Received: 28 March 2020 | Revised: 30 September 2021 | Accepted: 2 October 2021

DOI: 10.1002/smj.3346

STRATEGIC MANAGEMENT JOURNAL WILEY

RESEARCH ARTICLE

# Trained to lead: Evidence from industrial research

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## Abstract

**Research Summary:** This study investigates the importance of early life training for people's leadership roles later in the workplace. We focus on team leaders in industrial research and analyze changes in team leadership after the abandonment of the military draft by the United States in 1973. This policy produced a twofold effect on leadership training opportunities: it eliminated the training provided during the draft and reduced the incentives to pursue long-term education to defer conscription. Our results show a decrease in the probability of team leadership for men subject to the policy change. This effect, which is likely explained by the education channel, reduces over time. We discuss the implications of our findings for the formation of human capital to fulfill strategic leadership roles.

**Managerial Summary:** The progressive shift toward team-based innovation practices puts organizations in need of new leaders. Whether leaders can be trained as such is, however, a controversial topic. We argue that one can learn to become a leader through life-changing experiences. Our results show that people who undergo pervasive leadership-enhancing opportunities early in life have higher chances of fulfilling leadership positions later in the workplace. Therefore, our study calls for the provision of early life, inclusive leadership enhancing opportunities to shape leadership attitudes and capabilities. These include formal education, corporate internships, and on-the-job training but could also span to other domains, such as political activism, associationism, and sporting activities.

**KEYWORDS**

firm innovation, inventors, R&D projects, team leader, training

## 1 | INTRODUCTION

The constant increase in the demand for people who can take up leadership roles—key resources for the performance of organizations (e.g., Goodall, 2009; Kuhn & Weinberger, 2005; Quigley & Hambrick, 2015; Yukl, 2008)—clashes with their limited supply (Deloitte Insights, 2019; McKinsey Global Institute, 2018; Forbes: Wyman, 2019), therefore, reviving the discussion about the importance of leadership training programs. Articles in *Forbes* (Hansen, 2011) and The Economist (2014) discuss the role of business schools to train future leaders. At the same time, many of the Fortune 1,000 companies offer corporate trainings that combine formal education with hands-on opportunities to practice leadership (Lawler, Mohrman, & Benson, 2001). In the academic community, the question translates into the debate on the origin of leadership, whether it can be taught over the course of one's life in addition to rest on some innate individual talent (Day, 2012; Deming, 2017; Kuhn & Weinberger, 2005; Lazear, 2012).

We contribute to investigating the role of training to build team leadership by exploiting a policy change consisting in the elimination of the military draft by the United States in 1973. The effect of the abolishment of the draft on the provision of leadership training opportunities was twofold. First, it eliminated the direct training that people could have received during conscription (Gronqvist & Lindqvist, 2016; Liang, Wang, & Lazear, 2018). Second, by terminating the threat of conscription, it reduced the incentives to enroll in further education to defer the draft (e.g., Card & Lemieux, 2001). Both forms of training previously took place during the so-called impressionable years (ages 18–25; e.g., Eisenberg et al., 1999; Hess & Torney-Purta, 1967) when people are more receptive to external stimuli, and when interventions are most likely to produce impacts that persist in adults' outcomes (Chattopadhyay & Choudhury, 2017; Deming, 2017).

The context of our study is that of industrial research. We analyze the probability of inventors taking up leading roles, intended as roles of responsibility over the work of others, in research projects that led to the development of patentable inventions. This is a meaningful context for the purpose of this investigation, as the frequency of teamwork between specialized innovators has increased over time (Jones, 2009; Singh & Fleming, 2010; Wuchty, Jones, & Uzzi, 2007). Moreover, the management of these heterogenous teams leverages the costs and frictions of research collaborations (Bikard, Murray, & Gans, 2015; Hoegl & Gemuenden, 2001; Teodoridis, 2018), therefore increasing the value of and demand for lead inventors who take team-member responsibilities, design the team composition to exploit complementarities in knowledge specialization, apply for funding, and allocate tasks and resources (Ali & Gittelman, 2016; Choudhury & Haas, 2018). Recent work highlights the relevance of leaders and teamwork in knowledge-intensive projects (Rahmani, Roels, & Karmarkar, 2018), with lead inventors being central to R&D teams' learning (e.g., Stoker, Looise, Fisscher, & De Jong, 2001), affecting innovation outcomes by ensuring access to resources (Brown & Eisenhardt, 1995; Sarin & McDermott, 2003), and reducing team conflicts while increasing the overall group's ability to access and recombine knowledge (Guimerà, Uzzi, Spiro, & Nunes Amaral, 2005).

The empirical analysis uses data on 6,160 inventors in industrial research for whom we know whether they held roles of responsibility over the work of others at the time of the research project, together with information on their country and year of birth, and other individual characteristics. Country and year of birth define the sample of individuals subject to the policy change, that is, U.S. men born since 1953. We compare the probability of fulfilling leadership roles between inventors in the United States and inventors in countries retaining conscription, before and after the policy change. Importantly for the purposes of our research, because the elimination of conscription applied to all U.S. citizens, the change in the availability of training opportunities was independent of people's innate leadership attitudes.

We begin by estimating the change in the probability of inventors to take up leadership positions for three windows of birth years: 1947–1956, 1947–1963, and 1947–1975. The shorter the time window, the more likely it is that people born before and after the policy change had similar training opportunities besides those induced by the military draft. Thus, the policy change might have significantly modified the available options and incentives to learn and practice leadership for these people. The further from the cutoff year that people are born (e.g., for the time window until 1975), the higher the probability that alternative training experiences leveled out post-policy differences in leadership training opportunities across countries. Thus, for example, it is more likely that inventors born during the period 1947–1952 had training options similar to those born during the period 1953–1956 than to those of inventors born in the 1960s and 1970s, who were raised in the 1980s and 1990s, in an environment that underwent significant social and economic changes, and in which education was perceived as a key factor for social mobility.

In addition to the overall effect, we explore the plausibility of the two main channels through which the abolition of conscription likely produced changes in the probability of fulfilling leadership roles: the elimination of the direct training provided in the military, and the reduction of incentives to pursue higher education in order to defer the draft. To this end, we consider the fact that the Selective Service continued to assign draft-priority numbers also for all men born in 1953, 1954, 1955, and 1956, in case the draft was extended ("The Vietnam Lotteries," 2009). Thus, while the direct training channel reduced for all U.S. cohorts born from 1953 onwards, the education channel continued to operate—at least partially—until 1957 because of the threat of potential conscription. We employ these two cutoff years to explore further the role of the education channel in explaining differences in the probability of fulfilling leadership positions later in life.

We build evidence incrementally and, also because of the limited sample size for some of our analyses, we provide support for the plausibility of our interpretations through different pieces of evidence (King, Goldfarb, & Simcoe, 2021; Pillai, Goldfarb, & Kirsch, 2021). To this end, we collected supplementary information from 697 inventors among those in our larger sample. The experiences they were willing to share with us complement the results of the regression analysis and shed light on the extent to which leadership can be taught and the role of education and the military draft as training experiences.

Overall, our findings suggest that the elimination of draft, and therefore the two types of training that it involves, is associated with a reduction of the probability of being a team leader. Results for the time window 1947–1963 show that U.S. male inventors born after 1952 are less likely to fulfill team leadership roles in inventive projects later in life than inventors born in the same year located in countries that were not exposed to the policy change (i.e., −10.6 percentage-points). The overall effect accounts for both the direct military training and the education channels. It is worth noting that our pre-policy-change period (1947–1952) includes birth years of people serving in the Vietnam War, for whom not only was the number of draftees higher than in peacetime, but those drafted could be called up for active service in the war, which made the incentives to enroll in higher education extremely salient to avoiding conscription (Card & Lemieux, 2001).

The decrease in the probability of team leadership halves (i.e., −5.8 percentage points) when we consider inventors born up until 1956, which excludes the additional effect associated with the full elimination of the conscription threat for cohorts born after 1956. We observe an even smaller effect in the long run (i.e., −3.6 percentage points for the period 1947–1975), suggesting that training opportunities equalize across countries over time, therefore diluting the initial effect of the policy change. These findings are robust to the inclusion of individual and employer characteristics, sectoral, year, and country dummies, and country-specific linear time trends. Moreover, consistent with the idea that the education channel played a key role, we observe an additional decrease in the probability of being a team leader for inventors born after 1956, when the threat of conscription also terminated.

## 2 | BACKGROUND LITERATURE AND CONTRIBUTION OF THE STUDY

### 2.1 | Leaders formation and implications for the management of firms' inventive activities

The value and sources of leadership roles and skills are studied in the literature in different fields. There are comprehensive review articles, such as Yukl (1989), House and Aditya (1997), and Antonakis, Day, and Schyns (2012), and books (e.g., Antonakis & Day, 2017). Much of this literature focuses on personal characteristics, including physical traits (e.g., Lindqvist, 2012), genetic and personality traits (e.g., Arvey, Rotundo, Johnson, Zhang, & McGue, 2006; Gupta & Misangyi, 2018; Westley & Mintzberg, 1989), tasks and activities (e.g., Goodall, Kahn, & Oswald, 2011), and contextual variables that make leadership effective in private and public domains. Other strands of research focus on the returns of leadership roles at the individual level (e.g., Kuhn & Weinberger, 2005) and their relevance for corporate, institutional, and societal outcomes (e.g., Agarwal, Braguinsky, & Ohyama, 2020; Bertrand & Schoar, 2003; Flynn & Staw, 2004; Goodall, 2009; Jones & Olken, 2005; Rosenbloom, 2000; Shapiro, Hom, Shen, & Agarwal, 2016).

In the literature that examines factors affecting the probability that an individual takes up leadership roles, a debate relates to whether the propensity to lead others can be learned in addition to depending on some natural and innate inclinations. For example, by relating high school leaders to adults' managerial occupations, holding constant cognitive skills, Kuhn and Weinberger (2005) demonstrated that leadership is "teachable." Lazear (2012) showed that the acquisition of general skills predicts the development of leadership capabilities. Day (2012) investigated the nature of leadership development and concluded that leaders are mostly not born as such; instead, they develop through some nurturing processes.

The interest around the question of whether training can contribute to forming new business leaders has been stimulated by the rising demand for leadership roles to manage activities that traditionally were less in need of leaders, such as the management of innovation within organizations. In recent decades, teamwork among specialized inventors has become the standard (Jones, 2009). Although remarkably beneficial to innovation in terms of both quantity and quality of ideas (Singh & Fleming, 2010; Wuchty et al., 2007), teamwork is a demanding strategy for firms that need to integrate different background knowledge into innovation teams and to cope with communication burdens. Substantial monitoring and coordination efforts are necessary to ensure that teams work in synchrony, that they share a common "scientific" language, processes, coordinated actions, routines, and goals (Bikard et al., 2015). The rising importance of these coordination activities has led to an increase in the demand for team leaders who design the team composition, coordinate and exploit complementarities among team members (Hoegl & Gemuenden, 2001; Teodoridis, 2018), and allocate tasks and resources.

Information that we gathered from a follow-up survey of 697 inventors among those in the larger sample used in the regression analysis confirms that having responsibility for the work of others is common among inventors and that it is a particularly relevant and rewarding activity for the leading inventor, the team, and the employer more generally. For example, an inventor said that he finds "that research today is more team based and less based on the individual contributor. [Thus], utilizing a particular person's strengths and providing them technical and mentoring support […] allows them to better contribute to the team." Another inventor said that "leading a new-technology development team is different from 'normal' management. It requires fostering creativity while protecting the team from corporate interests." A third inventor argued that "everybody has different talents, experiences and thought processes. Effective management of the creative process […] must discover the means with which all team members can be utilized effectively without shutting down the ideas of any team member."

Thus, understanding whether the propensity to be in leadership positions can be learned remains an important goal. Yet, as Deming (2017) stated in his study on teamwork, coordination, and social skills, whereas there is broad consensus on their role in the management of innovation, research is still "silent about where they come from, and whether they can be affected by education or public policy" (p. 1635).

## 2.2 | Leadership development and the elimination of military conscription

We study whether the policy that eliminated conscription in the United States in 1973 is associated with inventors' probability of taking up team leadership roles later in life. This policy, which affected U.S. men born since 1953, is especially interesting for the purposes of our study.

First, it reduced the possibility of undergoing a landmark experience that exposes drafted individuals to a specific typology of leadership training early in life, when a person is especially receptive to any form of meaningful experience. This is important, as early career experiences can have lasting effects on subsequent job performance and approaches to problem-solving (Tilcsik, 2014). Chattopadhyay and Choudhury (2017) suggested that exposure early in life to challenging environments offers opportunities to develop skills through what they call "crucible experiences." The military can be listed among such experiences, changing a person's life course and helping shape individual personality and long-term behavior (Jackson, Thoemmes, Jonkmann, Lüdtke, & Trautwein, 2012; Koch-Bayram & Wernicke, 2018). It makes people learn "by observing" both successful leadership examples and negative examples or failures, and it provides training via both formal courses and exposure to a variety of experiences and leadership practices.

The relationship between leadership training and military service has received attention in the academic literature.[1] For example, Senor and Singer (2009) described the Israeli military service as one of the factors shaping "leadership, teamwork and mission-oriented skills and experience" (p. 234). Koch-Bayram and Wernicke (2018) found that CEOs with experience in the U.S. Army are less prone to financial misconduct, as a result of their early exposure to obedience to rules, discipline, and integrity, and pointed out that exposure to the military is among "the most far-reaching experiences in changing a person's life course because it typically occurs early in life and before many other triggering events" (p. 2946). Using data on people enlisted in the Swedish Army, Gronqvist and Lindqvist (2016) assessed whether different types of military training affect the probability of becoming a manager later in life. Evidence from company surveys such as Goldman Sachs suggested that military experience provides training for employees in managerial consulting (Nassiri, 2018), and multinational enterprises such as General Electric (n.d.) offer specific programs to recruit employees with military experience.

Second, the policy also eliminated the threat of enlistment for all U.S. men, thus reducing the incentives to pursue long-term education to avoid the draft. In the United States, men who were able to maintain a college deferment until they turned 26 could avoid service through subsequent alternative means (i.e., occupation, parenthood). Card and Lemieux (2001) provided empirical evidence of this effect by comparing the schooling outcomes of women and men according to the risk of induction during the Vietnam War. They estimated that draft-avoidance behaviors increased college attendance rates by 4–6%, and college degrees by 2%. Comparing World War II veterans with nonveterans, Bound and Turner (2002) showed that, conditional on high school graduation, the difference in the average number of years of college completed between the two groups is about 0.3, and the difference in college completion rates is roughly six percentage points. As far as the implications for leadership are concerned, by reducing the incentive to pursue graduate education, the abolishment of the draft decreased exposure to training opportunities to develop leadership skills through formal education during the impressionable years. By studying the elimination of conscription, we account for both channels, the direct one via the forgone training during the military, and the indirect one, consisting in lowering incentives to pursue further education to avoid the draft. This is also part of our contribution with respect to studies that condition on people being drafted and that capture the direct effect of the different types of training programs provided in the military draft on the probability of fulfilling leadership responsibilities (e.g., Gronqvist & Lindqvist, 2016).

## 3 | EMPIRICAL ANALYSIS

### 3.1 | Snapshot of the policy change

Military service in the United States was subject to conscription over most of the country's recent history until 1972. Conscription was largely enforced by the federal government during

[1]Our study investigates the implications of military service for the probability of being in leadership roles only. It does not investigate the quality of leadership skills or other crucial effects that military experience can have on individual outcomes, such as health, socioeconomic conditions, and earnings (e.g., Angrist, 1998; Angrist, 1990; Angrist & Krueger, 1994, for the United States; Bauer, Bender, Paloyo, & Schmidt, 2012, for Germany; Card & Cardoso, 2012, for The Netherlands; and Grenet, Hart, & Roberts, 2011, for the United Kingdom).

four conflicts: the American Civil War, World War I, World War II, and the Cold War (including the Korean War and the Vietnam War). From 1940 to 1947, conscription was regulated by the Selective Training and Service Act, which required all men from their 18th birthday until the day before their 65th birthday to register. Draftees were then selected by a national lottery to determine the order of people called up for active service. If drafted, a man served on active duty for 12 months, and then in a reserve component for 10 years or until he reached the age of 45, whichever came first.

The Selective Training and Service Act was replaced by the Selective Service Act in 1948, when the Selective Service System was established as an independent agency of the U.S. government maintaining information on those potentially subject to military conscription. U.S. male citizens and immigrant noncitizens between the ages of 18 and 25 were required by law to register within 30 days of their 18th birthday and were eligible for a service of 21 months. With the outbreak of the Korean War, the active-duty service time increased to 24 months, beginning in 1951. The Military Selective Service Act of 1967 expanded the ages of conscription and established that students' deferments were still granted. Students attending college or a training program full-time could request an exemption until the completion of a four-year degree or until their 24th birthday, whichever came first. In practice, those who obtained a college deferment until their 26th birthday could avoid conscription. If they obtained a bachelor's degree before the age of 25, they could apply for graduate deferment and then for occupational or dependent deferments (Card & Lemieux, 2001).

The draft was officially abolished in 1973 after a prolonged discussion in the Senate (Bradford, 2003; Chambers & Anderson, 1999). Legislation to create a voluntary force as advanced by the Gates Commission was signed on September 28, 1971, and further augmented by a standby draft to reconcile the opposition of several members in the House of Representatives (Asch, Miller, & Warner, 2009). In December 1972, the last men were conscripted; they were born in 1952 and reported for duty in June 1973. In the same year, a drawing was held to determine draft-priority numbers for men born in 1953, but no further draft orders were issued. In 1973, 1974, and 1975, the Selective Service assigned draft priority numbers for all men born in 1954, 1955, and 1956, in case the draft was extended, but it was never put into practice ("The Vietnam Lotteries," 2009).

## 3.2 | Empirical approach

U.S. men born before 1952 (included) were subject to conscription law; those born from 1953 onward did not have to comply with it. We compare the change in the probability of taking up leadership roles by U.S. inventors before and after the elimination of conscription with the change in probability for inventors in a group of countries that retain active conscription over the same period. In other words, we estimate the intention to treat (ITT) for the exposure of individuals to the elimination of conscription in the United States compared with countries listed in Table 1, in which conscription is still active or was abandoned only recently, such that the policy change did not affect people born in the time window of our study (i.e., Austria, Switzerland, Czech Republic, Germany, Denmark, Spain, Finland, Greece, Hungary, Israel, Italy, Norway, Poland, Sweden, and Slovenia). It is worth noting that the elimination of conscription is a policy change that applied to all U.S. males born after 1952. We interpret these estimates to capture the overall change in leadership associated with missing or reduced

**TABLE 1** Military draft policy, by country

| Country | Military draft policy |
|---|---|
| Austria (AT) | Mandatory draft active (6 months) |
| Czech Republic (CZ) | Mandatory draft abolished (effective 2005) |
| Denmark (DK) | Mandatory draft active (4–12 months) |
| Finland (FI) | Mandatory draft active (6–12 months) |
| Germany (DE) | Mandatory draft abolished (effective 2011) |
| Greece (GR) | Mandatory draft active (9–12 months) |
| Hungary (HU) | Mandatory draft abolished (effective 2005) |
| Israel (IL) | Mandatory draft active (3 years for men, 2 years for women) |
| Italy (IT) | Mandatory draft abolished (effective 2005) |
| Norway (NO) | Mandatory draft active (1 year) |
| Poland (PL) | Mandatory draft abolished (effective 2008) |
| Sweden (SE) | Mandatory draft abolished (effective 2011) |
| Slovenia (SI) | Mandatory draft abolished (effective 2004) |
| Spain (ES) | Mandatory draft abolished (effective 2002) |
| Switzerland (CH) | Mandatory draft active (18–21 weeks + recalls) |
| United States (U.S.) | Mandatory draft abolished (effective 1973) |

*Note*: We exclude from the control sample inventors born in Belgium, France, and the Netherlands, as these countries abolished conscription in 1994, 1998, and 1996, respectively, therefore potentially affecting inventors born at the end of the extended period considered in our study.

training from either the military draft or higher education that people would have had if the draft were still in place.[2]

We estimate the following equation:

$$Team\ leader_{iycs} = \beta_0 + \beta_1 USborn\ inventor_i + \beta_2 US\ born\ inventor_i \times Born\ 1953\ onwards_y + \beta_3 X_{iycs} + \gamma_c + \lambda_y + \delta_s + t_c + \varepsilon_{iycs} \quad (1)$$

where $Teamleader_{iycs}$ is the probability that inventor *i* born in year *y* in country *c* and working in sector *s* takes up leadership roles in a research project leading to the development of a patentable invention. $\beta_2$ is the coefficient of interest, capturing the effect of the ITT associated with the elimination of conscription via the interaction term between$US\ born\ inventor_i$, which takes the value 1 if the inventor was born in the United States, and Born 1953 $onwards_y$, taking the value 1 for birth years after 1952. We include a set of individual controls ($X_{iycs}$) dummy

[2]The elimination of the draft applied to all men born after 1952, although the effect that it produced depends on the strength of the training and the number of people trained, either directly through military experience or through longer education to defer the draft, before the policy change. The stronger and more diffused the training, the smaller the difference between the treatment on the treated (TOT) and the ITT. As far as the strength of the effect is concerned, the pre-policy period includes also years in which people were drafted for or threatened by the Vietnam War. Finally, the fact that people might have volunteered in the absence of conscription should produce an attenuation bias in our estimates.

variables for inventors' country of birth ($\gamma_c$) year of birth ($\lambda_y$), sector of employment ($\delta_s$) and linear country trends ($t_c$), as in Besley and Burgess (2004) and Autor, Palmer, and Pathak (2017).

The vector of controls $X_{iycs}$ accounts for individual heterogeneity along dimensions that we measure at the time of the project and that may play an important role in the probability of fulfilling leadership roles. These include education, the amount of working and leisure time to capture differences in effort, and a measure of tenure at the focal firm, productivity, and risk attitude and whether the individual moved across organizations in the past. We also included demographic variables for marital status and number of children, and measures of firm size to account for differences across firms in the probability of becoming a team leader due to the structure of the organization.

Our baseline regression refers to inventors born between 1947 and 1963. For the United States, these birth years include three groups of inventors: those subject to the military draft (up to year of birth 1952), inventors born in 1953 until 1956, for whom the draft was formally abolished but draft numbers were still issued, and inventors born after 1956, when draft numbers were no longer issued. In a second step, we estimate the main equation for a smaller sample of inventors born between 1947 and 1956, in the years before and right after the 1952 cutoff only. Finally, we look at the long-term, including inventors born until 1975. Because of the control variables included in the estimated specifications, this within-year, within-country, and within-sector estimation approach, with linear country trends allows us to control for country- and year-specific characteristics such that we do not conflate the effect of changes in conscription law with that of other concurrent country or time trends (e.g., Havnes & Mogstad, 2011; Pischke & Von Wachter, 2008).

Table 2 reports information on the distribution of observations across the different samples of inventors by countries and years affected and unaffected by the policy change.

## 3.3 | Inventors' data

We use the information on inventors gathered from a large-scale survey, the InnoS&T survey, conducted in 2009 and 2011 with individual inventors who had patented at least once with the European Patent Office between 2003 and 2005.[3] The analysis performed for the sample of inventors born between 1947 and 1963 includes 3,802 male inventors for whom we have complete records on the variables of interest for this study. The analysis for the 1947–1956 sample and the 1947–1975 sample use 1,936 and 6,160 inventors, respectively.

The InnoS&T data have the valuable advantage of providing information on inventors' responsibilities to manage other people's work at the level of the individual project leading to a patented invention (Parker, Mui, & Titus Jr., 2020). Our *Team leader* indicator takes the value 1 if an inventor had responsibility for the work of others at the time of the project leading to the surveyed patent, and 0 otherwise. We also employ the following two alternative dependent variables in robustness check analyses: *Budget and task allocation*, which takes the value 1 if the inventor had the autonomy to decide the allocation of tasks and budget resources for the inventive project of the research team that he led, and *Top management*, which takes the value 1 if the inventor had a top management position at the time of the inventive project. All three indicators signal the fulfillment of leadership responsibilities. The first two capture the role of team

[3]The Supporting Information in Hoisl and Mariani (2017) describes the data collection and the construction procedure for the resulting database as well as the tests performed to check the data representativeness and reliability.

**TABLE 2** Sample statistics

| | Inventors' date of birth: 1947–1952 | Inventors' date of birth: 1953–1956 | Inventors' date of birth: 1953–1963 |
|---|---|---|---|
| U.S.-born inventors | 376 (35.14%) | 300 (34.64%) | 810 (29.65%) |
| Non-U.S.-born inventors | 694 (64.86%) | 566 (65.36%) | 1922 (70.35%) |
| | 1,070 (100%) | 866 (100%) | 2,732 (100%) |
| | **Inventors' date of birth: 1953–1975** | **Inventors' date of birth: 1957–1963** | **Inventors' date of birth: 1957–1975** |
| U.S.-born inventors | 1,155 (22.69%) | 510 (27.33%) | 855 (20.24%) |
| Non-U.S.-born inventors | 3,935 (77.31%) | 1,356 (72.67%) | 3,369 (79.76%) |
| | 5,090 (100%) | 1866 (100%) | 4,224 (100%) |

*Source*: Authors' elaboration on InnoS&T data. Non-U.S. inventors are born in countries in Table 1 that retain conscription for people born in the period considered in this study.

leader in the context of an innovation project. The third, instead, refers to leadership roles at a higher firm level, similar to the measures of managerial roles employed in contributions that studied leadership positions in business organizations (Day, 2012; Kuhn & Weinberger, 2005; Lazear, 2012).[4]

The survey provides information about the inventors' year and country of birth, defining the population subject to the policy change.[5] It informs us also about the weekly average number of work hours and leisure-time hours, education, experience, risk attitude, mobility before the current job, inventive productivity, tenure, marital status, number of children, and employer firm size, which we measure and control for at the time of the invention, when we also measure whether the inventor was in leadership positions. The variables used in the empirical analysis, as well as their descriptive statistics, are listed and described in Table 3. In the Supporting Information, we report the correlation table (Table S1) and describe the follow-up survey with a sample of 697 inventors among those in the larger InnoS&T sample that we conducted in July and August 2020 with the goal of gathering qualitative information about the typology and frequency of leadership activities inventors took up on the job, the type and importance of leadership training experiences they underwent over their (early) life, whether they had any experience with the military and—in case they did not—the reasons why they were not

[4]On average, inventors worked on 3.6 projects in the same period and could be leading one of them, while being a team member in other projects (we control for this in the robustness checks section). This explains the large number of *Team leaders* in our sample. The *Budget and task allocation* and *Top management* variables, which are more restrictive in attributing leadership responsibilities, report a share of 29 and 10% leader inventors, respectively.

[5]For 48 inventors (1.26%) in the 1947–1963 sample, 16 inventors (0.83%) in the 1947–1956 sample, and 76 inventors (1.23%) in the 1947–1975 sample with missing country-of-birth records, we used information on their country of degree (if available) to qualify the country of the inventor. To check whether the country of degree is a good proxy for the country of birth, we computed the share of inventors for whom the country of degree is the same as the country of birth, conditional on having information on the latter. This share is 95.0%, 94.3, and 94.8% for the three samples, respectively. It is roughly 98.0% in the case of U.S.-born inventors.

TABLE 3 Variables' definition and descriptive statistics

| Variable | Description | Obs | Mean | *SD* | Min | Max |
|---|---|---|---|---|---|---|
| Team leader | Dummy variable: 1 if the inventor had at least one other person reporting to him/her at the time of the inventive project leading to the surveyed patent | 3,802 | 0.67 | 0.47 | 0 | 1 |
| U.S.-born inventors | Dummy variable: 1 if the inventor was born in the United States; 0 if he was born in Austria, Czech Republic, Denmark, Finland, Germany, Greece, Hungary, Israel, Italy, Norway, Poland, Sweden, Slovenia, Spain, Switzerland | 3,802 | 0.31 | 0.46 | 0 | 1 |
| Born 1953 onwards | Dummy variable: 1 if the inventor was born after 1952; 0 if he was born before 1953 | 3,802 | 0.72 | 0.45 | 0 | 1 |
| Born 1957 onwards | Dummy variable: 1 if the inventor was born after 1956; 0 if he was born before 1957 | 3,802 | 0.49 | 0.50 | 0 | 1 |
| Up to high school diploma | Dummy variable: 1 if the inventor holds a high school degree or less at the time of the invention | 3,802 | 0.17 | 0.37 | 0 | 1 |
| Bachelor's degree | Dummy variable: 1 if the inventor holds a Bachelor's degree at the time of the invention | 3,802 | 0.38 | 0.49 | 0 | 1 |
| Master degree or higher | Dummy variable: 1 if the inventor holds a Master degree or higher at the time of the invention (baseline) | 3,802 | 0.45 | 0.50 | 0 | 1 |
| Studying at 26 or above | Dummy variable: 1 if the inventor earned an educational degree at the age of 26 or later | 3,802 | 0.59 | 0.49 | 0 | 1 |
| Working hours | Average number of weekly hours worked at the time of the invention (log) | 3,802 | 45.39 | 13.30 | 0 | 80 |
| Leisure hours | Average number of weekly hours dedicated to leisure activities at the time of the invention (log) | 3,802 | 13.68 | 10.47 | 0 | 128 |
| Experience | Number of years since the inventor started to do research (log) | 3,802 | 18.50 | 8.50 | 0 | 44 |
| Tenure | Number of years at the employer (log) | 3,802 | 14.85 | 9.63 | 0 | 40 |
| Productivity | Inventor's number of prior inventions divided by the number of years of experience (log) | 3,802 | 2.26 | 6.16 | 0.02 | 200 |
| Mobility | Dummy variable: 1 if the inventor changed employer in the 5 years preceding the patent application | 3,802 | 0.32 | 0.47 | 0 | 1 |
| Risk attitude | Variable taking values between 1 (completely unwilling to take risk) and 11 (completely willing to take risk) (log) | 3,802 | 7.25 | 2.30 | 1 | 11 |
| Married | Dummy variable: 1 if the inventors is married or cohabiting at the time of the invention | 3,802 | 0.92 | 0.27 | 0 | 1 |
| Number of children | Number of children at the time of the invention (0, 1, 2, 3, or more than 3) (log) | 3,802 | 0.94 | 0.48 | 0 | 4 |

**TABLE 3** (Continued)

| Variable | Description | Obs | Mean | *SD* | Min | Max |
|---|---|---|---|---|---|---|
| Medium firm | Dummy variable: 1 if the employer firm at the time of the invention has between 100 and 249 employees. Small firm, with less than 100 employees, is the baseline | 3,802 | 0.07 | 0.25 | 0 | 1 |
| Large firm | Dummy variable: 1 if the employer firm has above 249 employees at the time of the invention | 3,802 | 0.74 | 0.44 | 0 | 1 |
| Missing firm size | Dummy variable:1 if information on the number of employees at the employer firm is missing | 3,802 | 0.01 | 0.09 | 0 | 1 |
| Number of inv. patents between 2003 and 2007 | Number of patents on which the inventor is listed between 2003 and 2007 (log) | 3,802 | 3.65 | 4.91 | 0.57 | 80.67 |
| Number of inventors by year and U.S. versus non-U.S. | Number of inventors by year of birth, U.S. and non-U.S. nationality | 3,802 | 312.81 | 178.03 | 58 | 586 |
| Budget and task allocation | Dummy variable: 1 if the inventor had autonomy over the allocation of tasks and resources for the inventive project | 3,802 | 0.27 | 0.44 | 0 | 1 |
| Top management | Dummy variable: 1 if the inventor had a top management position at the time of the invention | 3,633 | 0.10 | 0.29 | 0 | 1 |
| Autocratic leadership | Dummy variable: 1 if all major team decisions for the project are made by one person (the team leader). Values of 1 are for scores 1 and 2 on a scale 1 (max) to 5 (min) | 2,394 | 0.29 | 0.45 | 0 | 1 |

conscripted, and whether the military draft provided them with some formal or informal training in leading others.

## 4 | MAIN RESULTS

Table 4 shows the results of the regression analysis for the sample of individuals born between 1947 and 1963 (Column 1), between 1947 and 1956 (Column 2), and between 1947 and 1975 (Column 3). All specifications report the two core covariates included in the estimated equation: *U.S.-born inventor* and the interaction term between *U.S.-born inventor* and *Born 1953 onwards*. The interacted term is equal to 1 for U.S. inventors born from 1953 onwards. All three specifications control for inventors' year of birth, country of birth, sectoral dummies, linear country time trends, and a set of additional individual and employer firm controls. The estimated results are based on a linear probability model with *SE*s clustered at the country-of-birth level.

In Column 1, the $\beta_2$ coefficient is negative ($p = .001$), thus suggesting that the abandoning of conscription is associated with a lower probability of U.S. inventors fulfilling leadership roles later in their professional career compared with inventors with similar observable characteristics and born in the same year in countries that retained military conscription. In evaluating the magnitude of this coefficient (−10.6-percentage-points), it is worth recalling that the pre-treatment period includes the Vietnam War, when the number of draftees was significantly higher than in peacetime and that those drafted had a reasonable chance to be called up for active service. Hence, in these years, the effect of the direct training in the military was especially important as well as the incentive to enter long-term education to avoid the draft (Card & Lemieux, 2001).

The decrease in the probability to be in team leadership positions is smaller (−5.8 percentage points, $p = .088$) in Column 2 for the sample of inventors born between 1947 and 1956. These are individuals who were exposed to the elimination of the draft in 1973, even though the thread of conscription continued, in part, because draft numbers were issued for people born until 1956. In Column 3, which extends the sample of inventors to those born up until 1975, the coefficient of the interaction term reduces further (−3.6 percentage points, $p = .094$), supporting the view that, in the long run, the effect fades.[6] This is likely due to a leveling-out of opportunities across countries over time, which has diluted and counterbalanced the initial negative effect of the elimination of the draft. For cohorts of people born in the late 1960s and early 1970s, raised in the 1980s and 1990s, for instance, education became an important determinant of social mobility, traveling to different counties was a possibility for many, and social movements promoted equal access to opportunities. For these later cohorts of people, the effect of the elimination of conscription was therefore likely compensated for by other means.[7]

In the models estimated in Table 4, the variables controlling for individual inventor characteristics conform to our expectations. Education is an important predictor of the fulfillment of team leadership positions. Compared with the baseline of holding a master's or doctoral degree, both the *Up to high school diploma* and the *Bachelor's degree* dummies are negative ($p$-values equal or close to .000). Experience, tenure, number of working hours, and past productivity positively correlate with the probability of being in leadership roles. Finally, more risk-prone inventors are also more likely to be in leadership positions.[8]

Figure 1 explores the effect of the policy change over the period 1947–1975 graphically. The graph plots the estimated coefficients of a regression that interacts the treatment group, U.S.-born inventors, with birth-year dummies. The red vertical line indicates the year of birth 1953. The dashed vertical line indicates the year of birth 1957, which marks the first cohort of inventors for whom the threat of the draft was no longer in place, as the Selective Service assigned draft-priority numbers up to the year 1956. Figure 1 shows that for men born before 1953, the coefficients of the interacted terms, though different from zero for the latest cohorts before the policy change, do not show clear patterns compared to the baseline year. They are close to zero up to 1949, they are negative in 1950, and then positive afterwards. We observe, however, that, beginning with the 1953 year of birth, the yearly coefficients are consistently negative, and the

[6]We performed the Wald test to compare $\beta_2$ estimated in Column 1 with the one estimated in Column 2 and in Column 3. The test produces Chi-squares of 5.90 ($p = .015$) and 16.15 ($p = .000$), respectively. We therefore reject the null hypothesis that the difference between the two coefficients is 0.

[7]We obtain consistent results when we perform the estimation with a Logit regression. Although the magnitude of the coefficient of interest cannot be directly compared, the signs and statistical significance are in line. We report the results in Table S2 in the Supporting Information.

[8]We replicated results in Table 4 excluding all control variables that could be themselves an indirect outcome of the policy change, and including only dummy variables for sector, country, year of birth, country trends, and the yearly number of inventors in U.S. and non-U.S. countries. The results from these specifications remain consistent with those shown in Table 4 and are reported in Table S3, (Columns 1, 2, and 3) in the Supporting Information.

**TABLE 4** Team leadership and the elimination of conscription

| Dep. var: team leader | (1) Inventors born between 1947 and 1963 | (2) Inventors born between 1947 and 1956 | (3) Inventors born between 1947 and 1975 |
|---|---|---|---|
| U.S.-born inventor | −0.150 (0.352) | 0.088 (0.819) | −0.535 (0.000) |
| U.S.-born inventor × Born 1953 onwards | −0.106 (0.001) | −0.058 (0.088) | −0.036 (0.094) |
| Up to high school diploma | −0.153 (0.002) | −0.124 (0.000) | −0.116 (0.005) |
| Bachelor's degree | −0.107 (0.000) | −0.078 (0.000) | −0.078 (0.000) |
| Working hours | 0.042 (0.019) | 0.024 (0.174) | 0.052 (0.000) |
| Leisure hours | −0.028 (0.173) | −0.035 (0.141) | −0.029 (0.041) |
| Experience | 0.026 (0.025) | 0.017 (0.170) | 0.036 (0.002) |
| Tenure | 0.031 (0.018) | 0.050 (0.007) | 0.031 (0.000) |
| Productivity | 0.016 (0.029) | 0.025 (0.009) | 0.015 (0.001) |
| Mobility | 0.008 (0.725) | 0.034 (0.265) | 0.005 (0.750) |
| Risk attitude | 0.142 (0.000) | 0.153 (0.000) | 0.145 (0.000) |
| Married | 0.135 (0.000) | 0.137 (0.000) | 0.095 (0.001) |
| Number of children | 0.000 (0.988) | 0.038 (0.037) | −0.001 (0.888) |
| Medium firm | 0.056 (0.007) | 0.066 (0.010) | 0.032 (0.044) |
| Large firm | −0.049 (0.001) | −0.059 (0.001) | −0.087 (0.000) |
| Constant | 0.090 (0.623) | −0.235 (0.474) | 0.665 (0.000) |
| Observations | 3,802 | 1,936 | 6,160 |
| $R^2$ | .134 | .151 | .153 |
| Country FE | YES | YES | YES |
| Sector FE | YES | YES | YES |
| Year FE | YES | YES | YES |
| Linear country trends | YES | YES | YES |

*Note*: Linear probability model estimates. Robust *SE*s clustered at the country-of-birth level. *p*-values in parentheses. All columns include a control for the number of inventors by year and U.S. versus non-U.S. country of birth and a dummy for inventors working for firms for which information on size is not available. The variables working hours, leisure hours, experience, tenure, productivity, risk attitude, and number of children are measured on a logarithmic scale. We performed the Wald test to compare $\beta_2$ estimated in Column 1 with Column 2, and Column 3. The test produces Chi-square of 5.90 ($p$ = .015) and 16.15 ($p$ = .000), respectively. We, therefore, reject the null hypothesis of the difference between the two coefficients being 0.

decreasing trend continues after 1957 until the mid-1960s. This is consistent with the idea that the abolishment of conscription eliminated the training offered in the military as well as the incentives to enroll in higher education for people born from 1953 onwards, and that, plausibly, this second effect continued for people born after 1956, for whom the perceived threat of conscription was fully removed. In the period 1963–1964, the yearly coefficients become larger but

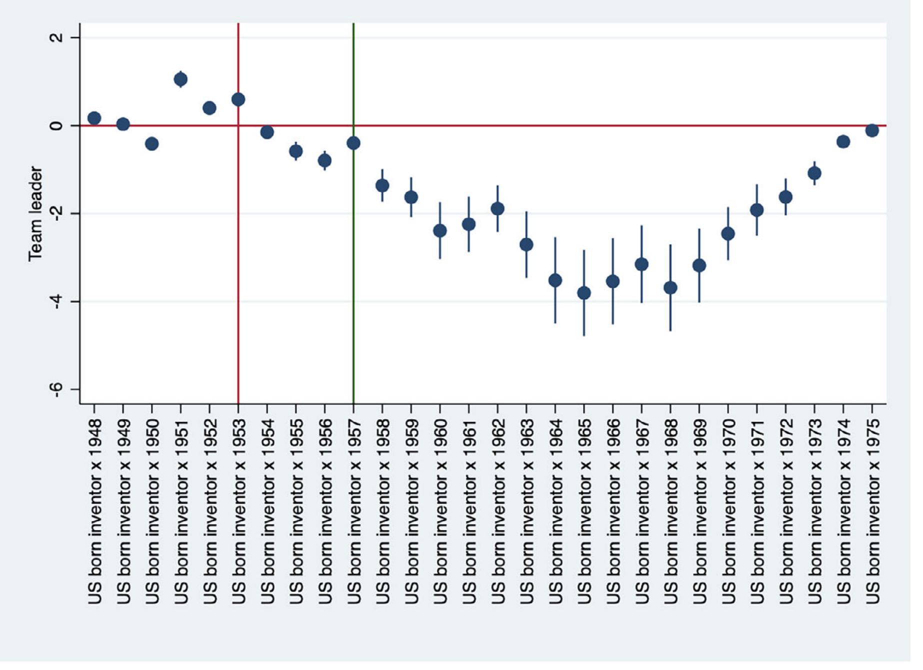


**FIGURE 1** Year-specific coefficients. The figure plots year-specific difference-in-difference coefficients (*U.S.-born inventor* × *Year of birth*) estimated from the following equation with a linear probability model: $Team\ leader_{iycs} = \beta_0 + \beta_1 US\ born\ inventor + \sum_y \beta_y US\ born\ inventor \times Year\ of\ birth_y + \beta_3 X_{iycs} + \gamma_c + \lambda_y + \delta_s + t_c + \varepsilon_{iycs}.$ The equation includes all variables used in the regressions in Table 4. Robust *SE*s are clustered at the country-of-birth level. The reference year for the interaction terms is 1947

much more imprecisely estimated. They remain stable for a few years, then become smaller and converge at zero. Although small sample size limitations in the year-by-year estimations prevent us from making strong statistical claims, the pattern that we observe in Figure 1, that is, the long-term convergence toward a zero difference, is consistent with the decrease in the overall estimated coefficient of the interaction term for the 1947–1975 time window shown in Table 4, Column 3.

## 4.1 | Alternative dependent variables, leadership style, and number of patents

The dependent variable employed in the models we estimate in Table 4 is based on the indication of whether the inventor had responsibilities for the work of others during the inventive process, which we think captures the essence of the role of team leaders in industrial research, where the management of human resources is key to the success of the inventive process. In this section, we checked our results with two alternative dichotomous dependent variables that measure leadership roles: *Budget and task allocation* and *Top management*. These variables capture different types of leadership responsibilities. *Budget and task allocation* refers to inventors having decision power to distribute tasks and budget resources among a project's team members. Therefore, this measure is even more specific when it comes to the type of responsibilities that an inventor fulfills as team leader. *Top management*, instead, captures high-level positions at the corporate level, whose leadership responsibilities refer to the strategic management of the organization. Columns 1 and 2 in Table 5 report the estimated results of the full specification models (as in Table 4, Column 1) that employ these dependent variables. The elimination of conscription is associated with a reduction in the probability of inventors being in both types of leadership roles, compared with inventors born in the same years in countries that always retained conscription. The estimated effect on *Budget and task allocation* is −13.3 percentage points ($p = .001$); it is −3.6 percentage points ($p = .051$) for the probability to be in *Top management* roles.

To provide further evidence on the direct effect of the elimination of conscription on the probability of fulfilling leadership roles, we constructed another dependent variable that captures the type of leadership style developed by inventors: *Autocratic leadership* takes the value 1 if one person made all major decisions on the team that led to the surveyed patent, and 0 otherwise. Military training is typically based on hierarchies and rigid rules. We expect the elimination of conscription to be reflected in a less autocratic leadership style. Results reported in Column 3 of Table 5 support this prior: the elimination of conscription is associated with a reduction of 11.4 percentage points in autocratic leadership roles ($p = .003$).[9]

Finally, Column 4 of Table 5 includes a control variable called *Number of inventor's patents between 2003 and 2007*, which indicates the number of patented inventions with a priority date between 2003 and 2007—and therefore contextual to the patent associated with the surveyed invention—on which the inventor is listed. This variable accounts for the total number of projects on which an inventor was working simultaneously at the time of the surveyed invention, as this may affect the likelihood to fulfill leadership positions in any of them. On the one hand, working simultaneously on many projects may reduce the chances of fulfilling leadership responsibilities because of time constraints. On the other hand, being involved in more than one project may imply a pivotal position within the inventive network and therefore correlate with the probability of being a team leader. In the end, the estimated results show that the variable is positively correlated with the likelihood of fulfilling leadership positions (the estimated coefficient is .012, $p = .035$) and that its inclusion does not affect the magnitude of the estimated coefficient for the main regressor.

## 4.2 | Explanations: forgone experience with conscription and lower incentives to enroll in long-term education

This section focuses on the mechanisms that we think likely explain the effect of the elimination of the draft on the probability of fulfilling leadership roles on the job. To gauge the plausibility of the channels that explain the observed changes in leadership, we combine previous knowledge from studies about the specific context in which the policy change took place, evidence from a statistical exercise that we performed, and information from the small-scale survey that we gather for this specific purpose.

[9]Corresponding specifications that include only dummy variables for the sector, country, year of birth, country trends, and a variable for the yearly number of inventors in U.S. and non-U.S. countries of birth are reported in Table S3 in the Supporting Information (Columns 4–6). Results remain consistent with those in Table 5, with the exception of the *Top Management* regression, for which individual-level variables seem to matter more.

**TABLE 5** Alternative dependent variables, leadership style, and number of patents

| Dep. var. | (1) Budget and task allocation | (2) Top management | (3) Autocratic leadership | (4) Team leader |
|---|---|---|---|---|
| | Inventors born between 1947 and 1963 | | | |
| U.S.-born inventor | −0.055 (0.818) | −0.736 (0.000) | −1.649 (0.009) | −0.180 (0.278) |
| U.S.-born inventor × Born 1953 onwards | −0.133 (0.001) | −0.036 (0.051) | −0.114 (0.003) | −0.106 (0.001) |
| Up to high school diploma | −0.078 (0.000) | −0.036 (0.027) | −0.017 (0.473) | −0.151 (0.003) |
| Bachelor's degree | −0.053 (0.000) | −0.012 (0.176) | −0.036 (0.027) | −0.107 (0.000) |
| Working hours | 0.027 (0.198) | 0.014 (0.128) | 0.021 (0.352) | 0.042 (0.019) |
| Leisure hours | 0.005 (0.441) | −0.012 (0.112) | −0.012 (0.298) | −0.028 (0.180) |
| Experience | 0.011 (0.191) | −0.022 (0.018) | −0.028 (0.074) | 0.022 (0.075) |
| Tenure | 0.010 (0.145) | −0.002 (0.780) | −0.001 (0.975) | 0.031 (0.016) |
| Productivity | 0.020 (0.027) | −0.006 (0.106) | −0.005 (0.255) | 0.011 (0.149) |
| Mobility | −0.019 (0.471) | −0.021 (0.029) | −0.049 (0.070) | 0.008 (0.725) |
| Risk attitude | 0.178 (0.000) | 0.081 (0.000) | 0.052 (0.082) | 0.143 (0.000) |
| Married | 0.064 (0.069) | 0.021 (0.328) | 0.030 (0.087) | 0.135 (0.000) |
| Number of children | 0.010 (0.491) | 0.002 (0.866) | −0.042 (0.029) | −0.000 (0.991) |
| Medium firm | −0.080 (0.027) | −0.118 (0.061) | −0.012 (0.762) | 0.054 (0.009) |
| Large firm | −0.126 (0.000) | −0.233 (0.000) | −0.085 (0.019) | −0.051 (0.001) |
| Number of inventor's patents 2003–2007 | | | | 0.012 (0.035) |
| Constant | −0.153 (0.345) | 0.926 (0.000) | 2.166 (0.001) | 0.126 (0.502) |
| Observations | 3,802 | 3,633 | 2,394 | 3,802 |
| $R^2$ | .113 | .159 | .103 | .134 |
| Country FE | YES | YES | YES | YES |
| Sector FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |
| Linear country trends | YES | YES | YES | YES |

*Note*: Linear probability model estimates. Robust *SE*s clustered at the country-of-birth level. *p*-values in parentheses. All columns include a control for the number of inventors by year and U.S. versus. non-U.S. country of birth and a dummy for inventors working for firms for which information on size is not available. The variables working hours, leisure hours, experience, tenure, productivity, risk attitude, number of children, and number of inventor's patents between 2003 and 2007 are measured on a logarithmic scale. For the dependent variable *Autocratic leadership*, we consider the sample of inventors with leadership responsibilities.

Our inventors widely acknowledge the importance of leadership training. Among other things, the people we surveyed reported that "management skills are a blend of education, consultation, observation and experience" and that "management trainings for inventors and people working in R&D is one of the most important supportive measures for a successful implementation of inventions and developments [that] has to take place as early as possible." We then asked about the specific mechanisms through which this training may take place.

Figure S2 in the Supporting Information graphs the type and frequency of the leadership training mechanisms listed by the inventors.

Overall, inventors report by far formal education as an important means, with a third of the inventors indicating it as a key leadership training opportunity. The share rises to about 50% if we include those who rated it as mildly relevant. Additional evidence shows that education was important also in draft times. More than half of the 39 U.S. inventors born before 1953 in our sample who did not enter the military reported that they were not drafted because they were in education.

Direct experience with conscription is also mentioned as an important leadership training opportunity by 10% of the inventors, with 20.9% of the inventors who were conscripted reporting some formal leadership training during the military draft and an additional 17.6% saying that, although they did not receive formal training, they were exposed to the observation of others' leadership roles, both good and less effective examples. Inventors also pointed to the draft as an opportunity to learn "how groups work through pressure" and, at the same time, to realize what type of leadership attitudes would not work, therefore instilling the sense of "what not to do" to be a team leader. One of the inventors put it very effectively, saying that "although [he] had no leadership role during military service, [he] rate[d] that experience very high in [his] education. It provided direct experience about how organizations work, what forms of leadership are successful and which ones fail."

Finally, descriptive evidence from these survey data suggest that the share of U.S. inventors with leadership responsibilities from the group of inventors born in the United States before 1953 is 77.8% among those who were drafted and 82.4% for inventors who were not drafted, because they were in education at that time.

Then, we turn to the larger sample of inventors in the InnoS&T survey to investigate further the plausibility of the direct military training and the education mechanism as tentative explanations for the decrease in team leadership. First, we look at the direct channel due to the termination of the training provided in the military. We focus on the category of low-educated inventors, those with a high school degree or lower. This group, which corresponds to 634 inventors in our sample of people born between 1947 and 1963 (43 inventors for the United States), is barely exposed to forms of training provided by formal education and is therefore particularly affected by the lost opportunity to receive direct leadership training during conscription. Thus, if we find that the reduction in the probability of being in a team leadership position is higher after the policy change for this group of inventors, it is presumably driven by the elimination of direct training. Column 1 in Table 6 shows the estimated coefficients of our full specification regression augmented with an interaction term between the dummy variable for low-educated inventors (equal to 1 if an inventor has a high school education or less) and the indicator for whether an inventor is born in the United States after 1952. The probability of fulfilling leadership roles following the elimination of conscription drops by 24.3 percentage points for this very small sample of low-educated inventors.

Second, we exploit the fact that whereas military training during conscription was terminated for people born after 1952, the Selective Service continued to assign draft numbers to men born between 1953 and 1956. This could have created in people born until 1956, the feeling that the threat of being drafted was still in place, which, to some extent, made the incentive to pursue higher education persist. Card and Lemieux (2001) showed that men's enrollment in higher education as a draft-avoiding behavior was especially marked in wartime, which includes years in the pre-policy-change period in our study. However, their data suggest that male college-graduation rates continued to slowly decrease also for people born after 1952. We,

**TABLE 6** Elimination of conscription: Exploration of the direct and indirect channels

| Dep. var. team leader | Inventors born between1947 and 1963 | |
|---|---|---|
| U.S.-born inventor | −0.122 (0.429) | −0.231 (0.152) |
| U.S.-born inventor × Year of birth 1953 onwards | −0.099 (0.001) | −0.111 (0.000) |
| Up to high school diploma × U.S.-born inventor × Born 1953 onwards | −0.243 (0.000) | |
| Up to high school diploma × U.S.-born inventor | 0.013 (0.638) | |
| Up to high school diploma × Born 1953 onwards | −0.012 (0.779) | |
| Up to high school diploma | −0.071 (0.025) | −0.153 (0.002) |
| U.S.-born inventor × Born 1957 onwards | | −0.055 (0.046) |
| Bachelor's degree | | −0.107 (0.000) |
| Working hours | 0.046 (0.011) | 0.042 (0.019) |
| Leisure hours | −0.027 (0.194) | −0.028 (0.174) |
| Experience | 0.035 (0.004) | 0.026 (0.025) |
| Tenure | 0.029 (0.012) | 0.031 (0.018) |
| Productivity | 0.019 (0.023) | 0.016 (0.029) |
| Mobility | 0.010 (0.672) | 0.008 (0.727) |
| Risk attitude | 0.140 (0.000) | 0.142 (0.000) |
| Married | 0.134 (0.000) | 0.135 (0.000) |
| Number of children | −0.001 (0.907) | 0.000 (0.975) |
| Medium Firm | 0.057 (0.005) | 0.056 (0.007) |
| Large firm | −0.045 (0.003) | −0.049 (0.001) |
| Constant | −0.002 (0.989) | 0.182 (0.304) |
| Observations | 3,802 | 3,802 |
| $R^2$ | .127 | .134 |
| Country FE | YES | YES |
| Sector FE | YES | YES |
| Year FE | YES | YES |
| Linear country trends | YES | YES |

*Note*: Linear probability model estimates. Robust *SE*s clustered at the country-of-birth level. *p*-values in parentheses. Both columns include a control for the number of inventors by year and U.S. versus non-U.S. country of birth and a dummy for inventors working for firms for which information on size is not available. The variables working hours, leisure hours, experience, tenure, productivity, risk attitude and number of children are measured on a logarithmic scale. Column 1 includes the three-way interaction *Up to high school diploma* × *U.S.-born inventor* × *Born 1953 onwards* together with the two-way interactions built with its components. *Up to high school diploma* takes two values: 1 for inventors with up to high school education; 0 for inventors with a Bachelor degree or higher. Column 2 includes a dummy variable that takes the value 1 for years of birth from 1957 onwards; 0 otherwise. We interact it with *U.S.-born inventor*.

therefore, estimate a specification (Column 2 in Table 6) that uses two cutoff birth years, one at 1952, and another at 1956. The first one is measured with the usual *Born 1953 onwards* variable; the second is labeled *Born 1957 onwards*, and it takes the value 1 if an inventor was born after 1956, and 0 otherwise. We interact these two dummy variables with *U.S.-born inventor*. The coefficient of the term *U.S.-born inventor* × *Born 1957 onwards* measures the post-1956 change for U.S. inventors compared with non-U.S. inventors, and it should provide an indication of the additional effect via the education channel that the elimination of conscription might have produced once the issuing of draft of numbers ended. We estimate that this additional effect amounts to 5.5 percentage points (Column 2 in Table 6).[10]

## 5 | CONCLUSIONS

Leadership skills are important for organizations. They are, however, scarce compared with their growing demand for a variety of activities in corporate environments, including the management of inventive projects. Therefore, understanding whether they can be effectively learned through competence-enhancing experiences in addition to some innate abilities to lead the work of others has become a strategic objective.

We use the policy that led to the United States's abandoning of the military draft in 1973 to estimate the change in the likelihood of assuming leadership roles for U.S. inventors relative to those in countries that continued to enforce active conscription. This policy led to the sudden reduction of leadership training opportunities for young inventors in their "impressionable years," both because it eliminated a life experience to practice and observe leadership during the draft and because it reduced the incentives to enroll in long-term education to defer conscription. Our results reveal a decrease in the probability of fulfilling leadership roles for U.S. inventors from 1953 compared with same-cohort inventors who were not exposed to the policy change. The effect is larger in the aftermath of the policy change, and it decreases for cohorts of individuals born far after the cutoff year, whose opportunities to compensate by other means for the training lost because of the draft elimination increased substantially in the following decades. These findings, which seem to be driven largely by the reduction of incentives to pursue long-term education, are robust to the inclusion of year, country, and sectoral dummies, linear country trends and to controls for a large set of individual characteristics.

Our study speaks to the importance of strategies envisaging leadership-building training activities early in life. Although we focus on a specific type of leadership-enhancing experience, our results suggest that training provided during the impressionable years also produces effects later in life and in different contexts. This is confirmed by interviews with a group of inventors who report a variety of (direct and indirect) training experiences they had before turning 25 to be relevant in shaping their long-lasting attitudes toward and skills for leadership. Besides formal education, on-the-job training, and the military draft (where applicable), other early-life activities such as high school class leadership roles (e.g., Kuhn & Weinberger, 2005), politics during youth, Boy Scout activities, and even the family environment in which one is raised, all help shape leadership attitudes and capabilities.

[10]Again, we report the results of corresponding specifications that include only dummy variables for sector, country, year of birth, country trends, and a variable for the yearly number of inventors in U.S. and non-U.S. countries of birth in Table S3 in the Supporting Information (Columns 7 and 8). In addition, we checked whether, relative to non-treated countries, U.S. inventors had a lower likelihood to stay in education after turning 26 years old. We leverage information about the date of the highest degree earned to construct a dummy variable that takes the value 1 if an inventor was enrolled in education when he turned 26 (*Studying at 26 or above*). We employ this indicator as a dependent variable in two specifications with the coefficient of interest being that of the interaction term *U.S.-born inventor* × *Born 1953 onwards* (Column 1, Table S4 in the Supporting Information) and the interaction terms *U.S.-born inventor* × *Born 1957 onwards* (Column 2, Table S4 in the Supporting Information). The probability of U.S. inventors of being in education at the age of 26 or later decreases after 1953 and it reduces further after 1957.

The second set of implications of our study follows from the result that, after we control for U.S. inventors who were enrolled in long-term education before 1973, the direct effect of conscription is salient only for inventors with a shallow level of education (high school or less). Thus, on the one hand, this finding confirms that education is a crucible leadership training experience that deserves to be incentivized at all levels, providing families information about the importance of education for the potential it can unleash in children when adults, or providing children themselves incentives to avoid early dropouts. On the other hand, our study also points to the importance of providing forms of training that are accessible independently of the socioeconomic and education group to which one belongs. Whereas the aim of this study is not to emphasize the value of the military per se—and in fact we are unable to address potential negative side effects on other aspects of individuals' lives—the draft provided a kind of training accessible to all individuals regardless of their initial background and formal requisites. Unequal opportunities to access training, such as that offered in higher education, may have important consequences, especially for the most disadvantaged groups. In the case of our study, the elimination of conscription especially prevented low-educated inventors from unleashing their leadership potential. For these people, the availability of various forms of inclusive training opportunities in order to make efficient use of the equal distribution of talent across different groups is essential.

Our research focuses on the probability of fulfilling leadership roles and does not assess the quality of leadership skills that people develop. We show, however, that the type of training has an effect on the leadership style that people develop. Thus, for example, the hierarchical structure typical of the military setting seems to train inventors to develop relatively autocratic leadership styles, such that the elimination of conscription makes lead inventors more prone to develop less autocratic managerial attitudes. This evidence also suggests that alternative, less hierarchical training programs, such as those offered in higher education programs or via internships, might influence both the probability of becoming a leader and the type of decision-making process and outcomes that leaders implement.

Our study is not immune to limitations. First, we focus on a single policy change, which offers an interesting setting for our research, but could also reflect distinctive features of the U.S. military system, where the focus on building leadership attitudes is especially strong, and where companies traditionally value such experience. Therefore, it would be interesting to obtain a broader cross-countries and cross-cohorts perspective. For instance, many European countries have recently abandoned military conscription. Extending our setting to these alternative national contexts would allow us to focus on different institutional environments, where military service may provide different sets of leadership and command skills, and where corporate environments may be more or less prone to value the training provided.

Second, by combining data on the sample of people who took part in the InnoS&T survey with information on a policy change that happened in one country and involved specific cohorts of inventors only, we ended up relying on a relatively small sample of observations. This is especially challenging when focusing on particular subgroups of inventors or time windows, such as in the year-by-year exercise. This limitation, and the time lag between the treatment and the measured outcome, affects the precision of our estimates. Therefore, we explored the potential mechanisms underlying our results also qualitatively to provide a bundle of consistent analyses and pieces of evidence that, altogether, could tell a plausible story.

Third, because the abandonment of conscription affected virtually all male residents in the United States who were born after 1952, technically, we do not have a category of non-compliers. However, the magnitude of the effect on the dependent variable still depends on the number of people enlisted and enrolled in education to defer the draft in the pre-policy-change period. The higher the number of these people, the larger the effect of the elimination of conscription after the policy change. Therefore, the category of noncompliers in our framework could be proxied by the share of men who were not conscripted or not enrolled in long-term education before the policy change. Unfortunately, our data do not provide information of this type. We can at best infer the share from official statistics about the number of people enlisted in the population in the years of our investigation, and from extant research that shows a sizable positive effect of the threat of enlistment on college attendance rates, particularly because of the Vietnam War. As a consequence, the ITT we capture as a result of both forgone mechanisms differs from the real Treatment on the Treated effect (TOT). That is, although our estimates are still informative about the average effect of the elimination of conscription on the probability of fulfilling leadership roles later in life, actual data about who, among our inventors, was neither conscripted nor pursued education because of the threat of enlistment, would allow us to specify the effect of the elimination of the draft on the affected people and to precisely disentangle the different channels through which this effect took place.

Finally, whereas our setting exploits a policy change that affects the supply of leaders in the United States with respect to other countries, it tells us little about potential changes in demand. If the number of leadership positions for inventors born from 1953 onwards decreased in the United States relative to other countries, then our results may (also) reflect a cap in demand. In this respect, it is worth considering that our study focuses on R&D team managers, or inventors who have responsibility for a small group of researchers working on a project that led to the surveyed patent. These are "lead inventors"—as in Choudhury and Haas (2018)—for whom demand constraints are relatively low. In fact, the supply of lead inventors is accommodated to a certain degree by a relatively elastic demand because project leaders themselves might also help increase the number of available leadership slots by proposing their own research projects. In addition, there is also evidence that the demand for team leaders has increased over time, with previous research suggesting that teamwork activities devoted to patent development increased at a decadal rate of 17% during the period 1975–1999 for patents granted by the U.S. Patent Office (Jones, 2009).

## ACKNOWLEDGEMENTS

We thank the participants of the faculty seminar in the Departments of Strategic Management and Globalization at the Copenhagen Business School (DK), EPFL (CH), INSEAD (FR), Northeastern University (United States), the DRUID Conference 2018 (DK), the Ghoshal Conference 2018 at London Business School (United Kingdom), the Workshop on Innovators' Mobility held in April 2018 at INSEAD (FR), the 2018 CREI Workshop held at Bath University (United Kingdom) and the 2018 TIM Executive Committee midyear Meeting, held in New York (United States). We also thank Joshua Angrist, Bronwyn Hall, Paolo Pinotti and two anonymous reviewers for their constructive feedback. All errors remain our own.

## DATA AVAILABILITY STATEMENT

Individual data used in this research are subject to privacy and confidentiality restrictions.

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**How to cite this article:** Gagliardi, L., & Mariani, M. (2021). Trained to lead: Evidence from industrial research. *Strategic Management Journal*, 1–25. https://doi.org/10.1002/smj.3346