally preferring to be assigned to units that likewise rank them highly. Overall, strategic preference reporting appears to have increased in the years following the randomized trial, and results from officer surveys suggest that much of this was driven by agents' desire to strategically coordinate first-to-first matches.

C.3 Evidence of Strategic Communication in Other Settings

Our evidence that agents on each side of the market coordinate their preferences is particularly relevant to other contexts where proximity and repeated interaction between participants on either side of the market play a significant role, such as in other organizations' internal labor markets and the NRMP for medical doctors. Results from other studies suggest that the strategic preference coordination we observe in our setting may also occur in other contexts, even if such coordination is difficult to prove. For example, nearly 46% of doctors in the NRMP match to their first-ranked choice even though surveys indicate that doctors have similar preferences over programs, a puzzle that Echenique et al. (2022) suggest is partly explained by the NRMP's requirement that doctors only rank hospitals that they interview with. In a different context, medical school programs in Denmark appear to strategically rank students based on characteristics that are strongly correlated with students' preferences for their program (Friedrich et al., 2024). The preference behavior documented in both of these settings—where doctors and students have incentives to deviate from the truth—is also consistent with the possibility that applicants strategically coordinate their preferences with programs. Moreover, multiple studies document how both doctors and residency program directors frequently communicate about rankings after interviews even though this type of communication is prohibited by the NRMP's code of conduct (Anderson et al., 1999; Carek et al., 2000; Teichman et al., 2000; Sbicca et al., 2010; Carek, 2012; Berriochoa et al., 2018).

The market unraveling and strategic preference behavior we observe in our setting is also consistent with recent evidence from other two-sided markets where agents' preferences may strategically respond to the preferences of agents on the other side of the market, even when there is little direct communication between participants on either side of the market. For example, in some school-choice markets, students have incentives to strategize their preferences because schools observe or solicit them (Abdulkadiroğlu et al.,

2009; Figueroa et al., 2018). The high share of officers who match to their first choice in our setting is also similar to the Boston Mechanism, the Boston Public Schools' system for assigning students to schools prior to 2006. The Boston Mechanism placed many students in their top choice school—not because it allocated students well, but rather because the mechanism incentivized students to misreport less popular schools as their first choice instead of their true top choice (Abdulkadiroğlu et al., 2006).

Most of the other settings described in this subsection are not from firm-internal labor markets. Although more speculative, cross-market communication may be even higher in organizations that are smaller than the U.S. Army. Intuitively, the smaller the organization, the more likely it is both for an employee to have contact with the hiring manager on the other side of the market and for the employee to be caught misrepresenting their preferences, something that doctors in the NRMP are warned not to do.[C.6] This does not mean that DA cannot lead to improved matches relative to an internal labor market where managers or HR representatives match workers to jobs without the aid of an algorithm. However, it does suggest that the benefits of adopting a strategyproof mechanism may be attenuated in internal labor markets or other settings where agents can leverage repeated interactions to strategically align their preferences.

[C.6] See for example: https://blog.matcharesident.com/residency-programs-number-one-choice/.

D Appendix Tables and Figures

Table D.1: Multiple Hypothesis Testing Adjusted Inference

Variable	Asymptotic *P*-value	Wild Bootstrap *P*-value	FWER *P*-value	FDR *Q*-value
Panel A: Match Characteristics Outcome Family				
First-to-First Match	0.497	0.547	0.544	0.498
DA Match (Not First-to-First)	0.000	0.000	0.000	0.001
Justified Envy For Any Job	0.000	0.001	0.011	0.001
Count of Jobs Where Officers Have Justified Envy	0.000	0.001	0.011	0.001
Panel B: Preferences Outcome Family				
Ranked Match (Officer)	0.596	0.667	0.679	0.596
-1(Rank of Match) (Officer)	0.040	0.123	0.325	0.081
Panel C: Survey of Officers' Preferences Outcome Family				
Is the officer in the survey data at all? (Feb 2020)	0.741	0.824	0.958	0.930
Rate your overall satisfaction with the assignment you received (Standardized)	0.343	0.468	0.845	0.686
Rate your overall satisfaction with the AIM2 marketplace (Standardized)	0.168	0.259	0.724	0.674
How likely are you to stay active in the US Army (Standardized)	0.930	0.944	0.958	0.930
Panel D: Units' Submitted Preferences Outcome Family				
Ranked Match	0.822	0.848	0.856	0.822
-1(Rank of Match)	0.014	0.082	0.241	0.029
Panel E: Retention Outcome Family				
Still in Army as of 30 September 2020	0.147	0.170	0.380	0.221
Still in Army as of 30 September 2021	0.025	0.055	0.147	0.075
Still in Army as of 30 September 2022	0.582	0.627	0.633	0.583
Panel F: Performance Outcome Family				
Officer Received an Evaluation (Sept. 2021)	0.081	0.118	0.415	0.233
Share of Evaluations that are 'Most Qualified' (Sept. 2021)	0.462	0.512	0.650	0.462
Officer Received an Evaluation (Sept. 2022)	0.116	0.194	0.427	0.233
Share of Evaluations that are 'Most Qualified' (Sept. 2022)	0.364	0.420	0.650	0.462
Panel G: Promotion Outcome Family				
Promoted (Sept. 2022)	0.642	0.675	0.893	0.845
Has Promotion Percentile (Sept 2022)	0.844	0.861	0.893	0.845
Promotion Board Percentile (Sept 2022)	0.254	0.344	0.664	0.763
Panel H: Strategic Preference Reporting Outcome Family				
If guaranteed, would job be ranked #1?	0.061	0.104	0.459	0.106
Extent preferences reflect your truth? (Standardized)	0.005	0.021	0.164	0.018
Submitted preferences always reflect true preferences	0.001	0.006	0.094	0.010
Did you rank any job higher because units see if in your top 10%?	0.010	0.022	0.212	0.023
Is the officer in the survey data at all? (Feb 2020)	0.741	0.824	0.976	0.769
If position guaranteed, would this position be ranked #1? (Feb 2020)	0.768	0.810	0.976	0.769

Notes: The asymptotic p-value is the conventional p-value based on our standard errors clustered by market. The The family-wise error rate (FWER) is the probability of rejecting any true null hypothesis belonging to a "family" of hypotheses. Families are defined by the group of outcomes in each panel. We calculate FWER adjusted p-values using 9,999 iterations of the free step-down resampling methodology of Westfall et al. (1993) using the implementation of Jones et al. (2019). The false discovery rate (FDR) is the expected proportion of false rejections within a family of outcomes (Benjamini and Hochberg, 1995). We calculate FDR adjusted q-values using the implementation of Anderson (2008).

Table D.2: Officer Evaluations Predict Promotions

	Outcome: Promoted	
	(1)	(2)
Most Recent OER Was MQ		0.320***
		(0.014)
Second Most Recent OER Was MQ		0.252***
		(0.013)
Third Most Recent OER Was MQ		0.202***
		(0.012)
Fourth Most Recent OER Was MQ		0.126***
		(0.011)
Fifth Most Recent OER Was MQ		0.078***
		(0.011)
Rank x Year FE	X	X
R^2	0.099	0.533
N	2879	2879
Outcome Mean	0.775	0.775

Notes: Column (1) reports a regression of officers' promotion to the next higher rank on fixed effects for every combination of officer rank and the year of the promotion board (promotion boards are held once per year). Column (2) adds an indicator variable that equals 1 if the officer's most recent evaluation prior to the board received a rating of "Most Qualified", an indicator if the second most recent evaluation prior to the board received a rating of "Most Qualified", and so on. The sample is limited to officers considered for promotion between October 2020 and September 2022 and who had at least five evaluation reports on file at the time of their promotion board.

Table D.3: Officer Survey Questions

October-December 2019 Mid-Market Survey (Table 3, Panel D)

Q13: "If the Army could guarantee you orders to any assignment in your AIM2 marketplace, would this assignment be the position that you ranked number one in your marketplace (your responses to this survey will be kept anonymous; units will not know how you answered this or any other question)?"
Q14: "Did you ever rank any positions in your marketplace higher than normal because units can see if you ranked one of their positions among your top 10 percent of possible choices?"
Q15:"To what extent did the preferences you submitted via AIM2 reflect your true preferences for positions?" *(Possible Responses: "Never", "Rarely", "Some of the Time", "Most of the Time", "Almost Always", "Always")*

October-December 2019 Post-Market Survey (See Table 3, Panel D)

Q1: "Rate your overall satisfaction with the assignment you received." *(Possible Responses: "Extremely Positive", "Positive", "Neutral", "Negative", Extremely Negative.")*
Q2: "Rate your overall satisfaction with the AIM2 marketplace." *(Possible Responses: "Extremely Positive", "Positive", "Neutral", "Negative", Extremely Negative.")*
Q3: "If the Army could guarantee you orders to any assignment in your AIM2 marketplace, would this assignment be the position that you ranked number one in your marketplace (your responses to this survey will be kept anonymous; units will not know how you answered this or any other question)?"
Q4: "Did you ever rank any positions in your marketplace higher than normal because units could see if you ranked one of their positions among your top 10 percent of possible choices?"

October-December 2020 Post-Market Survey (See Table D.16, Table D.18)

Q3: "If the Army could guarantee you orders to ANY assignment in your AIM2 marketplace as long as you ranked it number one, would you change the job that you ranked number one in your marketplace?"
Q4: "During the market, did you ever alter your assignment preferences in an attempt to secure a "one to one" match?"
Q5: Did you ever rank any positions in your marketplace higher (or lower) than you otherwise would have because units could see if you ranked one of their positions among your top 10 percent of possible choices?"

October-December 2021 Post-Market Survey (See Table D.17, Table D.19)

Q1: During the market did you ever alter your assignment preferences in an attempt to secure a "one to one" match?"
Q2: "Where does the position you listed a #1 in the AIM Marketplace fall on your true preference list? Your responses to this survey will be kept anonymous; units will not know how you answered this question" *(Possible Responses: "My #1 Preference was truly my #1 Preference", "One of my top three preferences", "One of my top five preferences", "One of my top 10 preferences", "Outside of my top 10 preferences")*

Notes: This table lists the exact working of all officer survey questions and possible responses for questions reported in this paper. Questions without responses listed were Yes/No questions.

Table D.4: Most Common Occupations Among Officers in Experimental Sample

Occupation	Number of Officers	Percent of Sample
Logistics	1376	14.368%
Intelligence	1089	11.371%
Signal (IT/Communications)	893	9.324%
Infantry (Ground Forces)	724	7.560%
Field Artillery	623	6.505%
Human Resources	529	5.524%
Engineers	525	5.482%
Aviation	519	5.419%
Police	334	3.488%
Armor (Tanks)	325	3.394%

Notes: This table reports the ten largest military occupations among the 9,577 officers in the markets that were part of the randomized trial.

Table D.5: Sensitivity of Performance Results to Imputation Techniques

Variable	N	Control Mean	Coefficient	SE	*P*-value
Panel A: Performance in First Year					
Share of Evaluations that are 'Most Qualified', Imp Mean (Sept. 2021)	9,576	0.481	-0.005	0.008	0.553
Share of Evaluations that are 'Most Qualified', Imp 0 (Sept. 2021)	9,577	0.432	0.002	0.008	0.823
Share of Evaluations that are 'Most Qualified', Imp 1 (Sept. 2021)	9,577	0.538	-0.012	0.009	0.149
Panel B: Performance in Second Year					
Share of Evaluations that are 'Most Qualified', Imp Mean (Sept. 2022)	9,577	0.493	-0.016	0.011	0.145
Share of Evaluations that are 'Most Qualified', Imp 0 (Sept. 2022)	9,577	0.405	-0.003	0.009	0.735
Share of Evaluations that are 'Most Qualified', Imp 1 (Sept. 2022)	9,577	0.593	-0.018	0.011	0.124

Notes: This table shows the sensitivity of our performance results to various techniques for imputing missing data. Performance is measured using officers' evaluation reports. Evaluation reports are the most important factor in determining whether an officer is promoted to the next highest rank. Officers with strong evaluation reports have better performance ranking and, ultimately, better chances of being promoted, than officers with weak evaluation reports. We define strong performance as receiving an evaluation report with a rating of "Most Qualified." A rating of "Most Qualified" is the best, and senior raters cannot give this rating to more than 49% of the officers they evaluate. The Army's Evaluation Entry System does not permit senior raters to break this cap of 49%. In this table, we show the results if we assume officers missing reports would have received an average evaluation, the maximum possible evaluation, or the worst possible evaluation. All regressions control for baseline covariates described in section 4 and strata fixed effects (Equation (1)). Standard errors clustered by market. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.6: Career Manager Heterogeneity - Compliance and Strategic Preference Behavior

Outcome	Control Mean (1)	Effect of DA Inexperienced Managers (2)	Effect of DA Experienced Managers (3)	P-value (2) vs. (3) (4)	Experienced Manager Effect (5)
Panel A: Compliance with RCT, Preferences Over Matches					
First-to-First Match	0.455	0.010	-0.032	0.167	0.018
		(0.014)	(0.024)		(0.018)
DA Match (Not First-to-First)	0.013	0.277***	0.274***	0.952	0.043
		(0.027)	(0.036)		(0.029)
Justified Envy for Another Job	0.096	-0.033***	-0.032**	0.952	-0.002
		(0.011)	(0.015)		(0.013)
Avg Num of Jobs Just Envied Per Officer	0.139	-0.059***	-0.044**	0.615	-0.001
		(0.018)	(0.020)		(0.020)
Officer Ranked Match	0.848	0.024**	-0.030	0.034	0.011
		(0.012)	(0.022)		(0.020)
-1(Officer Rank of Match)	-7.851	2.125**	-0.289	0.108	0.676
		(1.040)	(0.730)		(0.915)
Unit Ranked Match	0.778	0.023*	-0.011	0.199	0.002
		(0.013)	(0.021)		(0.019)
-1(Unit Rank of Match)	-2.742	0.506*	0.223	0.437	-0.239
		(0.263)	(0.163)		(0.220)
Panel B: Officer Survey Questions on Strategic Behavior					
Is officer in the survey data?	0.874	0.012	-0.011	0.269	0.009
		(0.013)	(0.016)		(0.014)
If guaranteed, would job be ranked #1?	0.844	0.022**	0.003	0.285	0.022*
		(0.010)	(0.012)		(0.012)
Extent preferences reflect your truth? (Standardized)	0.000	0.077***	0.021	0.245	0.044
		(0.027)	(0.032)		(0.027)
Submitted preferences always reflect true preferences	0.238	0.021*	0.032**	0.587	0.014
		(0.012)	(0.013)		(0.011)
Did you rank any job higher because units see if in your top 10%?	0.545	-0.013	-0.052***	0.166	-0.000
		(0.015)	(0.020)		(0.020)
Is officer in the survey data? (Feb 2020)	0.529	0.107*	-0.133**	0.024	0.165***
		(0.063)	(0.063)		(0.059)
If guaranteed, would job be ranked #1? (Feb 2020)	0.694	-0.015	0.012	0.456	0.011
		(0.019)	(0.028)		(0.024)

Notes: This table shows the impact of matching with DA on strategic preference behavior of officers when markets are managed by inexperienced career managers and when markets that are managed by experienced career managers. Each row reports estimates from a regression of the outcome variable identified in the left column on the interaction of an indicator for being in a DA market with an indicator for the market being managed by an inexperienced manager, another interaction of an indicator for being in a DA market with an indicator for the market being managed by an experienced manager, and a separate main term that indicates if an experienced manager manages the market. All regressions control for baseline covariates described in section 4 and strata fixed effects, similar to Equation (1), and exclude 49 observations from 6 markets where we are unable to identify the market's career manager. We identify a career manager as being experienced if the manager has been in the position for a year or longer at the start of the marketplace. If more than one manager matches officers to jobs within a market, we classify the market as having an experienced manager if the majority of officers in the market are matched by an experienced manager. Standard errors, clustered by market, are reported in parentheses. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.7: Descriptive Statistics and Balance on Career Manager Experience

	Experienced CM Mean	Inexperienced CM Mean	Regression Adj. Difference	SE	*P*-value	*N*
Panel A: Officer (Market Participant) Characteristics						
Female	0.136	0.144	-0.012	0.024	0.611	9,528
White	0.675	0.657	0.030	0.023	0.198	9,528
Black	0.151	0.148	-0.010	0.017	0.543	9,528
Hispanic	0.089	0.100	-0.009	0.008	0.265	9,528
Married	0.804	0.718	0.000	0.013	0.978	9,528
Children	0.693	0.580	-0.004	0.017	0.809	9,528
Married with Children	0.643	0.536	-0.010	0.018	0.586	9,528
Birth year 1962-1966	0.006	0.00	-0.005*	0.003	0.056	9,528
Birth year 1967-1971	0.045	0.035	-0.011*	0.007	0.092	9,528
Birth year 1972-1976	0.139	0.096	-0.023**	0.009	0.017	9,528
Birth year 1977-1981	0.301	0.196	-0.002	0.014	0.913	9,528
Birth year 1982-1986	0.330	0.267	0.030	0.020	0.132	9,528
Birth year 1987-1991	0.127	0.241	0.021*	0.011	0.066	9,528
Birth year 1992-1996	0.051	0.156	-0.009	0.007	0.207	9,528
ROTC	0.522	0.537	0.030*	0.017	0.076	9,528
USMA	0.140	0.141	-0.008	0.024	0.749	9,528
Performance Quartile 1	0.159	0.253	-0.000	0.011	0.973	8,717
Performance Quartile 2	0.250	0.243	0.008	0.011	0.495	8,717
Performance Quartile 3	0.278	0.251	0.003	0.009	0.702	8,717
Performance Quartile 4	0.313	0.253	-0.011	0.015	0.471	8,717
More than 3 years in the current rank	0.526	0.484	0.010	0.018	0.598	9,516
Joint Test, Officer Characteristics					0.063	9,528
Panel B: Market Characteristics						
Number of Officers	84.976	88.940	36.404**	17.652	0.043	109
Number of Jobs	105.619	128.649	19.117	24.978	0.446	109
Joint Test, Market Size					0.055	109
Panel C: Career Manager Characteristics						
CM is Below Median Age					0.071	109
CM is White					0.456	109
CM is Black					0.163	109
CM is Hispanic					0.256	109
CM is Female					0.045	109
CM is USMA Commission					0.312	109
CM is ROTC Commission					0.537	109
Joint Test, Manager Chars.					0.005	109

Notes: This table compares characteristics of participating officers, market composition, and career managers between markets managed by experienced career managers and markets managed by inexperienced career managers. Regression adjusted differences and standard errors are estimated from a regression of each characteristic on an indicator for the market being managed by an experienced career manager and strata fixed effects for every combination of rank and skill group (described in Section 3). Standard errors are clustered by market. The joint test is from an F-test on the null hypothesis that all of the baseline covariates in the panel are zero in a regression of having an experienced career manager on the baseline covariates and strata fixed effects with inference clustered by market. For the joint test, missing values of each covariate are imputed with the mean of the covariate within the market and a missing indicator is added to the covariates included in the joint test. Observations in Panel C are weighted by the number of officers in the market. Panel C only reports p-values and the number of observations because privacy restrictions prevent us from reporting summary statistics on career managers. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.8: Robustness of Heterogeneity by Career Manager Experience Results

Outcome	Baseline Estimates			$+\mathbb{1}$(Young CM)$+\mathbb{1}$((Young CM)$\times$(DA))			$+\mathbb{1}$(Male CM)$+\mathbb{1}$((Male CM)$\times$(DA))		
	Eff. of DA Inexp. Mgrs. (1)	Eff. of DA Exp. Mgrs (2)	P-value (2) v. (3) (3)	Eff. of DA Inexp. Mgrs. (4)	Eff. of DA Exp. Mgrs (5)	P-value (4) v. (5) (6)	Eff. of DA Inexp. Mgrs. (7)	Eff. of DA Exp. Mgrs (8)	P-value (7) v. (8) (9)
Panel A: Retention									
Share in Army in September 2020	0.010***	-0.009**	0.005	0.020***	-0.003	0.002	0.009***	-0.009*	0.007
	(0.004)	(0.004)		(0.006)	(0.004)		(0.003)	(0.005)	
Share in Army in September 2021	0.019***	-0.006	0.044	0.034***	0.005	0.020	0.018***	-0.003	0.063
	(0.006)	(0.010)		(0.010)	(0.012)		(0.005)	(0.010)	
Share in Army in September 2022	0.006	-0.003	0.526	0.010	-0.003	0.375	0.007	-0.004	0.455
	(0.007)	(0.011)		(0.014)	(0.016)		(0.008)	(0.012)	
Panel B: Performance in First Year									
Officer Received an Evaluation (2021)	0.021*	-0.002	0.214	0.038**	0.004	0.079	0.020*	0.003	0.312
	(0.011)	(0.012)		(0.018)	(0.018)		(0.011)	(0.012)	
Share Evals "Most Qualified" (2021)	-0.003	-0.016	0.544	0.005	-0.012	0.500	-0.002	-0.016	0.522
	(0.012)	(0.016)		(0.029)	(0.024)		(0.013)	(0.016)	
Panel C: Performance in Second Year									
Officer Received an Evaluation (2022)	0.032***	-0.019	0.018	0.036**	-0.019	0.014	0.035***	-0.021	0.008
	(0.011)	(0.017)		(0.016)	(0.017)		(0.010)	(0.018)	
Share Evals "Most Qualified" (2022)	-0.026	0.011	0.274	-0.006	0.023	0.427	-0.027	0.014	0.221
	(0.017)	(0.023)		(0.027)	(0.027)		(0.018)	(0.024)	
Panel D: Promotion Outcomes									
Promoted (Sept. 2022)	0.029**	-0.030	0.038	0.082***	0.012	0.011	0.042***	-0.025	0.016
	(0.014)	(0.021)		(0.023)	(0.021)		(0.014)	(0.021)	
Has Promotion Board Percentile (Sept 2022)	0.003	0.005	0.937	0.041**	0.039*	0.895	0.008	0.011	0.879
	(0.010)	(0.019)		(0.017)	(0.022)		(0.011)	(0.020)	
Promotion Board Percentile (Sept 2022)	0.022**	-0.017	0.030	0.040**	-0.005	0.014	0.031***	-0.016	0.012
	(0.010)	(0.011)		(0.017)	(0.016)		(0.011)	(0.012)	
Panel E: Market Clearing Outcomes									
Any Changes by Career Manager	-0.233***	-0.232***	0.991	-0.233***	-0.233***	0.998	-0.245***	-0.244***	0.985
	(0.027)	(0.035)		(0.047)	(0.046)		(0.028)	(0.041)	
Number of Changes by Career Manager	-0.656***	-0.322*	0.146	-0.640***	-0.256	0.081	-0.745***	-0.362**	0.114
	(0.154)	(0.167)		(0.191)	(0.199)		(0.168)	(0.177)	
Days From Market Close to Final Change	-6.525***	1.333	0.003	-7.045**	0.919	0.007	-6.189***	0.295	0.005
	(1.628)	(2.090)		(2.838)	(2.596)		(1.323)	(2.301)	
Days From First Slate Change to Final Change	-3.776***	0.892	0.000	-4.282***	0.945	0.000	-3.943***	0.450	0.001
	(0.862)	(1.041)		(1.536)	(1.386)		(0.833)	(1.086)	

Notes: Columns (1)-(3) replicate columns (2)-(4) of Table 5. Columns (4)-(6) replicate columns (2)-(4) of Table 5, but with an additional indicator control for the career manager being below median age plus the interaction of the career manager age indicator with the DA market indicator. Columns (7)-(9) replicate columns (2)-(4) of Table 5, but with an additional indicator control for the sex of the career manager plus the interaction of career manager sex with the DA market indicator.

Table D.9: Examples of Identical Jobs

Job ID	Unit Name	Location	Job Description
1	1st Brigade, 5th Infantry Division	Fort Brady	[REDACTED] CCC Instructor - Responsible for the leadership, supervision, and welfare of Army [REDACTED] Captains Career Course (SOFCCC) students. Serves as a small group instructor for up to a 16-person small group. Coordinates and supervises the preparation and execution of the active component of the [REDACTED] Common Core of instruction. Evaluates, counsels and mentors students. Recommends changes in the program to increase effectiveness.
2	1st Brigade, 5th Infantry Division	Fort Brady	[REDACTED] CCC Instructor - Responsible for the leadership, supervision, and welfare of Army [REDACTED] Captains Career Course (SOFCCC) students. Serves as a small group instructor for up to a 16-person small group. Coordinates and supervises the preparation and execution of the active component of the [REDACTED] Common Core of instruction. Evaluates, counsels and mentors students. Recommends changes in the program to increase effectiveness.
3	34th Engineering Command	Fort Brady	Serves as a project manager for the USACE, [REDACTED] district. Responsible for supervising construction and renovation projects throughout [REDACTED] and the INDOPACOM area. Coordinates all project phases with federal, state, and tribal agencies to build partnerships and to provide quality construction. Advises the contracting officer on all project information, acting as a liason through all project stages. Conducts site scoping, quality assurance inspections, and final inspections of completed construction. Reviews and approves project budgets, invoices, and schedules.
4	34th Engineering Command	Fort Brady	Serves as a project manager for the USACE, [REDACTED] district. Responsible for supervising construction and renovation projects throughout [REDACTED] and the INDOPACOM area. Coordinates all project phases with federal, state, and tribal agencies to build partnerships and to provide quality construction. Advises the contracting officer on all project information, acting as a liason through all project stages. Conducts site scoping, quality assurance inspections, and final inspections of completed construction. Reviews and approves project budgets, invoices, and schedules.
5	1st Brigade, 7th Armored Division	Fort Buckner	Senior Advisor to the Commander, [REDACTED] National Guard Aviation Brigade (a Major General by MTOE). Responsible for the timely acquisition, delivery, training, and support for a large [REDACTED] aviation modernization program. Advises senior [REDACTED] partners and logistics contractors. Coordinates subordinate command and staff elements in the tactical employment of aviation combat systems. Partners with [REDACTED] BCT and their ground advisors in the safe execution of Air Ground Integration / collective training events.
6	1st Brigade, 7th Armored Division	Fort Buckner	Senior Advisor to the Commander, [REDACTED] National Guard Aviation Brigade (a Major General by MTOE). Responsible for the timely acquisition, delivery, training, and support for a large [REDACTED] aviation modernization program. Advises senior [REDACTED] partners and logistics contractors. Coordinates subordinate command and staff elements in the tactical employment of aviation combat systems. Partners with [REDACTED] BCT and their ground advisors in the safe execution of Air Ground Integration / collective training events.
7	1st Brigade, 7th Armored Division	Fort Buckner	Senior Advisor to the Commander, [REDACTED] National Guard Aviation Brigade (a Major General by MTOE). Responsible for the timely acquisition, delivery, training, and support for a large [REDACTED] aviation modernization program. Advises senior [REDACTED] partners and logistics contractors. Coordinates subordinate command and staff elements in the tactical employment of aviation combat systems. Partners with [REDACTED] BCT and their ground advisors in the safe execution of Air Ground Integration / collective training events.
8	3rd Brigade, 9th Infantry Division	Fort Mackinac	Plans, organizes, and supervises the preparation and execution of unit movement and operations. Coordinates deployment and distribution actions across agencies. Prepares and validates deployment plans. Documents Army deployment and distribution.
9	3rd Brigade, 9th Infantry Division	Fort Mackinac	Plans, organizes, and supervises the preparation and execution of unit movement and operations. Coordinates deployment and distribution actions across agencies. Prepares and validates deployment plans. Documents Army deployment and distribution.

Notes: This table contains example descriptions of identical jobs that belong to the same unit within the same market. Unit names and Army locations have been adjusted for security purposes but remain the same across identical jobs. Some items within job descriptions are also redacted for security reasons.

Table D.10: Heterogeneity by Average Unit Participation At The Market Level

Outcome	Control Mean (1)	Effect of DA Low Part Markets (2)	Effect of DA High Part Markets (3)	P-value (2) vs. (3) (4)
Panel A: Retention				
Share in Army in September 2020	0.985	0.007*	0.001	0.217
		(0.004)	(0.003)	
Share in Army in September 2021	0.934	0.018**	0.004	0.202
		(0.008)	(0.006)	
Share in Army in September 2022	0.849	0.018*	-0.009	0.047
		(0.009)	(0.008)	
Panel B: Performance in First Year				
Officer Received an Evaluation (2021)	0.890	0.011	0.015	0.835
		(0.011)	(0.014)	
Share Evals "Most Qualified" (2021)	0.483	-0.012	-0.001	0.665
		(0.014)	(0.015)	
Panel C: Performance in Second Year				
Officer Received an Evaluation (2022)	0.806	0.024	0.006	0.380
		(0.017)	(0.010)	
Share Evals "Most Qualified" (2022)	0.498	-0.016	-0.006	0.702
		(0.020)	(0.014)	
Panel D: Promotion Outcomes				
Promoted (Sept. 2022)	0.296	-0.006	0.013	0.429
		(0.019)	(0.011)	
Has Promotion Board Percentile (Sept 2022)	0.321	-0.012	0.013	0.222
		(0.013)	(0.014)	
Promotion Board Percentile (Sept 2022)	0.497	0.023**	-0.004	0.043
		(0.011)	(0.007)	
Panel E: Strategic Preferences				
Is officer in the survey data?	0.874	-0.012	0.017*	0.169
		(0.017)	(0.010)	
If guaranteed, would job be ranked #1?	0.844	0.017	0.008	0.563
		(0.011)	(0.009)	
Extent preferences reflect your truth? (Standardized)	0.000	0.091***	0.017	0.050
		(0.028)	(0.024)	
Submitted preferences always reflect true preferences	0.238	0.038***	0.013	0.076
		(0.011)	(0.009)	
Did you rank any job higher because units see if in your top 10%?	0.545	-0.023	-0.028**	0.832
		(0.018)	(0.014)	
If guaranteed, would job be ranked #1? (Feb 2020)	0.694	0.020	-0.027*	0.202
		(0.029)	(0.016)	
Did you rank any position higher because units can see if they're in your top 10%	0.449	0.010	-0.003	0.614
		(0.018)	(0.017)	

Notes: This table shows the impact of matching with DA for markets with an above-median level of average unit participation and for markets with a below-median level of average unit participation. Each row reports estimates from a regression of the outcome variable identified in the left column on the interaction of an indicator for being in a DA market with an indicator for the market having an above-median level of average unit participation (within rank), another interaction of an indicator for being in a DA market with an indicator for the market having an average unit participation measure that is equal to or below the median (within rank). All regressions control for baseline covariates described in section 4 and strata fixed effects, similar to Equation (1). We construct the average unit participation measure by first calculating the average share of officers that the unit ranked among jobs that belong to the unit but that are in other markets. We then calculate the market-level of participation as the average of unit-level participation among all units in each market, weighted by the number of jobs that belong to each unit. See the notes for Table 4 for additional details on the construction of outcomes. Standard errors, clustered by market, are reported in parentheses. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.11: Descriptive Statistics and Balance on Unit Participation Measure

	High Part Market Mean	Low Part Market Mean	Regression Adj. Difference	SE	*P*-value	*N*
Panel A: Officer Characteristics						
Female	0.151	0.128	-0.027	0.018	0.122	9,577
White	0.648	0.681	-0.008	0.023	0.734	9,577
Black	0.163	0.132	0.014	0.016	0.387	9,577
Hispanic	0.097	0.096	-0.006	0.009	0.523	9,577
Married	0.729	0.779	-0.013	0.011	0.229	9,577
Children	0.605	0.648	-0.003	0.016	0.851	9,577
Married with Children	0.557	0.602	0.001	0.014	0.942	9,577
Birth year 1962-1966	0.005	0.00	-0.001	0.002	0.607	9,577
Birth year 1967-1971	0.037	0.042	0.003	0.005	0.527	9,577
Birth year 1972-1976	0.107	0.118	0.004	0.010	0.686	9,577
Birth year 1977-1981	0.219	0.258	-0.015	0.014	0.288	9,577
Birth year 1982-1986	0.290	0.292	0.001	0.017	0.949	9,577
Birth year 1987-1991	0.212	0.179	0.004	0.013	0.751	9,577
Birth year 1992-1996	0.128	0.100	0.006	0.012	0.625	9,577
ROTC	0.558	0.493	0.003	0.014	0.857	9,577
USMA	0.116	0.170	-0.045***	0.016	0.008	9,577
Performance Quartile 1	0.238	0.188	0.029	0.018	0.107	8,759
Performance Quartile 2	0.246	0.247	-0.020*	0.011	0.073	8,759
Performance Quartile 3	0.262	0.261	-0.000	0.011	0.992	8,759
Performance Quartile 4	0.254	0.305	-0.009	0.018	0.611	8,759
More than 3 years in the current rank	0.494	0.509	-0.008	0.019	0.680	9,565
Joint Test, Officer Characteristics					0.000	9,577
Panel B: Market Characteristics						
Number of Officers	94.509	72.241	10.000	19.730	0.614	115
Number of Jobs	117.544	115.440	-3.173	24.557	0.898	115
Joint Test, Market Size					0.572	115
Panel C: Career Manager Characteristics						
CM is Experienced					0.939	109
CM is Below Median Age					0.777	109
CM is White					0.334	109
CM is Black					0.216	109
CM is Hispanic					0.800	109
CM is Female					0.923	109
CM is USMA Commission					0.190	109
CM is ROTC Commission					0.159	109
Joint Test, Manager Chars.					0.510	109

Notes: This table compares characteristics of participating officers, market composition, and career managers between markets with an above-median level of average unit participation and markets with a below-median level of average unit participation. Regression adjusted differences and standard errors are estimated from a regression of each characteristic on an indicator for the market having an above-median level of average unit participation and strata fixed effects for every combination of rank and skill group (described in Section 3). Standard errors are clustered by market. The joint test is from an F-test on the null hypothesis that all of the baseline covariates in the panel are zero in a regression of above-median average unit participation on the baseline covariates and strata fixed effects with inference clustered by market. For the joint test, missing values of each covariate are imputed with the mean of the covariate within the market and a missing indicator is added to the covariates included in the joint test. Observations in Panel C are weighted by the number of officers in the market. Panel C only reports p-values and the number of observations because privacy restrictions prevent us from reporting summary statistics on career managers. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.12: Robustness of Heterogeneity by Average Unit Participation At The Market Level

Outcome	Baseline Estimates			$+\mathbb{1}((\text{USMA})\times(\text{DA}))$		
	Eff. of DA Low Part. (1)	Eff. of DA High Part. (2)	P-value (2) v. (3) (3)	Eff. of DA Low Part. (4)	Eff. of DA High Part. (5)	P-value (4) v. (5) (6)
Panel A: Retention						
Share in Army in September 2020	0.007*	0.001	0.217	0.009**	0.002	0.144
	(0.004)	(0.003)		(0.004)	(0.003)	
Share in Army in September 2021	0.018**	0.004	0.202	0.021**	0.006	0.177
	(0.008)	(0.006)		(0.009)	(0.006)	
Share in Army in September 2022	0.018*	-0.009	0.047	0.017	-0.009	0.051
	(0.009)	(0.008)		(0.011)	(0.009)	
Panel B: Performance in First Year						
Officer Received an Evaluation (2021)	0.011	0.015	0.835	0.013	0.017	0.868
	(0.014)	(0.011)		(0.014)	(0.012)	
Share Evals "Most Qualified" (2021)	-0.012	-0.001	0.665	-0.006	0.002	0.725
	(0.015)	(0.014)		(0.016)	(0.015)	
Panel C: Performance in Second Year						
Officer Received an Evaluation (2022)	0.024	0.006	0.380	0.023	0.006	0.383
	(0.017)	(0.010)		(0.016)	(0.010)	
Share Evals "Most Qualified" (2022)	-0.016	-0.006	0.702	-0.003	0.002	0.845
	(0.020)	(0.014)		(0.021)	(0.014)	
Panel D: Promotion Outcomes						
Promoted (Sept. 2022)	-0.006	0.013	0.429	-0.010	0.010	0.387
	(0.019)	(0.011)		(0.019)	(0.012)	
Has Promotion Board Percentile (Sept 2022)	-0.012	0.013	0.222	-0.015	0.011	0.195
	(0.013)	(0.014)		(0.013)	(0.015)	
Promotion Board Percentile (Sept 2022)	0.023**	-0.004	0.043	0.026**	-0.003	0.038
	(0.011)	(0.007)		(0.012)	(0.008)	
Panel E: Strategic Preferences						
Is officer in the survey data?	-0.012	0.017*	0.169	-0.007	0.020**	0.207
	(0.017)	(0.010)		(0.019)	(0.009)	
If guaranteed, would job be ranked #1?	0.017	0.008	0.563	0.015	0.007	0.596
	(0.011)	(0.009)		(0.012)	(0.009)	
Extent preferences reflect your truth? (Standardized)	0.091***	0.017	0.050	0.100***	0.022	0.039
	(0.028)	(0.024)		(0.030)	(0.025)	
Submitted preferences always reflect true preferences	0.038***	0.013	0.076	0.038***	0.013	0.072
	(0.011)	(0.009)		(0.011)	(0.009)	
Did you rank any job higher because units see if in your top 10%?	-0.023	-0.028**	0.832	-0.019	-0.026*	0.775
	(0.018)	(0.014)		(0.019)	(0.015)	
If guaranteed, would job be ranked #1? (Feb 2020)	0.020	-0.027*	0.202	0.017	-0.028	0.199
	(0.029)	(0.016)		(0.027)	(0.017)	
Did you rank any position higher because units can see if they're in your top 10%	0.010	-0.003	0.614	0.007	-0.005	0.642
	(0.018)	(0.017)		(0.020)	(0.017)	

Notes: Columns (1)-(3) replicate columns (2)-(4) of Table D.10. Columns (4)-(6) replicate columns (2)-(4) of Table D.10, but with an additional interaction of the officer being a graduate of the United States Military Academy at West Point (USMA) with an indicator for being in a DA market. All regressions control for baseline covariates described in section 4 and strata fixed effects (as in Equation (1)). Standard errors clustered by market. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.13: Heterogeneity by Career Manager Experience And Unit Participation

Outcome	Effect of DA Inexp CM Low Part (1)	Effect of DA Inexp CM High Part (2)	Effect of DA Exp CM Low Part (3)	Effect of DA Exp CM High Part (4)	P-value (1) v. (2) (5)	P-value (1) v. (3) (6)	P-value (1) v. (4) (7)
Panel A: Retention							
Share in Army in September 2020	0.015***	0.007	-0.006	-0.013**	0.246	0.009	0.003
	(0.005)	(0.005)	(0.005)	(0.006)			
Share in Army in September 2021	0.030***	0.004	0.005	-0.008	0.032	0.114	0.052
	(0.009)	(0.008)	(0.014)	(0.016)			
Share in Army in September 2022	0.035***	-0.031***	-0.005	0.014	0.001	0.035	0.309
	(0.013)	(0.011)	(0.015)	(0.017)			
Panel B: Performance in First Year							
Officer Received an Evaluation (2021)	0.029	0.008	-0.023	0.023	0.513	0.065	0.817
	(0.021)	(0.018)	(0.015)	(0.017)			
Share Evals "Most Qualified" (2021)	0.018	-0.045*	-0.063***	0.054**	0.067	0.007	0.199
	(0.017)	(0.024)	(0.021)	(0.024)			
Panel C: Performance in Second Year							
Officer Received an Evaluation (2022)	0.056***	0.003	-0.026	-0.001	0.046	0.018	0.077
	(0.020)	(0.015)	(0.030)	(0.024)			
Share Evals "Most Qualified" (2022)	-0.021	-0.049**	0.002	0.046	0.409	0.581	0.075
	(0.021)	(0.023)	(0.034)	(0.030)			
Panel D: Promotion Outcomes							
Promoted (Sept. 2022)	0.054***	-0.013	-0.107***	0.060**	0.032	0.000	0.864
	(0.020)	(0.020)	(0.026)	(0.023)			
Has Promotion Board Percentile (Sept 2022)	0.018	-0.024	-0.059***	0.074**	0.070	0.003	0.075
	(0.015)	(0.015)	(0.019)	(0.029)			
Promotion Board Percentile (Sept 2022)	0.041***	-0.003	-0.005	-0.010	0.044	0.058	0.020
	(0.014)	(0.014)	(0.017)	(0.014)			
Panel E: Survey Questions on Strategic Behavior							
Is officer in the survey data?	-0.016	0.039**	-0.010	-0.015	0.122	0.851	0.980
	(0.024)	(0.020)	(0.021)	(0.022)			
If guaranteed, would job be ranked #1?	0.035**	-0.001	-0.014	0.027	0.137	0.031	0.746
	(0.015)	(0.017)	(0.016)	(0.021)			
Extent preferences reflect your truth? (Standardized)	0.129***	0.005	0.025	0.057	0.026	0.083	0.178
	(0.035)	(0.040)	(0.046)	(0.040)			
Submitted preferences always reflect true preferences	0.038***	-0.001	0.028*	0.048***	0.092	0.659	0.688
	(0.014)	(0.018)	(0.017)	(0.018)			
Did you rank a job higher because units see your top 10%?	0.011	-0.046*	-0.079**	-0.015	0.106	0.025	0.458
	(0.021)	(0.027)	(0.031)	(0.025)			
Is officer in the survey data? (Feb 2020)	-0.002	0.269***	-0.163**	-0.194**	0.032	0.162	0.096
	(0.083)	(0.093)	(0.066)	(0.079)			
If guaranteed, would job be ranked #1? (Feb 2020)	0.005	-0.030	0.029	-0.010	0.285	0.626	0.720
	(0.025)	(0.022)	(0.048)	(0.029)			

Notes: This table reports heterogeneity in the impact of matching with DA by both career manager experience and market-level average unit participation. Each row reports estimates from a regression of the outcome variable identified in the left column on the interaction of an indicator for being in a DA market with an indicator for the market being managed by an inexperienced manager and being a low unit participation market, an interaction of an indicator for being in a DA market with an indicator for the market being managed by an inexperienced manager and being a high unit participation market, an interaction an indicator for being in a DA market with an indicator for the market being managed by an experienced manager and being a low unit participation market, an interaction of indicator for being in a DA market with an indicator for the market being managed by an inexperienced manager and being a low unit participation market, an interaction for the market having an experienced manager and being a high unit participation market, and separate main effects for whether the market has an experienced manager and whether the market is a high unit participation market. All regressions control for baseline covariates described in section 4 and strata fixed effects, similar to Equation (1), and exclude 49 observations from 6 markets where we are unable to identify the market's career manager. See the notes for Tables 4, 5, and D.10 for additional details. Standard errors, clustered by market, are reported in parentheses. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.14: Heterogeneity by officers' sex, race, and marital status

Outcome	Sex			Race			Marital Status		
	Female Coefficient (1)	Male Coefficient (2)	P-value (1) vs. (2) (3)	White Coefficient (4)	Non-White Coefficient (5)	P-value (4) vs. (5) (6)	Married Coefficient (7)	Not Married Coefficient (8)	P-value (7) vs. (8) (9)
Panel A: Retention									
Share in Army in September 2020	0.006	0.003	0.625	0.003	0.005	0.663	0.004	0.001	0.602
	(0.006)	(0.003)		(0.003)	(0.004)		(0.003)	(0.006)	
Share in Army in September 2021	0.026*	0.008	0.218	0.010*	0.012	0.894	0.013**	0.004	0.580
	(0.013)	(0.005)		(0.006)	(0.008)		(0.005)	(0.014)	
Share in Army in September 2022	0.020	0.001	0.250	-0.000	0.010	0.574	0.006	-0.006	0.437
	(0.015)	(0.006)		(0.008)	(0.013)		(0.007)	(0.014)	
Panel B: Performance in First Year									
Officer Received an Evaluation (2021)	0.021	0.012	0.559	0.015*	0.010	0.686	0.018**	-0.002	0.153
	(0.015)	(0.008)		(0.008)	(0.011)		(0.008)	(0.014)	
Share of Evaluations that are "Most Qualified" (2021)	0.005	-0.008	0.559	-0.001	-0.015	0.456	-0.006	-0.007	0.947
	(0.020)	(0.008)		(0.009)	(0.016)		(0.010)	(0.017)	
Panel C: Performance in Second Year									
Officer Received an Evaluation (2022)	0.026	0.012	0.595	0.012	0.019	0.673	0.017*	0.006	0.540
	(0.025)	(0.009)		(0.011)	(0.015)		(0.009)	(0.018)	
Share of Evaluations that are "Most Qualified" (2022)	0.004	-0.012	0.632	-0.011	-0.008	0.908	-0.010	-0.012	0.927
	(0.031)	(0.012)		(0.014)	(0.021)		(0.012)	(0.021)	
Panel D: Promotion Outcomes									
Promoted (Sept. 2022)	-0.038	0.011	0.073	0.004	0.006	0.894	0.004	0.005	0.940
	(0.025)	(0.010)		(0.011)	(0.014)		(0.011)	(0.013)	
Has Promotion Board Percentile (Sept 2022)	-0.030	0.007	0.069	0.001	0.004	0.773	0.004	-0.007	0.386
	(0.020)	(0.009)		(0.010)	(0.012)		(0.010)	(0.013)	
Promotion Board Percentile (Sept 2022)	0.013	0.007	0.792	0.007	0.010	0.846	0.005	0.022	0.342
	(0.020)	(0.007)		(0.008)	(0.013)		(0.007)	(0.016)	

Notes: This table shows the impact of matching with DA among officers from the subgroups identified in column headings. All regressions control for baseline covariates described in section 4 and strata fixed effects, similar to Equation (1). See the notes for Table 4 for additional details on the construction of outcomes. Standard errors, clustered by market, are reported in parentheses. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.15: Heterogeneity by officers' baseline performance, experience, and occupation

Outcome	Combat Occupation			Time in Grade			Performance		
	Combat Coefficient	Non-Combat Coefficient	P-value (1) vs. (2)	Greater Than 3 Years in Grade	Less Than 3 Years in Grade	P-value (4) vs. (5)	First and Second Performance Quartiles	Third and Fourth Performance Quartiles	P-value (7) vs. (8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Retention									
Share in Army in September 2020	-0.003	0.007**	0.040	0.005	0.002	0.548	0.003	0.004	0.872
	(0.004)	(0.003)		(0.004)	(0.003)		(0.004)	(0.003)	
Share in Army in September 2021	0.006	0.013***	0.473	0.008	0.013*	0.661	0.014*	0.006	0.444
	(0.009)	(0.005)		(0.008)	(0.007)		(0.008)	(0.007)	
Share in Army in September 2022	0.012	-0.002	0.255	-0.008	0.015	0.169	0.011	-0.005	0.241
	(0.011)	(0.007)		(0.010)	(0.010)		(0.009)	(0.009)	
Panel B: Performance in First Year									
Officer Received an Evaluation (2021)	0.010	0.015	0.734	0.024*	0.003	0.236	0.023**	0.006	0.241
	(0.011)	(0.010)		(0.012)	(0.011)		(0.012)	(0.010)	
Share of Evaluations that are "Most Qualified" (2021)	-0.003	-0.008	0.726	-0.002	-0.009	0.801	0.021	-0.025*	0.057
	(0.009)	(0.011)		(0.016)	(0.017)		(0.015)	(0.014)	
Panel C: Performance in Second Year									
Officer Received an Evaluation (2022)	0.018	0.012	0.743	0.028*	0.001	0.319	0.022	0.012	0.702
	(0.014)	(0.012)		(0.016)	(0.017)		(0.017)	(0.014)	
Share of Evaluations that are "Most Qualified" (2022)	-0.023	-0.003	0.409	-0.009	-0.012	0.915	0.019	-0.026	0.170
	(0.020)	(0.013)		(0.020)	(0.018)		(0.021)	(0.020)	
Panel D: Promotion Outcomes									
Promoted (Sept. 2022)	0.005	0.004	0.938	0.009	-0.000	0.843	0.014	-0.005	0.474
	(0.016)	(0.012)		(0.026)	(0.025)		(0.018)	(0.017)	
Has Promotion Board Percentile (Sept 2022)	-0.010	0.009	0.243	0.012	-0.010	0.634	0.011	0.003	0.729
	(0.012)	(0.012)		(0.026)	(0.024)		(0.017)	(0.013)	
Promotion Board Percentile (Sept 2022)	0.010	0.006	0.813	0.005	0.048	0.220	0.013	0.004	0.490
	(0.010)	(0.009)		(0.007)	(0.033)		(0.010)	(0.009)	

Notes: This table shows the impact of matching with DA among officers from the subgroups identified in column headings. All regressions control for baseline covariates described in section 4 and strata fixed effects, similar to Equation (1). Combat occupations include infantry, armor, special forces, engineers, field artillery, air defense artillery, and aviation. See the notes for Table 4 for additional details on the construction of outcomes. Standard errors, clustered by market, are reported in parentheses. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table D.16: October-December 2020 Marketplace Officer Survey Response

Survey Question	Yes	No	N
Q4: During the market did you ever alter your assignment preferences in an attempt to secure a "one to one" match?	66%	34%	3,894
Q3: If the Army could guarantee you orders to ANY assignment in your AIM2 marketplace as long as you ranked it number one, would you change the job you ranked #1	46%	54%	3,896

Notes: This table reports results from a survey administered to officers in markets that took place from October through December 2020, one year after the marketplace in the randomized trial. The results are from officers who were in the same rank and occupation as officers in the treated (DA) markets of the randomized trial. There were 5,116 officers in such markets from October-December 2020, of which 3,896 (76%) responded to the survey. All officers in October-December 2020 markets were matched to jobs according to DA.

Table D.17: October-December 2021 Marketplace Officer Survey Response

Survey Question	Percent Yes	Percent No	N
Q1: During the market did you ever alter your assignment preferences in an attempt to secure a one to one match?	58%	42%	2,745
Q2: Where does the position you listed as #1 in the AIM Marketplace fall on your true preference list?			2745
My #1 Preference was truly my #1 preference	62%		1712
One of my top three preferences	21%		579
One of my top five preferences	7%		185
One of my top ten preferences	5%		128
Outside my top 10 preferences	5%		141

Notes: This table reports results from a survey administered to officers in markets that took place from October through December 2021, two years after the marketplace in our experiment. The results are from officers who were in the same rank and occupation as officers in the treated (DA) markets of the randomized trial. There were 3,932 officers in such markets from October-December 2021, of which 2,745 (70%) responded to the survey. All officers in October-December 2021 markets were matched to jobs according to DA.

Table D.18: Additional October-December 2020 Marketplace Officer Survey Responses

	Q4 Resp: "Yes" (N = 2,555)		Q4 Resp: "No" (N = 1,339)	
Survey Question	Yes	No	Yes	No
Q3: If the Army could guarantee you orders to ANY assignment in your AIM2 marketplace as long as you ranked it number one, would you change the job you ranked #1?	53%	47%	34%	66%
Q5: Did you rank any position higher because units see if you ranked one of their positions among your top 10% of possible choices?	67%	33%	32%	68%

Notes: This table reports results from a survey administered to officers in markets that took place from October through December 2020, one year after the marketplace in the randomized trial. The results are split by officers' responses to Question 4 of the same survey, which asks officers if they ever altered their assignment preferences in an attempt to secure a one to one match (see Table D.16).

Table D.19: Additional October-December 2021 Marketplace Officer Survey Responses

	Q1 Resp: "Yes" (N = 1,581)	Q1 Resp: "No" (N = 1,164)
Survey Question		
Q3: Where does the position you listed as #1 in the AIM Marketplace fall on your true preference list?		
My #1 Preference was truly my #1 preference	53%	76%
One of my top three preferences	28%	12%
One of my top five preferences	9%	4%
One of my top ten preferences	6%	3%
Outside my top 10 preferences	4%	6%

Notes: This table reports results from a survey administered to officers in markets that took place from October through December 2021, two years after the marketplace in the randomized trial. The results are split by officers' responses to Question 1 of the same survey, which asks officers if they ever altered their assignment preferences in an attempt to secure a one to one match (see Table D.17).

Table D.20: Determinants of Officer Preferences

	DA Markets			Control Markets		
Covariate	-1(Officer Rank for Job)	Ranked Job #1	Ranked Job #2	-1(Officer Rank for Job)	Ranked Job #1	Ranked Job #2
In Birth State	7.008**	0.331***	0.269***	12.531***	0.290***	0.236***
	(3.546)	(0.052)	(0.050)	(2.799)	(0.050)	(0.049)
In Spouse Birth State	9.635***	0.441***	0.358***	7.411**	0.389***	0.314***
	(3.724)	(0.071)	(0.068)	(3.651)	(0.060)	(0.058)
In Own and Spouse Birth State	1.761	0.132	0.173	-4.815	0.429**	0.268*
	(9.377)	(0.173)	(0.165)	(6.852)	(0.169)	(0.155)
Operational Unit	6.405***	0.019	0.015	18.434***	0.036***	0.038***
	(1.940)	(0.014)	(0.014)	(1.490)	(0.013)	(0.013)
Airborne Unit	2.552	0.036	-0.001	19.483***	0.015	-0.012
	(2.797)	(0.039)	(0.036)	(1.991)	(0.037)	(0.036)
Midwestern Region	15.005***	0.087**	0.078**	24.455***	0.052	0.098***
	(1.792)	(0.038)	(0.036)	(1.757)	(0.035)	(0.034)
Southern Region	28.421***	0.173***	0.246***	29.857***	0.136***	0.134***
	(2.086)	(0.037)	(0.036)	(1.998)	(0.037)	(0.035)
Western Region	24.737***	0.181***	0.240***	25.698***	0.143***	0.186***
	(2.054)	(0.037)	(0.036)	(1.921)	(0.038)	(0.036)
Asia	-6.110*	0.071*	0.094***	-3.533	0.019	0.021
	(3.222)	(0.037)	(0.035)	(2.940)	(0.037)	(0.035)
Europe	42.351***	0.363***	0.446***	43.395***	0.371***	0.345***
	(3.676)	(0.042)	(0.041)	(2.616)	(0.043)	(0.041)
Global South	14.723***	0.376***	0.297***	16.957***	0.126*	0.145**
	(3.873)	(0.104)	(0.087)	(3.341)	(0.071)	(0.070)
Coastal County	20.063***	0.134***	0.147***	20.267***	0.130***	0.160***
	(1.280)	(0.018)	(0.018)	(1.249)	(0.017)	(0.017)
County Income (Standardized)	3.263***	0.025**	0.030***	1.228***	0.021**	0.010
	(0.445)	(0.011)	(0.011)	(0.464)	(0.010)	(0.010)
County Population (Standardized)	3.254***	0.040***	0.047***	3.625***	0.038***	0.031***
	(0.487)	(0.010)	(0.010)	(0.561)	(0.009)	(0.009)
County Share College+ (Standardized)	-0.301	0.030***	0.025***	3.539***	0.008	0.022**
	(0.433)	(0.009)	(0.009)	(0.558)	(0.009)	(0.009)
County Mean Winter Temp (Standardized)	-7.848***	-0.010	-0.030**	-5.274***	-0.015	0.013
	(0.737)	(0.014)	(0.014)	(0.795)	(0.014)	(0.014)
County Mean Summer Temp (Standardized)	2.713***	-0.026*	-0.025*	-0.800	-0.036***	-0.044***
	(0.680)	(0.013)	(0.013)	(0.871)	(0.013)	(0.013)
Observations	320700	1072727	1068468	402678	1111526	1107265
R-Squared	0.494	0.009	0.009	0.417	0.008	0.008

Notes: Each column of this table reports results from a regression of the outcome listed in the column heading on the job characteristics listed in the left-most column. In the first column, we multiply officers' preferences for jobs by -1 so that a positive point estimate implies that the characteristic is associated with jobs that officers prefer more. Results are constructed from a sample that includes one observation for every possible officer-by-job pairing. All regressions include fixed effects for the state the job is located in and officer fixed effects. Standard errors are clustered on officer. The variable "In Birth State" indicates if the job is located in the officer's state of birth. Winter and summer temperatures were measured in 2016. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

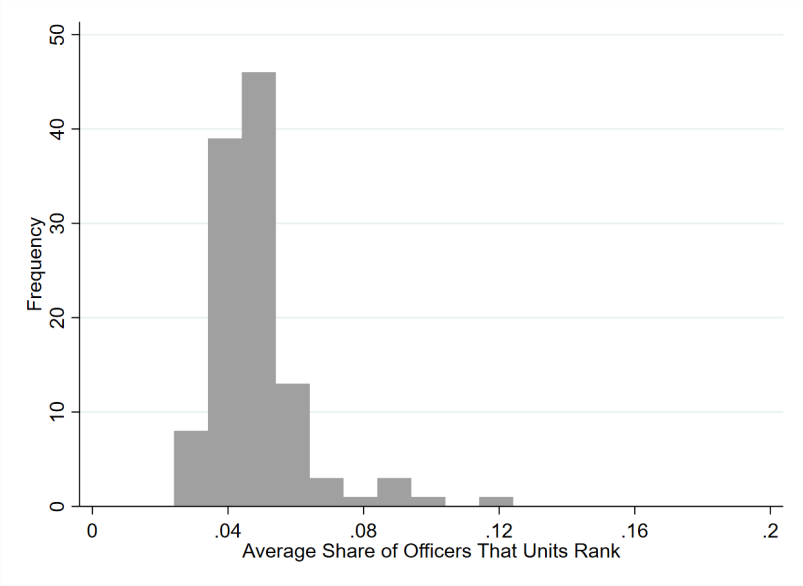
Table D.21: Determinants of Unit Preferences

	DA Markets			Control Markets		
Covariate	-1(Unit Rank for Job)	Unit Preferenced Officer	Unit Ranked Officer #1	-1(Unit Rank for Job)	Unit Preferenced Officer	Unit Ranked Officer #1
Female	0.414**	0.442***	0.099***	-0.076	0.279***	0.070***
	(0.207)	(0.062)	(0.017)	(0.170)	(0.069)	(0.018)
Black	0.373**	-0.298***	-0.063***	-0.378**	-0.320***	-0.081***
	(0.180)	(0.062)	(0.017)	(0.177)	(0.061)	(0.017)
Hispanic	-0.239	-0.277***	-0.036*	-0.288	-0.168**	-0.055***
	(0.206)	(0.067)	(0.020)	(0.192)	(0.073)	(0.020)
Other Race	-0.069	-0.243***	-0.019	-0.140	-0.015	-0.035*
	(0.195)	(0.068)	(0.022)	(0.192)	(0.070)	(0.020)
Married	0.035	0.024	0.012	-0.360**	0.152**	0.031*
	(0.181)	(0.055)	(0.016)	(0.173)	(0.059)	(0.017)
Children	0.052	-0.393***	-0.039	-0.286	-0.105	-0.017
	(0.311)	(0.094)	(0.030)	(0.320)	(0.101)	(0.029)
Married w/ Children	0.242	0.587***	0.086**	0.886***	0.156	0.041
	(0.351)	(0.106)	(0.034)	(0.339)	(0.111)	(0.032)
>3 Years in Rank	-0.045	0.652***	0.044***	0.099	0.187*	0.032**
	(0.241)	(0.111)	(0.015)	(0.229)	(0.100)	(0.015)
ROTC	0.666***	0.038	0.005	-0.230	0.105*	0.021
	(0.171)	(0.060)	(0.017)	(0.170)	(0.056)	(0.016)
USMA	0.204	0.047	0.017	0.116	0.186**	-0.002
	(0.223)	(0.083)	(0.026)	(0.204)	(0.079)	(0.024)
2nd Perf Quartile	0.787***	0.355***	0.066***	0.667***	0.432***	0.048***
	(0.179)	(0.057)	(0.016)	(0.178)	(0.059)	(0.016)
3rd Perf Quartile	0.853***	0.688***	0.145***	0.816***	0.739***	0.146***
	(0.185)	(0.065)	(0.018)	(0.174)	(0.064)	(0.017)
Top Perf Quartile	0.991***	0.794***	0.205***	1.011***	0.868***	0.194***
	(0.202)	(0.076)	(0.020)	(0.187)	(0.073)	(0.018)
Observations	51615	1148726	1148726	52259	1171117	1171117
R-Squared	0.582	0.074	0.010	0.547	0.071	0.010

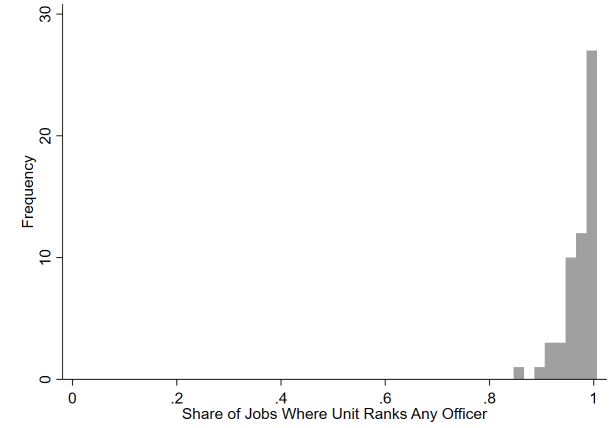
Notes: Each column of this table reports results from a regression of the outcome listed in the column heading on the officer characteristics listed in the left-most column. In the first column, we multiply units' preferences for officers by -1 so that a positive point estimate implies that the characteristic is associated with officers that units prefer more. Results are constructed from a sample that includes one observation for every possible officer-by-job pairing. All regressions include job fixed effects and cluster standard errors on the job. Winter and summer temperatures were measured in 2016. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Figure D.1: Distribution of Unit Participation Across Markets

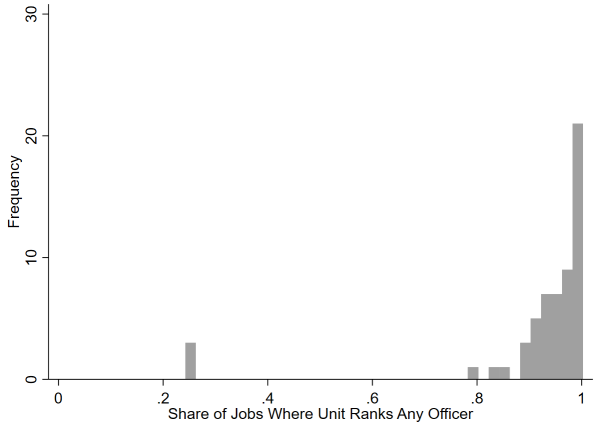
(a) Distribution of Average Unit Participation Across Markets



(b) Any Participation: High Part. Markets



(c) Any Participation: Low Part. Markets



Notes: Panel A reports the distribution of the market-level measure of unit participation described in Section 6.2. To construct the unit participation measure, we first calculate the average share of officers that the unit ranked among jobs that belong to the unit but that are in other markets. We then calculate the market-level of participation as the average of unit-level participation among all units in each market, weighted by the number of jobs that belong to each unit. Panel B reports the distribution of the share of jobs where a unit preferences any officer in their marketplace when restricting the sample to markets with an average unit participation measure that exceeds the median of the unit participation measure across all markets with jobs in the same rank. Panel C reports the distribution of the share of jobs where a unit preferences any officer in their marketplace when restricting the sample to markets with an average unit participation measure that is equal to or below the median of the unit participation measure across all markets with jobs in the same rank.

Figure D.2: Army Marketplace User Agreement (Implemented Prior to 2021 Marketplace)

ATAP User Agreement

Introduction – ATAP is About Trust.

Trust is the lifeblood of our profession. In fact, trust-building is a big part of why we've created the Army Talent Alignment Process (ATAP) – to increase talent alignment, transparency, and trust. These benefits make the Army more effective, but only if all ATAP users behave honestly and ethically.

"Honest and Ethical" Means Living the Army Values AND Following Marketplace Rules.

ATAP functions best when units and officers trust the assignment marketplace enough to share accurate and granular talent information, resulting in better talent alignment. To build and safeguard that trust, the Army has created a set of **marketplace rules** governing all ATAP interactions. Grounded in applicable federal EO/EEO guidelines and DoD/Army policy, these rules apply to **ALL parties**. Ignoring these rules not only reduces trust but **may have legal consequences** as well.

Marketplace Rules - The "DOs and DON'Ts"

Respect the confidentiality of preferences.

While units and officers may verbally express interest in each other, neither party will ask the other to disclose their preferences in any way. Officer and unit preferences are strictly **confidential**.

Protect officers from retaliation.

Officers expressing good faith concerns with the marketplace will **not** be penalized or retaliated against by units/commanders during the hiring process, to include intentional mischaracterizations of their abilities or motivations.

Don't ask coercive or illegal interview questions.

This includes questions regarding age, gender, religion, sexual orientation, and marital or family status. To prevent this from occurring, units should consider using standardized, prescreened interview questions for all job candidates.

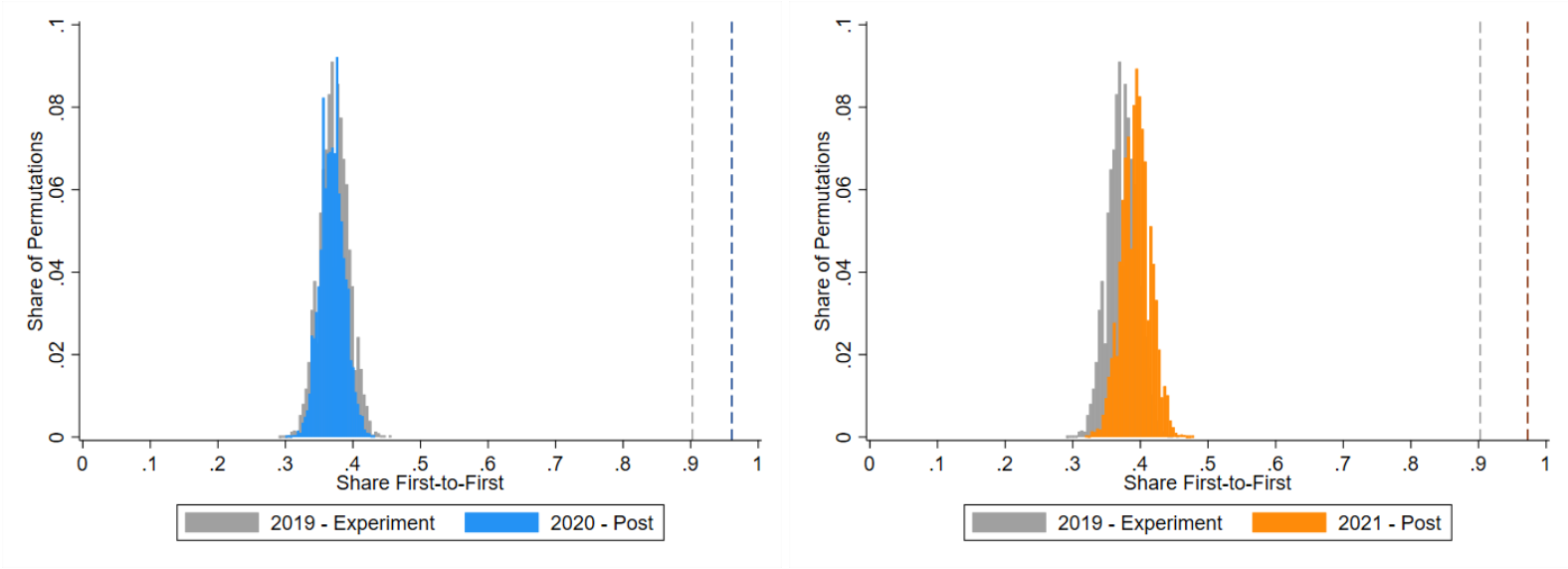
Don't ask for evaluation reports.

While officers may elect to share OERs voluntarily, units cannot compel them to do so, nor may units ask HRC for access to OERs.

Summing Up. The Army is committed to ensuring that ATAP is an inclusive, fair, and professionally rewarding experience for all parties. To help ensure this, please report conduct that is inconsistent with this User Agreement at the link below. Prior to filing a report, we encourage you to review the frequently asked questions.

Notes: All participants in the marketplace that opened in October 2021 were required to acknowledge the user agreement above the first time they logged into the online platform. The marketplace that opened in October 2021 was the second major marketplace after the randomized trial and used DA for all markets.

Figure D.3: Preference Coordination Tests: Post-Experiment Markets

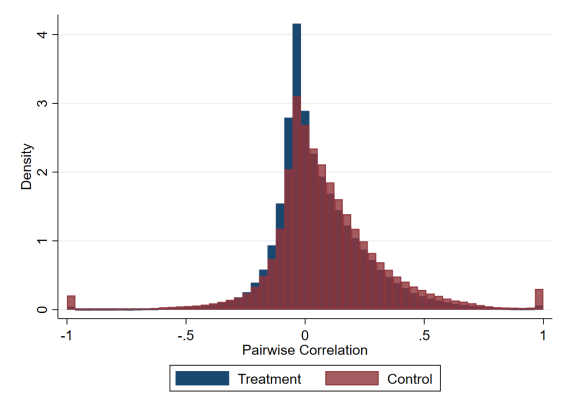


(a) First Post-Experiment Market (Oct 2020)

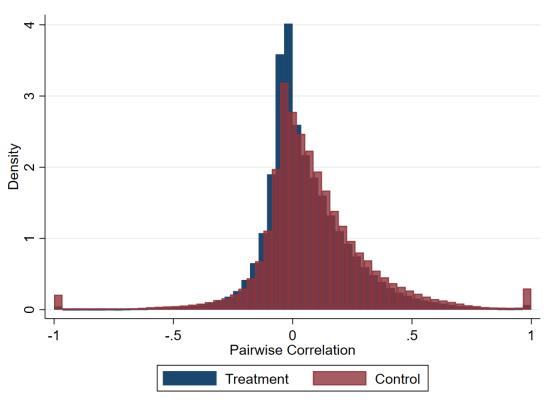
(b) Second Post-Experiment Market (Oct 2021)

Notes: These figures test the null hypothesis that officers' top choices are uniformly distributed over identical positions using a randomization test in an analogous set of markets in the first and second year after the RCT took place. All of these markets used DA to match officers to jobs, and corresponded to treated (DA) markets in the randomized trial (based on military rank and occupation). Holding unit preferences fixed, we randomize which of the identical jobs the officer ranks first 10,000 times. The solid blue (orange) bars show the distribution of the share of one-to-one matches across iterations in the markets that took place one (two) year after the randomized trial. These bars are overlayed on top of gray solid bars that show the distribution of the share of one-to-one matches from the same exercise executed on DA markets from the randomized trial. The vertical dashed lines show the actual share of one-to-one matches in the corresponding samples. Samples are restricted to officer-job group combinations with potential one-to-one matches because the officer ranked one of the jobs first and at least one of the identical jobs ranked the officer first. Two or more positions are identical if they belong to the same unit, have identical job descriptions, are in the same location, and are in the same market (and will therefore be positions for the same rank). See the notes of Figure 1 for additional details.

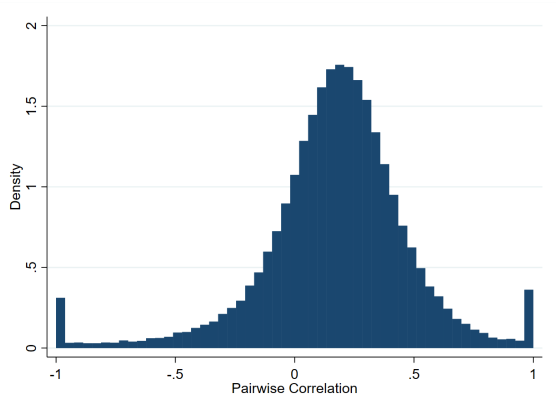
Figure D.4: Pairwise Preference Correlations



(a) 2020 Markets



(b) 2020 Markets, Drop Top 5 Percent



(c) 2019 Markets

Notes: These figures show the distribution of pairwise rank correlations between all pairs of officers in the same market. Figure (a) shows estimates using all preference data for officers in the experimental markets. Figure (b) shows analogous estimates dropping the top 5 percent of most preferred positions. Figure (c) shows analogous estimates to Figure (a) using the prior year's markets which had lower unit participation and so potentially had less coordination between officers and units. Officers rank their preferred positions from most to least preferred, without being required to rank all positions in their choice set. Unranked positions are assumed to be less preferred than ranked ones, but they are treated as equally preferred to one another. Additionally, officers can indicate positions they would not like to match with. These undesirable positions are considered the least preferred overall, ranking below both ranked and unranked positions.