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Abstract

We study the effects of crucible experiences along multiple sensitive periods on career progression. While prior literature has hinted that individuals can be imprinted during multiple sensitive periods, not just during the early career, there has been scant attention to it theoretically and empirically. We use unique administrative data of 8662 U.S. Army officers who graduated from the United States Military Academy (USMA) at West Point from 1995 to 2004 and exploit a natural experiment to estimate robust treatment effects. In our setting, workers were quasi-randomly assigned to crucible locations such as war zones in Iraq and Afghanistan and, importantly for our study, the quasi-random assignment to crucibles could be during the early career of the individual (i.e., during the first five years of the career), mid-career (between the fifth and ninth year of the career), or both during the early- and mid-career. We exploit this allocation protocol to estimate robust treatment effects of crucible exposure on an objective measure of career advancement—promotion to the rank of major. We additionally exploit variation in whether the repeated crucible assignments are in the same or different geographic/cultural contexts to study whether crucible assignment triggers one of two possible human capital development and learning mechanisms: building absorptive capacity in a relatively narrow context or exaptation and developing dynamic capabilities. Our evidence suggests that based on task characteristics, the former mechanism is in play in our empirical context. Our results contribute to literatures on imprinting, development of managerial capabilities, learning and career experiences, and how the geographic/cultural context can shape human capital.

INTRODUCTION

Extreme environments—such as wars, disasters, revolutions, industrial accidents, and macroeconomic crises—are often crucibles for organizations and employees. They often require managing greater complexity than employees and managers are used to, such as in managing outside of expected routines, under emergent interdependencies, and with needs of rapid coordination even as vital lines of resourcing and communication are momentarily disrupted (Comfort, 1985). Even for organizations for whom such environments are a "normal risk," managing in turbulent environments often involves failure of standard operating routines and the need for rapid improvisation on the ground (e.g., Solnit, 2010; United States (US) GAO, 2008; Vaughan, 1996). For example, firefighters at Mann Gulch faced a series of failures in tackling the fire using established routines and lines of communication (Weick, 1993). During the ongoing COVID-19 pandemic, overflowing emergency rooms (Hixenbaugh & Ornstein, 2020) are arguably an example of an extreme work environment.

J. D. Thompson noted in various works the importance of understanding management in such environments, where both exceptions to established routines and new modes of coordination need to be developed on the fly (Thompson, 1967; Thompson and Hawkes, 1962). Managers seeking to operate in such environments often have to create what Thompson called "synthetic" organizations that improvise over the existing organization in ways best adapted to the simultaneous communication, time, and resource challenges imposed in turbulent and uncertain environments. Beyond the immediate exigency of managing in extreme environments, such environments can also leave long-lasting imprints on organizations and managers. While some work has explored the organizational imprints of such events (such as of technological, managerial, and relational learning (Marquis & Tilcsik, 2013; Vaughan, 1996), little to no work has shed light on how such extreme environments—which we call crucibles—affect managerial learning and future performance. This is

both a motivation and a point of departure for our study. In addition, while prior literature has hinted that individuals can be imprinted during multiple sensitive periods, not just during the early career, there has been scant attention to it theoretically and empirically.

There is a rich literature on early work experience and career outcomes (Burton, Sørensen, & Beckman, 2002; Campbell, 2013; Castilla, 2008; Chattopadhyay & Choudhury, 2017; Groysberg, Lee, & Nanda, 2008; Higgins, 2005; Huckman & Pisano, 2006; McEvily, Jaffee, & Tortoriello, 2012; Tilcsik, 2014). This literature shows that challenges early in the career can shape the rate of career advancement, through mechanisms such as learning, socialization, formation of norms, etc. Conceptually, this finding is related to the process of "exaptation" in the imprinting literature (Higgins, 2005; Marquis & Huang, 2010), a process whereby a capability developed as an adaptive response to initial conditions later becomes useful for a different purpose. Our study advances this literature in four ways, theoretically, and empirically.

First, extreme environments such as crisis or uncertainty have imprinting impacts at multiple levels (Marquis & Tilcsik, 2013). Imprints on careers, therefore, need to be considered as distinct from the impact of such environments on organizations and institutions themselves. Our study offers a setting where employees have career outcomes (such as promotions) independent of the fortunes of the organization, while the latter (the U.S. Army) is an enduring organization with standardized policies for evaluating eligibility for accelerated promotion.

Second, certain employees might be attracted to certain organizations or positions at a point in time, so often it is unclear if it is the matching process—namely, people with better fits being attracted to particular positions or situations—that is driving performance outcomes, or the imprint itself. We study a setting where employees are externally assigned to extreme environments such as theaters of war based on emergent needs, availability, and deployment timelines. These assignments

vary both temporally and spatially, so it allows us to understand how assignments to extreme environments (what we call "crucibles") impact capability development and promotion.

Third, much of the literature on career imprints is catholic with regard to the content of such imprints on careers, such as whether they are managerial skills or just on-the-job operational skills of employees. Much of that is determined based on what stage of their career an employee encounters an extreme environment (or "crucible"). When employees are assigned to crucibles early in their careers, their adaptation to, and learning from, it is largely confined to issues of doing a codified or operational task satisfactorily, while steering clear of the adverse psychological impacts of challenging environments—even for those trained for such environments (Durham, McCammon, & Allison, 1985; Erikson, 1976; Haas & Hendin, 1985). However, when they are assigned to the crucible as managers, they have greater agency to shape routines such as of resourcing and coordination, and they are able to learn possibly new (hard and soft) managerial skills from such assignments (Chattopadhyay & Choudhury, 2017; also see Schoar & Zuo, 2011). Our study allows us to observe assignments to crucibles at different points of time in the individual's career, offering insights into how crucibles can have varying imprints on individual careers based on whether they are encountered as operational and psychological challenges (e.g., early-career) or as managerial (mid-career) crucibles with much more discretion in shaping organizational routines and action in the crucibles (and learning from it). In doing so, our study attends to the call to study multiple sensitive periods (e.g., Marquis & Tilcsik, 2013) to provide insight into multiple levels/content of imprints even within the career process.

Finally, imprinting as a treatment can be of multiple forms—either as fit and developing absorptive capacity or as exaptation. The imprinting-as-fit perspective sees imprints of particular kinds of past conditions as one of cognitive models and routines that were most adaptive for the employee at the time of the imprint, that then influence the employee's decisions and outcomes as

he/she transitions through their career (Higgins, 2005; Tilscsik, 2014). Building on the literature on the development of managerial cognitive capabilities (Helfat & Peteraf, 2015), one can argue that multiple exposures to *similar* crucibles, such as crucibles in similar geographic, linguistic, and cultural contexts, could help develop managerial cognitive capabilities around language, communication, and social cognition. As the prior literature has argued, development of these managerial cognitive capabilities could help individuals better reconfigure strategic assets and this could, in turn, positively affect career outcomes.

An alternative perspective is one of exaptation, where imprints are opportunities for capability development, but these capabilities might become useful in other areas in the future (Marquis & Huang, 2010). Still another perspective has emphasized how past experiences are not only learning opportunities, but also dynamic capabilities, in that it is about "learning to learn" (Anderson, Farrell, & Sauers, 1984; Ellis, 1965; Estes, 1970). The literature on the development of managerial cognitive capabilities provides a complementary theoretical perspective. As Helfat and Peteraf (2015: 17) state, practice, training, and exposure to "uncertain, complex, and often fast-paced" environments might lead to the development of a key managerial cognitive capability related to *attention*, and this might help managers sense opportunities better, even if the repeated exposure to crucibles are in dissimilar contexts.

These contrasting perspectives on learning and capability development from crucibles—based on the theoretical perspectives of fit, exaptation, learning-to-learn, and the development of managerial cognitive capabilities—can be seen as varying forms of absorptive capacity (Cohen & Levinthal, 1994), but most work has found it hard to segregate their relative impacts on imprinting in individual careers. Part of the difficulty in differentiating the content of learning is that what is relevant might vary with time. Similarly, there are also differences across studies in the extent to which learning is about abstraction in a knowledge domain (e.g., learning to manage complexity by

reducing tight coupling) rather than particular knowledge around that same domain (such as cultural practices or ties to central actors that hold legitimacy and resources). Our study takes some of these aspects as boundary conditions to ask if imprints of learning from a task domain leads to higher performance in future managerial assignments in the same task domain but in different geographic contexts.

Our empirical context comprises the U.S. Army and its officers who graduated from the United States Military Academy at West Point (USMA) for the period 1995 through 2004. In an organization that has existed for several centuries and is assured of survival well into the future, officers have clearly defined paths for promotion. Officers are externally assigned to crucibles—extreme theaters of war with adverse conditions—based on changing political situations, deployment needs, and organizational rotation cycles in and out of combat zones. These assignments can happen early in a career, such as of freshly minted graduates from the academy, and/or later in a career, such as when officers are up for promotion to major. Finally, sometimes officers can find themselves assigned to multiple crucibles at various times in their career, but these assignments are exogenously made to either the same crucible (e.g., a particular extreme theater of war) or a different crucible (a different theater of war). Their operational and managerial assignments might vary slightly between crucibles, but their area of specialization remains constant across these assignments.

We find that assignment to crucibles aids career progression. For officers assigned to crucible locations in their first five years, the marginal effect of that assignment on the likelihood of receiving early promotion to major is 1.8 percent. For those assigned to crucibles in their fifth to eighth years of service, the marginal effect is 56.7 percent. Further, in elaborating the mechanism such as whether crucible assignments provide context-specific learning and human capital development vs. generalized exaptation or "learning-to-learn," we find support for the former.

Assignment to multiple crucibles enhances career progression even more when the crucibles are similar in context (cultural and geographic) rather than when they are different. Our results contribute to literatures on imprinting, development of managerial cognitive capabilities, learning, career experiences, and how the geographic and cultural context can shape human capital.

Theory and Hypotheses

Early crucibles and career outcomes. There is a rich literature on early work experience and career outcomes (such as Burton et al., 2002; Campbell, 2013; Castilla, 2008; Chattopadhyay & Choudhury, 2017; Groysberg et al., 2008; Higgins, 2005; Huckman & Pisano, 2006; McEvily et al., 2012; Tilcisk, 2014). This literature shows that through various kinds of learning, challenges early in the career can shape the rate of career advancement.

For example, early-career imprints, especially of extreme environments, can provide crucial cognitive lenses to make sense of the work environment in the future (Marquis & Tilcsik, 2013). Scholars note that such episodes can be thought of as role transitions within careers, where "individuals are motivated to reduce uncertainty and tend to experience cognitive unfreezing (e.g., DiRenzo, 1977; Ibarra, 1999; Van Maanen & Schein, 1979), such that the "cognitive models that…[they] hold can be challenged and replaced with scripts and schema that are more congruent with the new environment (Dokko, Wilk, & Rothbard, 2009: 55)"" (Marquis & Tilcsik, 2013: 200). For example, Dokko, Wilk, & Rothbard (2009) demonstrate the performance implications of carrying norms and schemas learned in one firm into another firm. Schoar and Zuo (2011) demonstrate how CEOs' risk attitudes are shaped by the macroeconomic environment of their early career and when managers who begin their careers in a recession become CEO, they tend to focus more on cost cutting. Geographic assignments in particular can be important sources of cognitive lenses that influence what issues draw attention and what kinds of solutions are envisaged (e.g., Marquis & Battilana, 2009).

Imprints of operating in extreme environments can also influence or make salient the ties to peers and mentors that continue to influence individual careers, even as individuals progress through their careers. For example, McEvily et al. (2012) document imprinted ties to mentors conferring practical knowledge with persistent advantages for young lawyers. Such early-career socialization experiences are particularly important in conferring tacit knowledge around how to deal with exceptions to standardized operating procedures or even in providing insights into the informal norms of behavior and into the kinds of behaviors and attitudes that are valued by organizations. Thus, even if the direct situations themselves change over time, early imprints can provide points around which local search for solutions proceeds in the future (Levinthal, 2003). Kacperczyk (2009) and Azoulay & Herridge (2011) document early-career mentors' and peers' effects on subsequent choices at work. Finally, in a relatively new stream of research, Chattopadhyay and Choudhury (2017) document how assignment to a challenging location, marked by high degree of uncertainty, can shape early-career workers' problem-solving skills and positively influence longer-term career outcomes. Therefore, as a baseline, we hypothesize that:

Hypothesis 1. Assignment to extreme environments among early-career professionals increases career progression in the long run.

Imprints of mid-career crucibles. The rich body of existing work tells us relatively little about the effects of *mid-career imprinting* and how it shapes career outcomes. Yet, mid-career imprints are particularly important given that individuals often transition from being a worker performing a highly codified task to becoming a manager with greater agency to shape routines. For example, Dragoni, Tesluk, Russell, and Oh (2009) build on prior research by Kotter (1982), McCall, Lombardo, Lombardo, & Morrison (1988), and notably McCauley, Ruderman, Ohlott, & Morrow (1994) to provide a framework of managerial skill development assignments. This framework comprises 10 conceptual categories such as unfamiliar responsibilities, developing new directions,

high stakes, influencing without authority, handling external pressure, managing work group diversity, and working across cultures. Mid-career professionals are in a position to not only know how to execute codified tasks and manage people executing those tasks, but also have discretion to mold others' behavior and organizational routines, and possibly exert greater upward influence in shaping the outcomes of their managerial tasks. In extreme environments characterized by potential failures of coordination and resourcing, managers face a crucible of managing outside of regular routines and procedures, often requiring the building of task and coordination rules on the fly (e.g., Kramer & Moorkamp, 2019). In doing so, they can be seen as more appropriate agents for what Thompson (1967) considered the task of creating "synthetic organizations" in times of crisis and uncertainty; conversely, exposure to such crucibles provides mid-career professionals opportunities for (and often necessity of) developing greater managerial skills. Therefore, we hypothesize ceteris paribus the following:

Hypothesis 2a. Assignment to mid-career crucibles influences career progression in the future.

Hypothesis 2b. Assignment to mid-career crucibles leads to a stronger impact on career progression in the future, compared to early-career crucibles.

Multiple crucibles: Cumulative advantage or exaptation? Apart from the relative inattention to mid-career imprints, the extent literature is also largely silent on the impact of multiple imprints on career outcomes and the mechanisms underlying such impact. Yet, managerial development can be thought of as influenced by a process of punctuated change where there are multiple rapid periods of change in managerial routines and knowledge followed by periods of stability during which such routines and knowledge are applied/exploited to create value (Tushman, Newman, & Romanelli, 1986). Marquis and Tilcsik (2013: 221) similarly noted how from the standpoint of imprinting, "multiple sensitive periods greatly increases the scope and applicability of the imprinting perspective…not only because of their direct effects but also because it is during

these periods that the environment molds the focal entity with long-standing consequences." Yet, multiple sensitive periods have received scant attention in the study of careers in organizations.

Considering multiplicity of imprints from crucibles, however, also presents multiple pathways for managerial development. On the one hand, encountering both early-career (operational) and mid-career (managerial) crucibles might provide cumulative advantage by allowing mid-career professionals to leverage learnings from early-career crucibles to gain cumulative performance and learning advantages in future crucibles of the same kind. For example, much of the absorptive capacity perspective (Cohen & Levinthal, 1994) argues that leveraging emerging opportunities requires exposure to similar problem and search paths in the past. To quote Cohen and Levinthal (1990: 128, emphasis added by current authors), the "ability to evaluate and utilize outside knowledge is largely a function of the level of prior *related* knowledge." They also provide an example (ibid: 130): "students who have thoroughly mastered the principles of algebra find it easier to grasp advanced work in mathematics such as calculus." From this standpoint, crucibles build capabilities, and encountering multiple crucibles would provide path dependence advantages by building a greater cache of operational and managerial knowledge in such extreme environments. Empirically, this perspective would suggest that professionals benefit more from multiple crucibles when the early- and mid-career crucibles are very similar, or at least similar enough to build cumulative advantage from familiarity with typical solution paths and social learning in such environments.

This argument can be developed further using theoretical insights from the literature on development of managerial cognitive capabilities (Adner & Helfat, 2003; Helfat & Peteraf, 2003; Winter, 2000; and notably Helfat & Peteraf, 2015). This literature is focused on studying the development of managerial cognitive capabilities related to sensing, seizing, and reconfiguring strategic opportunities (Teece, 2007). In this literature, one of the key organizational capabilities

relates to "reconfiguration"—that is, selection, alteration, acquisition, and adaptation of strategic assets (Capron & Mitchell, 2009; Helfat et al., 2007; Zollo & Winter, 2002). Helfat and Peteraf (2015) argue that this key *organizational* capability is related to two *managerial* cognitive capabilities: the managerial capability related to language and communication and the one related to social cognition. To quote the authors, "Asset reconfiguration may depend critically on the ability of entrepreneurial top executives to persuade others in their organization to undertake new initiatives. Language can be used to communicate broad, overarching goals" (Helfat & Peteraf, 2015: 843). The authors also allude to the importance of managers' social cognition and state, "Social cognitive capability includes the capacity to understand the point of view of others, and therefore provides the potential to influence the behavior of others as well…The capacity of top executives to trust and foster trust is likely to depend in part on their social cognitive capabilities, since trust requires mutual understandings…Top executives may also utilize social cognitive capabilities when seeking to overcome organizational resistance to change" (ibid: 844). Arguably, repeated exposure to similar crucibles, such as crucibles in similar geographic, linguistic, and cultural contexts, might help managers develop language and social cognition skills. This might positively affect their ability to reconfigure strategic assets and may lead to superior individual career outcomes.

On the other hand, multiple crucibles can provide more than cumulative advantage from the stock of capabilities, allowing managers to build dynamic capabilities. For example, work on exaptation in the imprinting literature argues that capabilities developed as adaptive responses to early conditions later becomes useful for a different purpose (Higgins, 2005; Marquis & Huang, 2010). Similarly, a stronger form of this perspective considers past challenging situations as instances of learning to learn (Anderson et al., 1984; Ellis, 1965; Estes, 1970). Even while arguing for absorptive capacity as a form of cumulative advantage, Cohen and Levinthal (1994) discuss the

possibility that behind observed innovation outcomes might be the emergence of not just capabilities, but also something akin to dynamic capabilities.

We might draw complementary theoretical arguments from the literature on the development of managerial cognitive capabilities. As Helfat and Peteraf (2015) state, two managerial cognitive capabilities help with sensing opportunities: *perception* and *attention.* In turn, two other managerial cognitive capabilities help with seizing of strategic opportunities: *problem solving* and *reasoning.*

Helfat and Peteraf (2015) also allude to how exposure to uncertain and complex environments (i.e., crucibles) affects the managerial cognitive capability of attention. To quote Helfat and Peteraf (2015: 839), "Practice and training can improve capabilities for attention, providing a source of path dependence…Sensing opportunities and threats in an uncertain, complex, and often fast-paced environment calls for acute cognitive capabilities with respect to attention. By focusing on relevant stimuli, attention can facilitate environmental scanning. In addition, the alertness component of attention can facilitate the detection and creation of new opportunities, while the orienting capacity turns attention to relevant information."

From this standpoint, encountering both early-career crucibles and mid-career crucibles is valuable in a meta-learning sense; it allows individuals to be better at learning from "uncertain, complex, and often fast-paced" situations encountered across these crucibles and reacting to them with searching with greater *attention* across a wider solution space. Empirically this perspective would suggest that multiple crucibles are more valuable for career progression when they are different, or at least different enough that each crucible instantiates learning processes for new solutions.

Together this leads to two competing hypotheses:

Hypothesis 3a: Encountering both early-career and mid-career crucibles enhances the rate of career progression when the crucibles are more similar.

Hypothesis 3b: Encountering both early-career and mid-career crucibles enhances the rate of career progression when the crucibles are more different.

Empirical setting. The United States Army employs more than 1 million people, making it one of the largest organizations in the country. A group of approximately 90,000[1] men and women leads this organization, managing daily operations and long-term strategy as part of the Army's Officer Corps. Members of the Officer Corps lead teams from platoons (30-70 soldiers) to divisions (16,000-20,000 soldiers) and oversee the use of billions of dollars of military equipment comprised of tanks, helicopters, communications equipment, and all associated required components.[2]

INSERT FIGURE 1 HERE (military org chart)

Early-career assignments. Graduates of the USMA are one key source of officers in the Army's Officer Corps; they represented about 25 percent of newly commissioned officers in 2019.[3] After graduation, cadets are required to serve in the Army for at least five years. Cadets rank their preferred geographic location and the branch of the Army in which they will serve upon commissioning into the Officer Corps. They can choose from nine of the Army's 17 branches,[4] and the branch they select determines whether they will serve in a combat or noncombat capacity.[5] Posts are assigned based on the cadets' order of merit within the class, meaning that the top performer in the class is guaranteed their first priority branch and location,

[1] DoD Personnel, Workforce Reports & Publications. "Active Duty Military Personnel by Rank/Grade," November 30, 2019. https://www.dmdc.osd.mil/appj/dwp/dwp_reports.jsp.
[2] Army Regulation 735-5, "Property Accountability Policies," November 9, 2016. https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/r735-5_Web_Final.pdf.
[3] Estimate based on 2019 West Point graduates (Hill, M. "West Point to Graduate Record Number of Black Female Cadets." Associated Press, May 23, 2019. https://www.armytimes.com/news/your-army/2019/05/23/west-point-to-graduate-record-number-of-black-female-cadets/.) and total Second Lieutenants as of November 2019 (DoD Personnel, Workforce Reports & Publications. "Active Duty Military Personnel by Rank/Grade," November 30, 2019. https://www.dmdc.osd.mil/appj/dwp/dwp_reports.jsp.).
[4] Several branches are not available for selection by graduating cadets, including: Army Music, Civil Affairs, Chaplain, Electronic Warfare, Judge Advocate General, Psychological Operations, Public Affairs, and Special Forces.
[5] Combat units are Air Defense Artillery, Armor, Aviation, Engineers, Field Artillery, and Infantry. All others are considered noncombat, or support, units.

but all others receive assignments based on a combination of their preferential ranking and the remaining available posts.

INSERT FIGURE 2 HERE (Army branch descriptions)

Once assigned to a specific branch of the Army, USMA graduates—now commissioned as second lieutenants—are assigned to a division at random. Low-ranking officers (defined as those in their first five years of active duty) are treated as largely interchangeable during the assignment process, and the division personnel officer who determines the assignments often has little information about the relevant officers beyond their branch and rank.[6] Early-career officers have effectively no agency in this process, and they go where they are assigned, mitigating self-selection concerns.

Assignments at the brigade and battalion levels within a given division are needs driven, aimed at ensuring equitable distribution of talent across the Army as a whole. As brigades and battalions identify skills gaps, whether due to a specific soldier departing or in response to changes on the ground, division-level personnel managers seek to assign new incoming officers in a way that meets those needs. While specific skillsets may affect how early-career officers are assigned at these levels, judgments of the officers' talent or capacity do not. Once assigned, officers tend to remain in the same position for 12-18 months and in the same geographic location for approximately 36 months.

Career progression. Officers begin their field assignments as second lieutenants, leading platoons of 30-70 soldiers. During this initial assignment, officers are required to simultaneously lead and manage their soldiers and teams. Officers are primarily carrying out assigned tasks and not necessarily shaping new routines. After two years, according to a mandated advancement schedule,

[6] Notably, there are special considerations that may affect initial assignments, including family members with special needs or married couples where both individuals are in the Officer Corps, but these are rare.

they are promoted to first lieutenants. These initial field positions aim to develop officers' technical capacity, leaving them able to manage small teams as they carry out logistical, intelligence, maintenance, or tactical operations effectively.

After another two years and the completion of additional trainings, officers are promoted to the rank of captain. At this point, early-career officers often transition to staff positions, working within the military bureaucracy rather than in the field. This as an opportunity for officers to gain experience in higher-level organizational administration, learning how to manage larger teams of personnel and engage in strategic planning. Following rotations in staff roles, officers are assigned to command companies, made up of 3-4 platoons, or 50-250 soldiers. Captains bear full legal responsibility for their assigned companies, including oversight of personnel and equipment, training, and operations management. Most officers will remain captains for 6-7 years.

INSERT FIGURE 3 HERE (Military ranks and avg tenure)

At this point, individual performance begins to play a role in the speed of promotion. As officers move up in the Officer Corps ranks, there are fewer available positions to fill, as the organization requires fewer majors than it does second lieutenants. The transition from captain to major also marks a shift from the company-grade officers, who engage in direct troop leadership, to field-grade officers, who engage in broader strategic leadership. Advancement into, and within, the field-grade officer levels is no longer mandated after a set period of time. Instead, only a small percentage of officers at a given level will advance, based both on their personal performance (as reflected in annual performance evaluations) and on the availability of higher-rank positions.

Advancement decisions are made during annual promotion board meetings. Board membership changes each year, but is comprised of representatives from each branch of the Army holding a rank two levels above those being considered for advancement (i.e., the promotion board for rising majors would be comprised of current colonels). The board considers current and future

Army needs, as laid out in a guidance memo from senior Army leadership, and ranks eligible officers based on their annual Officer Evaluation Reports (OERs), job history, and assessed potential. Army leadership then determines the total number of officers to promote based on current needs and available positions and establishes a cut-line for the ranked list of officers (i.e., if there are 15 available positions, the top 15 officers receive promotions).

Though promotions do not follow a set timeline, most officers spend 5-7 years at each of the field-grade ranks. Becoming a major, for example, usually takes 10-11 years. Early promotion ahead of that timeline is called "below-the-zone promotion" and is considered a mechanism for the Army to identify and reward the most talented officers from across the organization. The Army, historically, has promoted up to 10% of a cohort below-the-zone.[7] For this study's purposes, officers will be considered the recipients of early promotion if they take 8-10 years to earn the rank of major.[8]

Defining a crucible. A crucible is an extreme situation during which new skills are forged. For this study's purposes, a *crucible* experience is defined as an individual spending time in a geographic location declared a combat zone by an Executive Order from the President of the United States. These locations for the years in our dataset are Afghanistan, Bahrain, Djibouti, Iraq, Kosovo, Kuwait, Qatar, and Saudi Arabia, locations that saw significant hostile group activities during this period.

No distinction is drawn between combat and noncombat *roles* in these locations, due to the challenging nature of the operating environment. There were many instances of soldiers in ostensibly noncombat roles coming under direct fire during the conflicts in Iraq and Afghanistan, whether in convoys providing supplies or logistical support to forward operating bases or in

[7] Gibson, H. "The Total Army Competitive Category Optimization Model: Analysis of U.S. Army Officer Accessions and Promotions," June 2007: https://apps.dtic.mil/dtic/tr/fulltext/u2/a470039.pdf
[8] https://www.thebalancecareers.com/military-commissioned-officer-promotions-4055887

administrative positions at bases that were attacked. For example, Pete Buttigieg, the former Mayor of South Bend, Indiana, who was in a noncombat role as a U.S. Navy reservist in Afghanistan was "tracking the flow of money to terrorist cells" and yet said, "It kind of felt like combat when the rocket alarm went off."[9] Physical presence in a declared combat zone is, therefore, a more appropriate variable than the official role classification.

Selection into a crucible. Whether a division, brigade, or battalion will deploy to a combat zone is related to the needs of the Army at large, rather than to the characteristics of any one battalion or—importantly for the purposes of this study—officer. Deployment decisions are made by the Secretary of the Army, based on the conditions in the field. Army leadership makes these decisions in part based on intangible factors like unit reputation, but primarily based on concrete considerations like a unit's current geographic location, whether that unit is engaged in another combat zone, and unit readiness (i.e., are they in a rest period following a combat deployment or undergoing requisite retraining?).

As all Army divisions maintain a high state of readiness, the specific divisions in line for deployment can change quickly, based on shifting needs. To give a concrete example, if a unit in Afghanistan noted an uptick in casualties and determined that the change was due to insufficient medical evacuation (MEDEVAC) capacity, an available MEDEVAC unit would be slated for rapid deployment to provide additional support. Where, exactly, that unit would deploy from—whether from another combat zone or from a noncombat placement—could vary based on global operational needs. The surges of Army personnel into Iraq in 2006 and Afghanistan in 2009-2010—each of which saw tens of thousands of additional troops deployed in an effort to stabilize degrading operational environments—are further examples of how deployment rotations can change rapidly and with little or no notice, based on shifting global strategies.

[9] https://apnews.com/2acf65b0b1b948d68de10607f170a1b3.

In addition, due to the decision to modularize brigades, the deployment of a division does not mean that every brigade in that division will deploy. Indeed, sometimes units are even set to deploy and then re-tasked at the last minute. For example, an armored division expecting to be sent to Iraq could instead be re-tasked and deployed to South Korea.

The randomness of the selection of officers into a given division, battalion, and brigade and the subsequent randomness of selection for combat deployment serve to mitigate endogeneity concerns related to whether or not a specific officer will face a *crucible* experience during the course of their career. In discussions with senior leaders, we learned that because officers cannot predict what will happen once they make their initial selection of a particular post, they lose their agency to increase or lower their chances of facing crucible experiences. One senior leader who was a branch chief[10] (or talent management expert) stated, "Officers are positioned based on the needs of the Army."[11]

Below we first outline the Data, Methods, and Results of our quantitative analysis before we delve into the qualitative evidence and robustness checks.

QUANTITATIVE ANALYSIS: DATA AND METHODS

The U.S. Army's Office of Economic and Manpower Analysis provided us with unique personnel information on the entire population of cadets who graduated from the USMA from 1995 to 2004, for a total of 8,682 observations. Though the Army publishes the lists of officer selectees for its promotion and command selection boards, our data goes further, providing the entire electronic military record for each officer. This allows us to track individuals from their time as cadets at the USMA and throughout their Army officer careers, noting demographic information, performance metrics, deployment locations, and dates of advancement.

[10] Interview with former Aviation Branch Chief at the U.S. Army's Human Resources Command, Colonel Bart Jonke, who managed all 12,000 aviation officers' career development for more than two years.

Dependent Variables

We use the dichotomous variable *early promotion to major* (*EPM*) in our main regression analysis, defining *EPM* to take the value of 0 if the officer was considered for promotion but not selected and 1 if the officer was considered and selected. Officers are considered to have experienced early promotion to major if they advanced within 8-10 years of their initial commission, rather than the average 10-11 years. An officer must have voluntarily continued in the Army to be considered; officers who voluntarily separate prior to this point are not considered.

Independent Variables

We examine the impact of crucible experiences on subsequent officer advancement using two indicator variables for crucibles (early and late), defined as 1 if the officer was exposed to a crucible experience and as 0 if not. We use the variable *early-career crucible assignment* to designate those who are deployed to such locations in the first five years of service as an officer (before the normal tenure-duration-based promotion to captain). We use the variable *late-career crucible assignment* to indicate being assigned to a crucible location while in the rank of captain, that is, to mark those who serve in such locations from their fifth to tenth years of service.

Control Variables

We seek to address endogeneity concerns by controlling for several measures of cadet capacity, performance, and demographic makeup. We measure cadets' academic ability using their overall SAT scores at their time of admission to the USMA. Scores are out of a total of 1600 points. We measure cadet performance while at the USMA using their overall GPA, measured on a traditional 4.0-scale. Cadet GPA is calculated based on three weighted components: academic (55 percent), military (30 percent), and physical fitness (15 percent) grades. We measure cadets' level of potential using their preadmission Whole Candidate Score (*WCS*). The USMA admissions personnel use cadet Whole Candidate Scores to grade and select applicants for matriculation. The WCS is

calculated based on three weighted components: academic performance (60 percent), demonstrated leadership (30 percent), and physical aptitude (10 percent). This score is predictive of both graduation from the USMA and likelihood of advancing to the rank of lieutenant colonel, typically achieved after 18 years of active duty service.[12]

Demographic controls include gender, ethnicity, and Army branch assignment. We include the variable *female* to indicate gender, taking the value of 1 if the observation is female and 0 otherwise. Ethnicity control variables, defined as having the value of 1 if the cadet claims the corresponding ethnicity and a value of 0 if not, include *Caucasian*, *African-American*, *Hispanic-American*, *Asian-American*, *Native-American*, and *Other*. Finally, we include dummy variables for the cadets' Army branch commissions after graduation. Specifically, we define the dummy variable *combat arms* as 1 if the cadet was commissioned into a combat branch and 0 if the cadet was commissioned into a noncombat branch. [13]

All graduating cadets are ages 21-26, with the greatest density at the median (22 years of age), so we do not control for age of first commission. We do include a dichotomous variable for *graduating cohort year*, which represents the year each cadet graduated from the USMA. Each cohort dummy is defined as having the value of 1 for the year the cadet graduated and a value of 0 for all other years. This variable helps account for endogenous influences such as major U.S. economy shifts, Army personnel policy changes, and changing generational values of Army officers across cohorts.

Table 1 reports descriptive statistics and pairwise correlations between independent and control variables. Of the sample of 8,682 officers, 37 percent were deployed to crucible locations in

[12] Hanser, L. M. & Oguz, M. 2015. *United States Service Academy admissions: Selecting for success at the Military Academy/West Point and as an officer*. Santa Monica, Calif: RAND Corporation.
[13] During the period of observations, female cadets were not allowed to commission into the combat branches of Armor or Infantry, but were allowed to commission into the combat units of Air Defense Artillery, Aviation, Engineers, and Field Artillery, as well as into all noncombat branches.

the first five years as a commissioned officer, and 23 percent were deployed to crucible locations in the fifth to tenth year of their career. In terms of demographic characteristics, women make up 14 percent of the sample, and the proportion of West Point cadets who are female increased over time, from approximately 10 percent in the 1990s to more than 15 percent in the 2000s. The sample has an average SAT score of 1271 and an average USMA GPA of 2.99.

Most of the officers (72 percent) commissioned into combat branches—divided among Air Defense Artillery, Armor, Aviation, Engineers, Field Artillery, and Infantry. The remaining 28 percent of the sample held noncombat commissions—divided among Adjutant General, Chemical, Finance, Medical Service, Military Intelligence, Military Police, Ordnance, Quartermaster, Signal, and Transportation. Among the pairwise correlations, there is a structural negative correlation between *combat arms* and *female*, given that women were restricted from serving in combat arms branches during the years captured in our data (1995-2004).

INSERT TABLE 1 HERE

Given that the dependent variable *early promotion to major* requires that the officer remain in the Army for 9-10 years, we must account for selection bias that might occur through voluntary attrition. Though assignment to crucible locations is arguably quasi-random, the decision to exit the profession is not. Table 2 reports descriptive statistics for the full sample divided into two groups: those who remain in the Army until they reach the rank of major and those who leave before reaching that rank. The officers who remain differ from those who leave. Women comprise a smaller percentage of the officer corps that remain, and the stayer population's SAT scores and GPAs are higher. Those who remain until they reach the rank of major are also more likely to be commissioned into combat arms branches.

INSERT TABLE 2 HERE

Models and Methods

The differences in observed attributes between officers who remain and officers who leave raise the concern that attrition-related selection bias may affect our estimates of the crucible experience effect on career performance. For this reason, we use a Heckman selection strategy to model this selection effect. Given our binary outcome variable, we use a Heckman probit model.

We seek to estimate the binary outcome of early promotion with the following latent model:

$$y_J^* = \beta x_j + u_{1j},$$

where the outcome, *y*, is the binary outcome of early promotion, *x* is vector of predictors, and *u* is the error term. However, since we observe only whether or not an officer is promoted early to major if he or she remains in the Army until year 8, we observe only the binary outcome when the latent variable, y_j^*, is greater than zero. This is captured in the probit equation below:

$$y_j^{probit} = (y_j^* > 0).$$

Because officers can choose to leave before being evaluated for the rank of major, the outcome of early promotion is not always observed. For observation *j,* this case is observed only if:

$$y_j^{select} = (\beta_0 cons + \beta_1 crucible\_early + \beta_2 crucible\_midcareer + \beta_3 female + \sum_{i=1}^{7} \beta_i race_i$$

$$+ \beta_{11} SAT + \beta_{12} wcs + \beta_{13} gpa + \beta_{14} combat.arms + \sum_{i=1}^{9} \beta_i cohort_i$$

$$+ \beta_{24} aviation + u_{2j}) > 0,$$

where

$$u_1 \sim N(0,1)$$
$$u_2 \sim N(0,1)$$
$$corr(u_1, u_2) = \rho$$

When $\rho \neq 0$, the standard probit model will yield biased results, hence the use of the selection equation before predicting the outcome observed only for the selected sample. For the model to be well identified, the selection equation should have at least one variable that is not in the probit equation. For this first stage, we also use a binary variable to indicate whether or not the officer was commissioned into the Aviation branch (*aviation*). Officers commissioned into the Aviation branch are required to remain in the Army longer due to branch-specific training requirements. As a result, their average service obligation is 7-8 years, as compared to five years for most USMA graduates. Given such requirements, being in the Aviation branch has a significant exogenous impact on the likelihood of remaining in the Army long enough to be evaluated for the rank of major.

In the second stage of the Heckman (probit), the focal dependent variable is *early promotion to major*. EPM is predicted on the same set of covariates except for the omission of the instrument, that is, the *aviation* indicator variable.

$$EPM_j^* = \beta_0 cons + \beta_1 crucible\_early + \beta_2 crucible\_midcareer + \beta_3 female + \sum_{i=1}^{7} \beta_i race_i$$

$$+ \beta_{11} SAT + \beta_{12} wcs + \beta_{13} gpa + \beta_{14} combat.arms + \sum_{i=1}^{9} \beta_i cohort_i + u_{2j}$$

Below we discuss results of the regression analysis followed by qualitative evidence from several interviews with U.S. Army sources involved in these promotion decisions.

RESULTS

The results of the Heckman probit regressions are reported in Models 1a-3b in Table 3. Model 1a is the selection model that predicts whether or not an officer will stay in the Army long enough to be considered for promotion to the rank of major. We observe that those who serve in crucible locations are more likely to remain in the Army than those who did not have a crucible experience. This is true irrespective of whether the crucible was during the first five years of service or

afterward. The coefficient is higher for late crucibles. We also see that $\rho \neq 0$, indicating the need to take selection effects into account.

The coefficient on the instrument (whether an officer belongs to the Aviation branch, which has a longer contract obligation) is positive and significant in predicting staying in the pipeline. We use *aviation* as the instrument in the first stage since it structurally lengthens the time in service, making attrition less likely between years five and 10 yet does not materially affect the likelihood of receiving early promotion to the rank of major (as is evidenced both by promotion statistics as well as based on interviews with promotion board members).

INSERT TABLE 3 HERE

Table 3, Model 1b reports the second stage of the Heckman estimation. Here, the key independent variables are *early-career crucible assignment* and *mid-career crucible assignment*. We observe that both coefficients are substantive and statistically significant, even after taking selection effects into account. For officers assigned to crucible locations in their first five years, the marginal effect of that assignment on the likelihood of receiving early promotion to major is 1.8 percent. This result supports Hypothesis 1, indicating that those who experience early crucibles have higher likelihoods of being selected for early promotion. For those assigned to crucibles between their fifth and eighth years of service, the marginal effect is 56.7 percent. This result support Hypotheses 2a and 2b, indicating that those who experience mid-career crucibles have higher likelihoods of being selected for early promotion; additionally, such increased early promotion effects are stronger than those having crucibles in the early stage of their careers.

In Models 2a and 2b of Table 3, we test competing Hypotheses 3a and 3b (to recap, Hypotheses 3a/3b had stated that encountering both early-career and mid-career crucibles enhances the rate of career progression when the crucibles are more similar/more different) by narrowing the analysis to those who have had two crucible experiences. We compare officers whose two crucible

deployments were to the same location (e.g., two deployments to Iraq), coded in the indicator variable *both early- and mid-career crucibles, same location* as 1, with those that deployed to different locations (e.g., one deployment to Iraq and one to Afghanistan) coded as 0 (so the latter is the base category). Model 2a presents the first-stage results. Model 2b presents the results of the second-stage Heckman probit. There are no coefficients estimated for the two crucibles separately, since all officers in the sample have experienced a crucible in both the first five years and the latter part of their observed service period. While having both early- and mid-career crucibles in the same location does not have any significant effect on staying in the pipeline, it does have a positive impact on early promotion to major compared to those who also experienced both crucibles but in the same geographic theater of activity. The estimated coefficient on *both early- and mid-career crucibles, same location* is 0.115, and it is statistically significant at the $p < .05$ level. The marginal effect of such matched crucible experiences on the outcome is 4.2 percent, suggesting that there are measurable career gains for those who have multiple crucible experiences in the same geography. These results support Hypothesis 3a over Hypothesis 3b; that is, these assignments to early- and late-career crucibles are more cumulatively beneficial for human capital development when they are in the same geography.

Pooled Models and Splits

We used a subset estimation approach to predict the impact of similar vs. different crucible experiences among the subset of those who were assigned to two crucible locations. Some may have concerns about such an approach, as we may not know: (1) whether the differences in slope are driven by different intercepts for those assigned to both crucibles; and (2) how important these multiple crucible nuances are in the bigger picture of human capital development across crucibles.

To address these methodological and empirical concerns, we ran the two-stage specification shown as Models 3a and 3b in Table 3. The sample for these models is the entire pooled sample as

used in 1a and 1b, but the specification breaks apart the crucible variables into further distinct indicator variables. These include *both early- and mid-career crucibles in same location*, *both early- and mid-career crucibles in different locations*, *only early-career crucible assignment*, and *only mid-career crucible assignment*, with these indicator variables taking on a 1/0 value as described in the variable name. The base category in this model is not being assigned to any crucible at all.[14]

The coefficients in the first stage (Model 3a) indicate that being assigned to multiple crucibles and being assigned to late career crucibles have large impacts on retention in the career pipeline. A smaller impact comes from having been assigned to an early-career crucible only (conformant with the first couple of models, albeit with more exclusive rather than overlapping dummies). The second stage (Model 3b) indicates similar effects on promotion but brings out the underlying nuances discussed in prior models. For example, the effect of being assigned to the same location for both early- and mid-career crucibles has a larger impact on early promotion compared to being assigned to different geographies for those crucibles (difference in point estimates is statistically significant; chi2(1)=5.24, p=.0221). More interestingly, the impact of being assigned to different geographies for early- and mid-career crucibles seems to provide the same human capital development opportunities (difference in pint estimates not significant) as being assigned to a crucible location in the mid-career period. This suggests that much of the human capital impact of being assigned to crucibles comes from being assigned during mid-career (when the responsibilities are managerial rather than about following instructions). Early-career crucible assignment does continue to have a small (albeit statistically significant) impact on early promotion long after.

Illustrative Example of Assignment and Impact by Cohort

[14] The AIC (Akaike Information Criterion) statistic however suggests that breaking down into extra subcategories makes it a slightly worse model fit compared to the pooled model shown in 1a and 1b. but these models are meant to advance understanding of 1a,b and check robustness of the subsample based model from 2a,b.

Even though crucible assignments are determined externally by deployment needs and organization-wide schedules (as we will discuss in the following section on qualitative evidence), some graduating cohorts of officers are just likely to find themselves with more opportunities. While we control for graduating cohort dummies in the Heckman probit models discussed previously, we nonetheless wanted to illustrate how the hypothesized effects play out in sub-aggregates, such as graduating cohorts. Table 4 shows statistics for three cohorts—officers graduating from the USMA in 1997, 1998, and 1999—that have some large year-to-year variations on the independent and dependent variables.

INSERT TABLE 4 HERE

For these years, the chances of early-career crucible assignment increases by cohort, while the chances of mid-career crucible assignment are highest for the middle cohort (1998). When comparing the chances of early promotion to major conditional on surviving in the career pipeline, we find that the highest rates of early promotion went to the 1998 cohort, tracking their greater exposure to mid-career crucibles compared to both the previous and following cohorts. Also notable perhaps is that the 1998 cohort had a high chance of experiencing both early- and mid-career crucibles. Yet, there were no major differences across these cohorts in pre-entry human capital or performance during their degree program, such as evidenced by similarity in SAT scores, the WCS (which is a private measure of cadet quality beyond academics), and GPA during their four-year degree program. This (perhaps crude) illustrative example is provided to lend more color to the findings, rather than to supplant the regression analysis, of course.

QUALITATIVE EVIDENCE AND ROBUSTNESS CHECKS

To further understand the impact of crucibles in our context, we conducted semi-structured interviews to complement our analysis of the archival data (list of interviewees in Table 5). These interviews are aimed at three distinct objectives. First, the conditionally random assignment to

crucible locations is critical to the identification strategy. In addition to the verification of stated policy rules, we use interviews to corroborate that crucible assignments are random. Second, we use the interviews as opportunities to test with experts the face validity of our general argument: that these crucible experiences augment human capital, and particularly *managerial* human capital, when assigned mid-career. Third, our interviews also allow us to explore possible an alternative explanation of our results—namely, whether or not the early promotion process takes into account sympathy for crucible assignment. Our discussions reinforced the importance of crucibles in accelerating the development of leaders. However, consistent with the quantitative results, the qualitative reports underscore how the timing of the crucible vis-à-vis the position one is serving in, does matter.

INSERT TABLE 5 HERE

These officers all led organizations from 500 to 18,000 personnel. All officers interviewed had multiple combat deployments as a leader at the small team level to the executive leadership level. We conducted 12 interviews of military officers from lieutenant colonel (having approximately 16-20 years of service) to lieutenant general or three-star general (having about 30-35 years of service). Half of these officers were promoted early at least once in their careers. We did not begin with any prior hypotheses.

Quasi-random Assignment

One might assume that individuals can have agency in their assignment and leverage personal relationships or networks to ensure they receive an assignment to a crucible opportunity in the form of a combat deployment. In other words, unobserved attributes that are correlated to early promotion could also be correlated to being deployed to crucible locations. In that case, this could be a competing explanation of our results. Similarly, if those making assignment decisions have the ability to sort stronger officers to more challenging locations, this could also be a competing

explanation. We discovered that the tasks' quasi-random nature provided zero opportunity for an individual to possess any agency in their assignment to a crucible experience in the form of a combat deployment. Additionally, we find that the Army does not actively sort officers to more challenging assignments based on perceptions of their quality.

In our discussions with senior Army leaders, there was a consistent theme that officers do not have agency in their assignment selection. Many interviewees provided support for this assertion. One senior leader, who has been in a combat leadership position for more than 30 years, has deployed on eight separate instances from 2003 to 2018, to Iraq, Afghanistan, and other strategic geographical areas in the Middle East region. In each deployment, he held either staff or support positions or was a commander or decision maker. He was responsible for an 18,000-person organization during his most recent assignment. He has also held positions on promotion boards and has a deep understanding of the officer assignment process. He shared that the way the Army initially develops leaders is by providing each person with a similar set of tools. Once this indoctrination occurs, the individuals are assigned based on the overall organization's needs versus any individual preference or evaluation of a particular skill set or unique attribute. Due to this organizational reality, officers cannot predict where they will be assigned or if their organization will be called to deploy to a combat zone. To reinforce this, he stated:

> *"We do not decide where we go, we are sent!" (XB)*

This senior leader was promoted early and has evaluated many officers directly and on the promotions board. He further emphasized the importance of performance in the role that one is assigned. Although the Army, as an organization, believes that combat experiences matter, the organization does not penalize high performers who have either less combat experience or no combat experience.

How Crucibles Develop Human Capital

Familiarity with the literature on crucibles and human capital development led us to believe that individuals may benefit from periods of intensity and may have increased performance following the crucible. Some might perceive exposure to an intense period as a signal of a high performer. Or it is possible that the traits a manager develops during the crucible or the experience they gain becomes valuable as they progress in the organization. This might be a way to gain the necessary experience needed to progress in the organization.

As stated earlier, our discussions reinforced the importance of crucibles in accelerating the development of leaders. However, the timing of the crucible and the position one is serving in does matter—primarily because of the role one is placed in during their crucible matters. When crucibles occur earlier, the scope of responsibility is small. We were able to engage a former talent management leader of the Army's 12,000 Aviation officers. Also, had a detailed conversation with the commanding officers of one of the combat arms centers of excellence. This center is responsible for training more than 10,000 officers annually at the initial onboarding of their careers.

The leader we interviewed had served in the Army for more than 22 years. He deployed to Iraq twice, once as a company commander and another as a senior staff officer. He also commanded a larger aviation organization in the Republic of Korea. During our discussion, he highlighted the industrial personnel model that the Army leverages. Each career field has similar positions. For example, all career fields have platoon leaders, which are small organizations comprised of 15-75 people. It is the initial organization for leaders to practice their craft. To ensure success, the Army pairs the young leader with a senior enlisted advisor or deputy to ensure that the do not make catastrophic mistakes. The platoon leader experience is direct leadership, where the new leader has command and control of all organizational activities. The next step is being on a staff or in a business line, followed by company command, the next leadership role. An Army company can be

as small as 27 people or as large as 350 people. It is the essence of organizational leadership. The ability of one leader to have complete knowledge of all activities is limited.

> *"When you are early in your career, you can be everywhere; but as you become senior, it is impossible, and the crucible forces you to empower others…Deployments are a valuable way to gain experience." (J)*

Experiences in intense, stressful environments force adaptation. They also extend the boundary conditions of an individual's risk tolerance when confronted with difficult decisions. Due to combat's daily unpredictable nature, it forces leaders to exercise their adaptability "muscles" in ways that are difficult to replicate. The experiences gained during a deployment provide critical feedback for a new mental model that can expand one's leadership acumen.

A senior commanding officer of a major Army training center who has served more than 32 years provided us with some good insights. He has commanded at every level and deployed on four separate occasions to Iraq, Afghanistan, and the Balkans. He has also been the commanding officer of one of the premier training centers in the continental United States. The Army sends large organizations monthly to practice conducting simulated war. He has a depth of knowledge of combat-related crucibles. On the one hand, he highlights that the intensity of the crucible exposes a weakness that might not be observed before a combat deployment because of the structure of the training.

On the other hand, some perceived low performers will expose their unique ability to lead, organize, and execute as an acute response to the situation's pressure. Also, officers are equipped with similar knowledge, but how they recombine that experience based on the case is different. In our discussion, he shared that rank matters. Positions are structured so that junior leaders are not expected to know as much and are given a lot of room to make mistakes. This is less true for senior company-grade officers like captains; these officers might be on senior staff or in company

command billets and have the responsibility of hundreds of officers and the execution of critical strategic and tactical tasks.

"Through the crucible of combat, one must look at the rank the individual was in when they deployed. They may have done poorly as a lieutenant after being in uniform for only one year; [that] does not mean there is no room for growth and development." (GB)

"Crucibles allow one to see strengths and weaknesses that can be refined and developed."(GB)

An officer might gain several potential strengths during a crucible. One possibility is the ability to be more decisive in decision making. Also, officers may gain organizational management skills and become more comfortable with operating in ambiguity. Other officers may show their weaknesses in terms of being unable to build high-functioning teams and/or being unable to distill large volumes of information, operationalize it, and execute effectively.

We discussed the officer development opportunities a crucible provides with a second senior commander of a combat training organization. This officer has more than 28 years of experience and has deployed on three separate occasions to Afghanistan and to Iraq twice. He deployed the first time as a senior staff officer and subsequent times as the commanding officer. He reinforced the accelerated development crucibles provide. He noted that in combat, everything matters, and there is almost no room for error. Every operation is the "Super Bowl," and individuals must execute at a high level. This will either increase one's capacity to operate or quickly expose those who are not fit to perform at a high level.

"Crucibles exposed a gap in my knowledge that I had to develop."(KA)

"Crucibles will highlight who can handle the stress and strain of the environment in a positive or negative way." (KA)

The Promotion Process is not Influenced by Sentiments of Sympathy

Our study may be subject to a competing explanation—that individuals who received early promotions to major driven by crucible assignments did so because selection boards had a sense of pity that they had recently been exposed to the extreme crucible of a combat deployment. In discussions with senior ranking officers, we learned that the promotion board process that the Army leverages is agnostic to individuals experiencing a crucible experience. The reality is that "Officers are placed in assignments and cannot pick where they go."[15]

These are not just impressions enshrined in the culture and ethos of senior officers staffing these promotion boards, but also formally outlined publicly in policy documents: "As an overview, promotion selection is conducted fairly and equitably by boards composed of mature, experienced, senior officers. Each board consists of different members, and women and minority members are routinely appointed. A typical board is presided over by a general officer. It consists of 18-21 officers in a grade senior to that of those being considered for promotion. The board membership reviews the entire performance portion of every officer's official record being considered for promotion. Selection boards recommend those officers who, in the collective judgment of the board, are best qualified for the promotion and future service in the Army."[16]

This provides a process that is not influenced by recency or by a strong network effect that might occur in other organizations. Even as it relates to our focal independent variable, crucibles matter, there may be a benefit to multiple combat deployments, especially to the same geographic region; however, the boarding process strongly attempts to reward officers based on observed performance alone.

Geographical Familiarity

[15] Interview with Commanding General of 7th Infantry Division, Major General Xavier Brunson.
[16] https://www.hrc.army.mil/content/Officer%20Promotions.

There are multiple benefits to operating in the same geographical space numerous times. Although every combat deployment is different, the familiarity eases the leader's anxiety. Though the mission may be different and the enemy has evolved, leaders gain confidence from being in the environment. This benefits the organization, as the officer has a more decisive way of operating and leading.

A Prussian general who led an army to victory during the nineteenth century Wars of German Unification once noted that "no plan survives contact with the enemy." This is translated in a similar thought in the U.S. Army: "The enemy has a vote."[17]

From 2001 to 2016, the Army engaged in direct action, counterinsurgency, moments of peace, and a hybrid. This dynamic reality caused each combat deployment to be significantly different because the environment, objectives, and the enemy were all different.

"Even though it is different, there is familiarity, and they had more hands-on experience." (J)

"The experience of being in Iraq before…understanding what it looks likes, smells like, and feels like was helpful."(GB)

The leaders we interviewed highlighted this and shared that although the battlespace is dynamic, familiarity with the geography, weather patterns, limitations of the enemy, and organizational structure all contribute to a less anxious leader, which results in an individual being able to make better decisions because they are far less stressed than an individual who is experiencing the same environment for the first time.

Meritocracy in Organizational Career Progression

Officers have clearly defined paths for promotion in an organization that has existed for several centuries and is assured of survival well into the future. Officers are externally assigned to

[17] https://www.providencejournal.com/article/20140803/OPINION/308039754.

crucibles based on changing political situations, deployment needs, and organizational rotation cycles in and out of combat zones. These assignments can happen early in the career, such as freshly minted graduates from the academy, and later in the career, such as when officers are up for promotion to major. Finally, officers can find themselves assigned to multiple crucibles at various times in their career. Still, these assignments are exogenously made to either the same crucible (e.g., a particular, extreme theater of war) or a different crucible (a different theater of war). Their operational and managerial assignments might vary slightly between crucibles, but their area of specialization remains constant across these assignments.

The leaders we interviewed all acknowledged the benefits of combat deployment. However, they also shared that the promotion process is not punitive and does not penalize individuals who have not been deployed. The selection board is provided specific guidance to ensure meritocracy (versus recency bias). One senior leader emphasized that combat deployments accelerate the organization's critical development, from leadership to operationalizing vague directives and risk management.

"The development that occurs in crucibles experiences is exponential to anything outside of that."(XB)

Still, the Army does not provide individuals agency in when, where, or in what capacity they will or will not be assigned to a combat zone or crucible. The organization does not penalize those who have not had the opportunity to experience combat. Two separate interviewees further highlight this fact.

"While on the board, I must set aside the crucible bias."(XB)

"There is not a single criterion for selection for promotion."(GB)

These senior leaders have more than 60 years combined Army experience, leading at multiple levels. They have each been promoted early at least once during their careers, while also having been part of the process that promoted other officers.

DISCUSSION AND CONCLUSION

Workers often are faced with extreme environments, a crucible experience that might shape career outcomes. The ongoing COVID-19 pandemic has demonstrated it is not only healthcare workers in overflowing emergency rooms, but also workers and managers facing disruptions in supply chains and demand and adoption of new work practices who face crucibles of varying degrees (Choudhury, Koo, & Li, 2020; Hixenbaugh & Ornstein, 2020; Lewry, 2020). This article examines the impact of both early- and mid-career crucibles (i.e. assignment to extreme environments) in shaping individual worker career progression. We look at multiple challenging assignments across early- and mid-careers as a staged process and separate their independent and cumulative impact on career progression. Our setting comprises 8,662 U.S. army officers who graduated from the West Point Military Academy from 1995 to 2004 and were quasi-randomly assigned to crucible locations such as war zones in Iraq and Afghanistan. Importantly for our study, the quasi-random assignment to crucibles could be during the early career of the individual (i.e., during the first five years of the career), mid-career (between the fifth and ninth year of the career), or *both* during the early- and mid-career times. We exploit this allocation protocol to estimate robust treatment effects of crucible exposure on an objective measure of career advancement—promotion to major. We additionally explore variations in human capital development from these assignments when they are cumulative, exploiting variation in whether the repeated crucible assignments are in the same or different geographic contexts and, therefore, whether it builds absorptive capacity for similar challenges or relates to exaptation and developing dynamic capabilities. Our evidence suggests the former mechanism in play in our empirical context. Our results contribute to literatures on imprinting, development of managerial cognitive capabilities, learning and career experiences, and how the geographic/cultural context can shape human capital.

Our study has several limitations. The results are from a single organization. While our setting has several advantages—such as quasi-random assignment of workers to crucibles and objective criterion for career advancement—allowing us for a clean estimation of the effects of crucible assignment on career progression, this also informs scope conditions. While the quasi-random assignment of workers to crucibles allows us to control for selection concerns in the context of our setting, there might be selection concerns regarding what observable and unobservable individual-level characteristics determine joining the U.S. Army in the first place and whether our effects hold up in external settings. Similarly, while quasi-random assignment within the same organization provides greater internal validity by holding constant the organizational environment, it presents questions of external validity in other contexts. Future work should study whether the effects of early- and mid-career assignment to crucibles demonstrate heterogeneity across work contexts and tasks and hold up in less extreme work environments.

Despite these limitations, our study makes important contributions to literatures in imprinting, learning and the development of managerial capabilities, and how geography shapes human capital development. Notably, our study makes a foundational contribution to the literature on imprinting. To the best of our knowledge, there has been no prior empirical exploration of either the effects of *multiple sensitive periods* or *mid-career imprints*. We echo what Marquis and Tilcsik (2013: 195) state (emphasis added by current authors): "Conceptualizing sensitive periods as times of transition rather than simply 'early' periods, we argue that an entity can experience *multiple sensitive periods over time*. Thus, there is a potentially intriguing interplay between different generations of imprints that are layered upon one another, with the traces of old layers surviving despite subsequent sensitive periods. Moreover, we highlight the possibility that some imprints will fade while others persist or become even more influential over time. The tensions between imprint decay, persistence, and amplification *represent a key area for future research*." The current study responds to this

call and documents that imprinting might indeed be relevant for individual workers during multiple sensitive periods; that is, during the early career and during promotion to a managerial role. We go further by studying heterogeneity of imprinting effects based on whether the imprints during the multiple sensitive periods are in similar or different geographic contexts.

Our findings on how multiple exposure to *similar* crucibles in the early career and managerial sensitive period is related to positive career outcomes contribute to the literatures on development of managerial cognitive capabilities (Adner & Helfat, 2003; Helfat & Peteraf, 2003; Winter, 2000; and notably Csaszar & Levinthal, 2016; Helfat & Peteraf, 2015). In this literature, Helfat and Peteraf (2015) allude to the importance of managerial cognitive capabilities related to language, communication, and social cognition. Repeated exposures to similar crucibles (i.e., crucible contexts that are geographically, linguistically, and culturally similar) may help develop managerial skills in language and social cognition and this, in turn, might help managers reconfigure strategic assets with positive career externalities. While we are unable to directly measure the development of language and social cognition skills in crucibles, we find supportive anecdotal evidence. To quote Wong (2004: 4), who provides an excellent qualitative study of human capital development of U.S. Army officers who are assigned to Operation Iraqi Freedom (OIF), "OIF requires junior leaders to be warriors, peacekeepers, and nation-builders—simultaneously." The author also provides examples of how "nation building" requires the development of language skills: "You go out and you talk to the people at the school or the clinic. You ask them, 'What do you guys need? How can we improve your neighborhood—your living conditions?'" (ibid: 4).

Related to the managerial skill of social cognition theorized by Helfat and Peteraf (2015), Wong (2004: 8) provides examples of how assignment to the Iraqi crucible led to the development of such skills: "Because junior officers are heavily involved in nation-building activities, they are interacting much more with the local populace than in other deployments such as Bosnia, Kosovo,

or the MFO. As a result, the nuances of culture become more noticeable. Officers reported having to learn how not to offend Iraqis with mannerisms inadvertently. Others noted that there were Iraqi idiosyncrasies that had to be learned. One officer commented, 'People here like to get really close to you when they talk. That bothers the hell out of me. It is a good thing to learn that they are not trying to sneak up on you or grab you or anything. They just want to talk; they are being friendly.'" In another illustration (ibid: 8), the author states, "The biggest thing that makes it complex here for me personally is the religious aspect of it and the Muslim world. I grew up learning about Shia and Sunnis in social studies class in junior high school, but I had no idea what these people were all about. To be here and learn about how they interact with each other and then in turn how they interact with the rest of the world—it was nothing I was prepared for." It is important to point out that the percentage of Shias in Iraq was reported to be around 70 percent[18]; in contrast, Afghanistan had a Sunni majority population with a smaller minority (around 13-15 percent Shias in Afghanistan[19] contrast to 30 percent Sunnis in Iraq), leading to potentially different patterns of interaction between the two Muslim communities in the two countries. Thus, social cognition skills learned in one religion/cultural context might be less useful in the other different context.

Our results are also relevant to the literature on how learning from experiences affects career outcomes (Burton et al., 2002; Campbell, 2013; Castilla, 2008; Chattopadhyay and Choudhury, 2017; Groysberg et al., 2008; Higgins, 2005; Huckman & Pisano, 2006; McEvily et al., 2012; Tilcsik, 2014). Notably, our findings that exposure to similar crucibles in multiple sensitive periods is related to positive career outcomes speaks to the assertion of March (1991). In the chapter titled "The Lessons of Experience," March (1991: 101-102, emphasis added by current authors) states that "Experience is a significant source of intelligence in *relatively isolated, narrow domains of frequently exercised* specialized

[18] Source: https://en.wikipedia.org/wiki/Shia_Islam_in_Iraq website accessed on January 29, 2020.
[19] Source: https://en.wikipedia.org/wiki/Shia_Islam_in_Afghanistan website accessed on January 29, 2020.

capabilities." The author also theorizes that in broader domains, experience might be "noisy" and "ambiguous" because the causal structure of experience might be complex, with uncontrolled variables, multiple interactions, and multiple collinearities. Future empirical work should go deeper in exploring the "lessons of experience" in geographically, culturally, linguistically diverse contexts for individuals experiencing multiple exposures to crucibles over their career to unpack the "noise" and "causal ambiguity" of experiences in why they might not be helpful to individuals.

Future work on individuals experiencing multiple crucibles during multiple sensitive periods could also speak to the "two interpretations of imprinting" alluded to by Levinthal (2003)—that is, "a strong form of imprinting that precludes ideas of adaptation and change and a weak form that incorporates notions of change." The weak form of imprinting is characterized by local search through a complex space of alternatives on a fitness landscape: Future work could attempt to identify fingerprints of such local search and adaptation between two successive imprints, received by the same individual, but in two temporally separated sensitive periods. Finally, our study relates to how the geographic and cultural context can shape human capital (Choudhury & Kim, 2019) and responds to the call for research on exploring the development of "contextual intelligence" of managers (Dhanaraj & Khanna, 2011; Khanna, 2015).

In conclusion, this article, to the best of our knowledge, represents the first empirical study to explore how crucible experiences received in multiple sensitive periods affect career outcomes. Using unique data and exploiting a quasi-random assignment of workers to crucibles, we find that while both early-career and mid-career crucible experiences positively affect longer- term career progression, the effects of a mid-career managerial crucible are economically more significant. We also provide evidence suggestive of a cumulative effect of crucibles on building absorptive capacity: multiple crucibles are most salient in positively affecting career outcomes when received in the same geographic/cultural context.

Tables and Figures

FIGURE 1
Military Organization Chart

Organizational level	Size	Lead Rank
Division	16,000–20,000 soldiers (3 brigades)	Major general
Brigade	3,000–7,000 soldiers (3–5 battalions)	Colonel
Battalion	300–1,000 soldiers (3–5 companies)	Lieutenant colonel
Company	30–250 soldiers (3–4 platoons)	Captain
Platoon	30–70 soldiers	Second lieutenant

Source: New York Public Media. "U.S. Army Units Explained: From Squads to Brigades to Corps." Accessed January 28, 2020. https://www.thirteen.org/blog-post/u-s-army-units-explained-from-squads-to-brigades-to-corps/.

FIGURE 2
Army Branches

Branches of the Army		
Air Defense Artillery  The Air Defense Artillery (ADA) branch specializes in anti-aircraft weaponry. This branch is responsible for protecting troops from aerial attacks and surveillance.	**Military Intelligence**  The Army's Military Intelligence branch is responsible for all intelligence gathered or learned during Army missions. Duties include all aspects of planning, organization, training, and operations of tactical intelligence, counterintelligence, signal intelligence and electronic warfare, security, interrogation, and aerial reconnaissance and surveillance.	**Adjutant General**  Adjutant General Corps Soldiers are experts in personnel management. This branch helps Soldiers with tasks that affect their welfare.
Armor  Armor Crewmembers use tanks and other track vehicles to engage enemy targets. The Armor branch is one of the most versatile combat arms branches in the Army.	**Chemical** The threat of Chemical, Biological, Radiological and Nuclear (CBRN) weapons requires the Army to have a corps of dedicated professionals capable of using the latest CBRN defense technology. The Chemical Branch protects our country from CBRN hazards and Weapons of Mass Destruction (WMD).	**Engineer**  Combat Engineers are the first in and the last to leave a battle. Engineer Soldiers receive experience in combat, construction, or topographic engineering units before branching out into such fields as civil works, military construction, environmental engineering and other specialties.
Calvary  Cavalry Scouts conduct reconnaissance missions to identify enemy activity. Because of the diversity of firepower they employ during combat, Cavalry Scouts are trained on more weapons systems than any other Soldier	**Signal**  Signal Corps Branch Soldiers are experts in operating and maintaining the Army's data systems, and resources.	**Chaplain**  The Chaplain Branch is responsible for providing spiritual comfort and support to Army Soldiers of all religious backgrounds.
Aviation  The Aviation branch is responsible for the coordination of Aviation operations from maintenance to control tower operations to tactical field missions. Army Aviators provide quick-strike and long-range target engagement during combat operations and are often responsible for transporting troops and supplies.	**Finance**  The Finance Branch manages the preparation and payment of travel, accounts for the disbursement of public funds, and payment of salaries. In addition to providing financial services for fellow Soldiers, Finance Soldiers play an important role in supporting logistical, medical and supply requirements during tactical missions.	**Infantry**  The Infantry Branch is the main land combat force. They are responsible for meeting any threat by land. Its mission: To maintain a state of readiness in preparation for combat worldwide.

Special Forces  The Special Forces branch contains some of the most skilled Soldiers in the world. Special Forces Soldiers operate in small teams to accomplish sensitive missions.	**Military Police**  The Army depends on Military Police (MP) to maintain order and discipline. They serve as the Army's law enforcement and security officers, and handle crimes committed on Army installations.	**Army Medical**  The Medical Branch is responsible for training doctors, nurses, veterinarians, and other medical professionals. The Army Healthcare Team represents one of the largest comprehensive healthcare systems in the world.
Ordnance  The mission of the Ordnance Corps is to Arm and Fix the Force. The Ordnance Corps is the support structure that assures our combat units are prepared during peace and war. A modern Army is dependent upon its ability to shoot, move, and communicate.	**Cyber Operations**  Cyber operations execute defensive and offensive cyberspace operations (DCO and OCO).	**Civil Affairs**  Civil Affairs officers identify critical requirements needed by local citizens in combat or crisis situations.
Quartermaster  The Quartermaster Branch handles the logistics of providing Soldiers with food, water, petroleum, repair parts and other field services during a military or relief operation.	**Psychological Operations**  The Psychological Operations Branch is primarily responsible for the analysis, development and distribution of intelligence used for information and psychological effect.	**Transportation**  Transportation Branch Soldiers are responsible for operating U.S. Army heavy equipment and ensuring that Soldiers in the field receive the critical supplies they need to complete the mission.
Public Affairs  The Army Public Affairs Branch participates in and assists with the supervision and administration of Army public affairs programs primarily through news releases, newspaper articles, web-based material and photographs for use in military and civilian news media.	**Judge Advocate General**  The U.S. Army Judge Advocate General's Corps is a government organization that operates like a court system. Its Judge Advocates are licensed attorneys qualified to represent the Army and Army Soldiers in military legal matters.	**Electronic Warfare**  The Electronic Warfare branch advises and assists the commander on electronic warfare operations.
Army Music  As a musician, you'll have the opportunity to play in many bands and ensembles, including brass and woodwind quintets, jazz combos, stage bands, rock and pop groups or Dixieland bands.	**Field Artillery**  As the "King of Battle," the Field Artillery provides the massive firepower necessary for our Army to win on the modern battlefield. Field Artillery soldiers command guns and rockets, and integrate fires into combined arms operations.	Adapted from goarmy.com

FIGURE 3
Military Officer Ranks

Category	Rank	Average tenure
Company-grade "tactical" officers	Second lieutenant	24 months (set)
	First lieutenant	24 months (set)
	Captain	6-7 years (performance)
Field-grade "operational" officers	Major	6-7 years (performance)
	Lieutenant colonel	5 years (performance)
	Colonel	Dependent on performance and availability of positions in following rank
General officers "strategic" officers	Brigadier general	
	Major general	
	Lieutenant general	
	General	
	General of the Army	

Table 1: Summary Statistics and Pairwise Correlations between independent and control variables (n=8862)

	max	min	mean	sd	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Female	1	0	0.14	0.34														
(2) Early Career Crucible Assignment	1	0	0.37	0.48	-0.03													
(3) Mid Career Crucible Assignment	1	0	0.23	0.42	-0.09	0.23												
(4) SAT Score	1600	670	1271	106	-0.06	-0.02	0											
(5) Cadet's Whole Candidate Score (WCS)	7390	4212	6038	375	0.02	0.01	0.01	0.62										
(6) GPA at US Military Academy	4.03	2.05	2.99	0.33	0.03	0.1	0.05	0.38	0.54									
(7) Combat Arms officer	1	0	0.72	0.45	-0.41	0.07	0.12	-0.03	-0.07	-0.08								
(8) Aviation Branch	1	0	0.12	0.33	-0.05	0	0.08	-0.02	0	0.04	0.23							
(9) Race = Asian	1	0	0.05	0.23	0.02	-0.02	-0.02	0.10	0.06	0.01	-0.08	-0.04						
(10) Race = Black	1	0	0.06	0.25	0.05	-0.03	-0.01	-0.23	-0.21	-0.20	-0.07	-0.05	-0.06					
(11) Race = Hispanic	1	0	0.05	0.22	0.00	0.02	0.00	-0.07	-0.08	-0.05	0.00	-0.01	-0.05	-0.06				
(12) Race = Native American	1	0	0.01	0.08	-0.01	0.01	0.01	0.00	-0.02	-0.02	0.00	-0.01	-0.02	-0.02	-0.02			
(13) Race = Other	1	0	0.01	0.10	0.02	0.01	0.01	0.01	0.00	0.01	0.00	0.00	-0.02	-0.03	-0.02	-0.01		
(14) Race = Pacific Islander	1	0	0.00	0.02	-0.01	0.01	0.03	-0.01	-0.01	-0.01	-0.01	0.01	-0.01	-0.01	0.00	0.00	0.00	
(15) Race = White	1	0	0.81	0.39	-0.05	0.02	0.01	0.13	0.14	0.15	0.09	0.06	-0.50	-0.55	-0.48	-0.17	-0.22	-0.04

Table 2: Summary statistics by retention

	Stay until promotion to Major milestone						Leave before promotion to Major milestone					
	n	mean	sd	max	min	median	n	mean	sd	max	min	median
Female	3126	0.11	0.31	1.00	0.00	0.00	5556	0.15	0.36	1.00	0.00	0.00
Early Career Crucible Assignment	3126	0.46	0.50	1.00	0.00	0.00	5556	0.32	0.47	1.00	0.00	0.00
Mid Career Crucible Assignment	3126	0.52	0.50	1.00	0.00	1.00	5556	0.07	0.26	1.00	0.00	0.00
SAT Score	3126	1278	106	1600	670	1280	5556	1268	106	1600	910	1260
Whole Cadet Score (WCS)	3126	6070	372	7390	4212	6090	5556	6024	374	7387	4694	6045
GPA at US Military Academy	3126	3.03	0.33	4.03	2.08	3.03	5556	2.97	0.33	3.98	2.07	2.96
Combat Arms officer	3126	0.77	0.42	1.00	0.00	1.00	5556	0.71	0.45	1.00	0.00	1.00
Aviation Branch	3126	0.17	0.37	1.00	0.00	0.00	5556	0.10	0.30	1.00	0.00	0.00
Race = Asian	3126	0.06	0.23	0.00	1.00	0.00	5556	0.05	0.22	0.00	1.00	0.00
Race = Black	3126	0.06	0.25	0.00	1.00	0.00	5556	0.06	0.24	0.00	1.00	0.00
Race = Hispanic	3126	0.05	0.22	0.00	1.00	0.00	5556	0.05	0.22	0.00	1.00	0.00
Race = Native American	3126	0.01	0.09	0.00	1.00	0.00	5556	0.01	0.07	0.00	1.00	0.00
Race = Other	3126	0.01	0.10	0.00	1.00	0.00	5556	0.01	0.10	0.00	1.00	0.00
Race = Pacific Islander	3126	0.00	0.02	0.00	1.00	0.00	5556	0.00	0.02	0.00	1.00	0.00
Race = White	3126	0.81	0.39	0.00	1.00	1.00	5556	0.82	0.39	0.00	1.00	1.00

Table 3: Heckman Probit Models predicting Early Promotion to Major conditional on surviving in career pipeline. Maximum likelihood estimates. Robust standard errors clustering on graduating cohort in parentheses. Two Tailed Tests * p<0.05, ** p<0.01, *** p<0.001

	Model 1a (1st stage)	Model 1b (2nd stage)	Model 2a (1st stage)	Model 2b (2nd stage)	Model 3a (1st stage)	Model 3b (2nd stage)
DV:	Survival in pipeline	Early Promotion to Major	Survival in pipeline	Early Promotion to Major	Survival in pipeline	Early Promotion to Major
Early Career Crucible Assignment	0.226*	0.188**				
	(0.101)	(0.073				
Mid Career Crucible Assignment	1.636***	1.013***				
	(0.100)	0.054				
Both Early and Mid Career Crucibles, Same Location			-0.005	0.115*	1.901***	1.312***
			(0.051)	(0.048)	(0.096)	(0.079)
Both Early and Mid Career Crucibles, Different Locations			Base category	Base Category	1.799***	1.090***
					(0.132)	(0.077)
Only Early Career Crucible Assignment					0.329**	0.281**
					(0.110)	(0.096)
Only Mid Career Crucible Assignment					1.807***	1.098***
					(0.084)	(0.045)
Female	-0.052	0.033	-0.060	0.162	-0.049	0.035
	(0.048)	0.104	(0.100)	(0.150)	(0.051)	(0.106)
Black	0.093	-0.244	-0.029	0.037	0.071	-0.262
	(0.093)	(0.154)	(0.168)	(0.131)	(0.108)	(0.153)
Hispanic	-0.005	-0.176	0.059	0.206	-0.017	-0.189
	(0.120)	(0.136)	(0.153)	(0.176)	(0.120)	(0.135)
Native American	0.206	-0.113	0.309	-0.171	0.202	-0.116
	(0.285)	(0.434)	(0.403)	(0.418)	(0.286)	(0.425)
Pacific Islander	-0.861***	-6.923***	-0.060	0.130	-0.850***	-6.969***
	(0.097)	(0.130)	(0.141)	(0.100)	(0.096)	(0.116)
White	-0.158	-0.163***	0.076	0.204	-0.168*	-0.165**
	(0.085)	(0.051)	(0.166)	(0.108)	(0.083)	(0.053)
Other	-0.226	-0.169	-0.104	0.481	-0.243	-0.167
	(0.196)	(0.345)	(0.323)	(0.279)	(0.200)	(0.338)
SAT Score	0.000	-0.001**	0.000	-0.001	0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Whole Cadet Score (WCS)	0.000*	0.000	0.000	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GPA at US Military Academy	0.366***	1.028***	0.392*	0.637**	0.374***	1.041***
	(0.080)	(0.058)	(0.198)	(0.226)	(0.073)	(0.061)
Combat Arms officer	-0.021	-0.117	0.170	-0.196**	-0.026	-0.128
	(0.048)	(0.070)	(0.113)	(0.066)	(0.048)	(0.073)
Aviation Branch (First stage instrument)	0.307***		-0.429***		0.310***	
	(0.054)		(0.048)		(0.051)	
Constant	-2.314***	-2.850***	-0.247	-0.979	-2.371***	-2.861***
	(0.298)	(0.543)	(0.727)	(0.883)	(0.287)	(0.550)
Grad. cohort yr dummies	Included	Included	Included	Included	Included	Included
Num. Obs. (#selected)	8,862 (3,127)		1,170 (914)		8,862 (3,127)	
Log pseudolikelihood	-5601.406		-994.5376		-5663.232	
AIC	11224.81		2009.075		11346.46	
Chi2 stat	10.47**		200.78***		14.58***	

Table 4
Illustrative Example of Assignment and Impact by Cohort

	1997 Cohort	1998 Cohort	1999 Cohort
Early-career crucible assignment	16.5%	25.8%	29.7%
Mid-career crucible assignment	24.5%	25.2%	23.5%
Early promotion to major	**11.3%**	**12.1%**	**11.6%**
SAT scores	1,285	1,286	1,280
Whole Cadet Score	6,058	6,038	6,022
GPA at U.S. Military Academy	2.954	2.944	2.951

Table 5
Rank, Branch, and Interview Duration for the Semi-structured Interviews

Rank	**Branch**	**Time**	**Method**
Lieutenant general/**3-Star**	Infantry	27 mins	Interview and video recording
Major general/**2-Star**	Infantry	25 mins	Interview and video recording
Major general/**2-Star**	Infantry	35 mins	Interview and video recording
Brigadier general/**1-Star**	Armor	33 mins	Interview and video recording
Colonel	Armor	30 mins	Interview and video recording
Colonel	Aviation	51 mins	Interview and video recording
Lieutenant colonel	Infantry	56 mins	Interview and video recording
Lieutenant colonel	Engineer	40 mins	Interview and video recording
Lieutenant colonel	Aviation	38 mins	Interview and video recording
Lieutenant colonel	Aviation	35 mins	Interview and video recording
Lieutenant colonel	Field artillery	43 mins	Interview and video recording
Lieutenant colonel	Field artillery	50 mins	Interview and video recording

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