Are CEOs born leaders? Lessons from traits of a million individuals*

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ABSTRACT

What makes a successful CEO? We combine a near-exhaustive sample of male CEOs from Swedish companies with data on their cognitive and noncognitive ability and height at age 18. CEOs differ from other high-skill professions most in noncognitive ability. The median large-company CEO belongs to the top 5% of the population in the combination of the three traits. The traits have a monotonic and close to linear relation with CEO pay, but their correlations with pay, firm size, and CEO fixed effects in firm policies are relatively low. Traits appear necessary but not sufficient for making it to the top.

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1. Introduction

Chief executive officers (CEOs) make a difference to the companies they manage (Bertrand and Schoar, 2003; Bennedsen, Pérez-González, and Wolfenzon, 2017; Jenter, Matveyev, and Roth, 2017), and shareholders reward their services handsomely (Edmans, Gabaix, and Jenter, 2017). What makes CEOs so valuable? Motivated by the idea that leaders may be born to their roles, a viewpoint advocated by Plato (2008), Carlyle (1841), and many others,[1] this paper studies whether traits developed early in life play a role in the selection of future CEOs into their positions, in their pay relative to other professions and relative to one another, and in firm policies. Knowledge of the role of traits can help in refining theories of CEO behavior; it can help in understanding differences between founders and professional managers and can also help in understanding why CEOs are paid so much.

We use unique data from Sweden to examine the personal traits at age 18 of top business leaders, members of other high-skill professions, and the population in the years 2004−2010. The data come from the Swedish military, which examines the physical, cognitive, and noncognitive characteristics of all conscripts to assess whether they are physically and mentally fit to serve in the military and are suitable for training for leadership or specialist positions. Military service was mandatory in Sweden during our sample period, so the relevant test pool for our sample includes virtually all Swedish men. Our sample consists of data on 1.3 million men born between 1951−1978. Of these men, 26,000 served as CEOs of companies of varying sizes at some point in our sample.

When analyzing the traits of CEOs, we need to benchmark them against other individuals. In addition to comparing CEOs to the population, we compare them to more than 6,000 lawyers, 9,000 physicians, 40,000 engineers, and 9,000 college-educated finance professionals. We also compare CEOs to managers and executives in the corporate sector and examine the traits of those who may be truly born to their roles, CEOs in family firms.

We focus on three personal traits: cognitive and noncognitive ability and height. These traits have a long history of being associated with labor market outcomes. For example, an extensive

[1]A Google search using the search term "born leader" returns 521,000 hits. Bertrand and Schoar (2003), Bertrand (2009), and Edmans and Gabaix (2016) speculate that CEOs may be born to their roles.

literature finds that cognitive and noncognitive traits and height significantly predict earnings of rank-and-file employees.[2] We expect the traits to be even more relevant for CEOs who have more complex and demanding job descriptions, ranging from creating and implementing the firm's strategy to leading and evaluating people.

Apart from their general nature, the timing of the measurement of the traits works to our advantage. The traits are measured before individuals have accumulated substantial leadership experience or professional or educational specialization. Beauchamp et al. (2011) find in the Swedish military data that 66%−93% of the variation in the traits we examine can be attributed to genetic and environmental factors shared by the male siblings of a family.[3] This suggests that the genetic makeup and the family to which people are born largely explains the variation in the traits.

We find that CEOs display considerably higher trait values than the population as a whole. The traits of large-company CEOs (defined here as having at least SEK 10 billion or USD 1.3 billion in total assets) are about at par or higher than those of physicians, lawyers, engineers, and finance professionals, even when we control for their pay. CEOs managing smaller firms and family firms have lower traits, particularly if they come from the founding family and have not founded the company themselves. Consistent with Pérez-González (2006), Bennedsen et al. (2007), and others, these results suggest that family firms make compromises in the traits of the CEO by limiting their selection of the CEO to a narrow pool of family candidates. Alternatively, family-firm CEOs can possess other characteristics, such as connections and early exposure to business life that help them make up for what they lack, in the three traits we study. Consistent with this argument, we find that founder CEOs, many of whom have an impressive track record in building up and growing the business, exhibit on average 0.1−0.2 standard deviations lower traits than nonfamily company CEOs.

All three traits are correlated with the likelihood a member of the population becomes a CEO. Noncognitive ability is the best predictor of an appointment to a CEO position, followed by

[2] A large literature on the role of education and labor market outcomes uses cognitive skills as the sole proxy for ability (e.g., Herrnstein and Murray, 1996; Schmidt and Hunter, 1998). Others argue that noncognitive skills are also important for predicting labor market outcomes (e.g., Heckman, 1995; Heckman, Stixrud, and Urzua, 2006). Yet another sizeable literature shows that height is related to labor market outcomes and leadership (e.g. Steckel, 1995, 2009; Persico, Postlewhite, and Silverman, 2004; Case and Paxson, 2008; Lindqvist, 2012). Mayew, Parsons, and Venkatachalam (2013) relate voice pitch to labor market outcomes for CEOs. Bolton, Brunnermeier, and Veldkamp (2010) offer a tentative economic analysis on the elements of effective leadership.

[3] Beauchamp at al. (2011) analyze a sample of identical and fraternal twins and decompose the variance in the three traits into the shared genetic, shared environmental, and idiosyncratic components.

cognitive ability and height. Cognitive ability is more important for larger companies that are more likely to hire their CEOs externally: the median large-firm CEO is in the top 17% of the population in cognitive ability.

While CEOs are smarter than average, they are not as smart as one might infer from prior literature. Less than one-fifth of Swedish large-firm CEOs belong to the "cognitive elite" comprising the top 5% of individuals, as defined by Herrnstein and Murray (1996) in The Bell Curve, not to mention the "higher professional" category of the top 0.1% of individuals of Burt (1924).[4]

The discrepancy between prior estimates of CEO IQ and our evidence suggests leadership ability cannot be boiled down to a single trait (see, e.g., Heckman, 1995) or circumstance.[5] Indeed, if we use a weighting scheme implied by the traits' impact on CEO appointments, the median large-company CEO makes a top 5% "elite" cutoff in the combination of his traits. But there are still more than 100 times as many men in managerial roles in the corporate sector who have better trait combinations than the median large-company CEO and who do not become a large-company CEO during our seven-year sample period. A favorable mix of these traits can be necessary but is not sufficient for making it to the executive suite. This suggests the skills that make a CEO are not easily measurable.

Are the "elite" traits of CEOs the reason why they are paid so well? We first show that the CEOs in our sample, as in other countries, are highly valued by the labor market: the median large-firm CEO belongs to the top 0.1% of the income distribution. However, only about one-tenth of the pay premium large-firm CEOs enjoy can be attributed to the labor market returns to the three traits. So even though CEOs belong to an "elite" group, the traits we measure are not the scarce resource that explains why CEOs are paid so much. This suggests it can also be challenging to explain CEO pay with other measures of "ability."

We also study whether traits explain across-CEO variation in career success and management style. We find that the traits have a monotonic and close to linear relation both with the size of the firm the CEO manages and with his pay, but the explanatory power of these associations is relatively low. We also examine the correlation of traits with CEO-specific fixed effects in firm policies and

[4] Similarly, Wai (2013) estimates that 38.6% of the CEOs of Fortune 500 firms attended a school requiring standardized test scores "that likely places them in the top 1% of ability." We find that 17% of large-firm CEOs belong to the top 4% (not the top 1%, a much tougher screen) in cognitive ability. While Swedish large-firm CEOs are running companies that are on average smaller than the Fortune 500 firms, they are still the largest firms in the country.

[5] Herrnstein and Murray (1996) and Wai (2014) discuss the role of financial constraints and educational opportunities on occupational outcomes.

performance extracted from a sample of CEOs who switched firms (e.g., Bertrand and Schoar, 2003). The traits appear to have even less explanatory power for firm outcomes than for executives' labor market success. This suggests that the early life traits economists frequently use to predict labor market outcomes cannot account for differences in CEOs' management styles.

Would the pattern in CEOs' traits look different in other countries? We doubt it. Sweden has had many world-class companies since the late nineteenth century (Olsson, 1993); on a per capita basis, there were about 50% or more Swedish companies in the 2017 Forbes Global 2000 list than US or UK corporations.[6] Few large Swedish companies are owned by the government (Faccio and Lang, 2002), and the managing practices of mid-sized Swedish companies are among the best in the world (Bloom and van Reenen, 2010). We expect Swedish CEOs to be selected at least as carefully as their peers in most other industrialized countries.

Our paper is related to three strands of literature. First, the paper is related to a wide array of recent economics and finance studies that analyze the effect of CEOs on various firm outcomes.[7] Bertrand and Schoar (2003) and Graham, Li, and Qiu (2012) show that CEO-level fixed effects matter for corporate policies and firm performance.[8] To find out what accounts for these fixed effects, researchers have looked into observable CEO characteristics, collected usually from bibliographic data or surveys. [9,10] In some studies, CEO ability or characteristics are inferred from stock price reactions or operating performance or from personal portfolio decisions. [11,12] Our paper addresses directly the question as to whether three important traits can explain differences in various corporate policies.

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[6] The World's Biggest Public Companies 2017. http://www.forbes.com/global2000/.

[7] E.g., Bertrand and Schoar, 2003; Adams, Almeida, and Ferreira, 2005; Malmendier and Tate, 2009; Chang, Dasgupta, and Hilary, 2010; Graham, Li, and Qiu, 2012; Custódio, Ferreira, and Matos, 2013; Custódio and Metzger, 2013; Graham, Harvey, and Puri, 2013; Bandiera et al., 2015; Benmelech and Frydman, 2015; Falato, Li, and Milbourn, 2015; Mullins and Schoar, 2016; Schoar and Zuo, 2017. For a related management literature, see, for example, Lieberson and O'Conner, 1972; Hambrick and Mason, 1984; Thomas, 1988; Finkelstein, Hambrick, and Cannella, 2009; Hiller et al., 2011. As pointed out by Bertrand and Schoar (2003), the focus of this literature and the methodological approach it follows differ substantially from that in the economics and finance papers.

[8] For a critique of this methodology, see Fee, Hadlock, and Pierce (2013).

[9] Adams, Almeida, and Ferreira, 2005; Malmendier and Tate, 2009; Custódio, Ferreira, and Matos, 2013; Custódio and Metzger, 2013; Graham, Harvey, and Puri, 2013; Benmelech and Frydman, 2015; Falato, Li, and Milbourn, 2015; Schoar and Zuo, 2017.

[10] Graham, Harvey, and Puri, 2013; Mullins and Schoar, 2013; Bandiera et al., 2015.

[11] Johnson et al., 1985; Pérez-González, 2006; Bennedsen et al., 2007; Chang, Dasgupta, and Hilary, 2010; Bennedsen, Pérez-González, and Wolfenzon, 2017; Jenter, Matveyev, and Roth, 2017.

[12] Malmendier and Tate, 2005, 2008; Malmendier, Tate, and Yan, 2011; Hirshleifer, Low and Teoh, 2012.

Many past studies focus on the CEOs of family companies and the differences between the founder and later generations.[13] Our study differs from this literature in its focus on managerial inputs, rather than on the outputs the firm generates. Managerial inputs can be observed with much less noise than outputs, such as performance, and they are not subject to the equilibrium forces that render the relations between outcomes and managerial inputs difficult to detect.[14]

Second, our paper is related to a vast literature on CEO pay.[15] One strand of this literature points to rising CEO pay in the US and argues it is the outcome of rent-seeking (e.g., Yermack, 1997; Betrand and Mullainathan, 2001; Bebchuk and Fried, 2004). CEO talent, other than perhaps the talent to steal, does not play an explicit role in this view. Another strand of the literature points to the same trend and argues it is the outcome of a matching process of rare CEO talent to firms of different sizes (e.g., Gabaix and Landier, 2008; Terviö, 2008; Edmans and Gabaix, 2011; Eisfeldt and Kuhnen, 2013; Gabaix, Landier, and Sauvegnat, 2014. Murphy, Shleifer, and Vishny (1991) study the allocation of talent in the economy and its implications for growth). The theory based on matching does not, however, take a stand on the nature of the executives' scarce talent. We show that executives' cognitive and noncognitive skills and height, explain their matching into firms, although far from perfectly. We also show that the inclusion of the traits in CEO pay regressions has a sizable effect on the coefficients of the level of education variables. They decrease on average by one-third, presumably because of the positive correlation between cognitive ability and the level of education. The sensitivity of the coefficient values to the (generally unobservable) traits suggests that one should interpret the education coefficients reported in the literature with caution.

Third and finally, our study is related to papers that analyze the characteristics or compensation of CEOs (Kaplan, Klebanov, and Sorensen, 2012; Kaplan and Sorenson, 2016) and other well-paid professionals, including lawyers (Kaplan and Rauh, 2010, 2013; Oyer and Schaefer, 2012), finance professionals (Kaplan and Rauh, 2010, 2013; Philippon and Resheff, 2012; Célérier and Vallée, 2014; Böhm, Metzger, and Strömberg, 2015), and entrepreneurs (Levine and Rubinstein, 2017). Kaplan, Klebanov, and Sorenson (2012) and Kaplan and Sorenson (2016) examine characteristics of candidates for CEO positions at the time of their appointment. Our dataset allows us to compare

[13] Anderson and Reeb, 2003; Pérez-González, 2006; Bennedsen et al., 2007; Bennedsen, Pérez-González, and Wolfenzon, 2017.

[14] In equilibrium, there is no link between talent and performance. Gabaix and Landier (2008) analyze an out-of-equilibrium outcome in which a company hires at no extra salary cost a much more highly ranked executive than is justified by the company's own rank. This leads to only a small improvement in corporate performance.

[15] See, e.g., Edmans, Gabaix, and Jenter (2017) for a review this literature.

the traits of many of these professional groups. For example, we find finance professionals have higher average pay than the other professionals, but their trait values are not particularly high. As a result, the three traits explain less of their pay premium than of any of the other professional groups or of small-firm CEOs.

In terms of data structure, the closest studies to ours are Lindqvist and Vestman (2011) and Lindqvist (2012), which match enlistment test data with the income of individuals in managerial positions. These individuals account for 8% of the male population and are thus on average considerably lower on the corporate ladder than CEOs. These studies also lack data on firm size, a key attribute in assignment models.

2. Data

Our dataset combines information from the Military Archives, Statistics Sweden, and the Swedish Companies Registration Office.[16] We utilize a panel of trait data on men born between 1951−1978 whose occupations we can observe in the period 2004−2010.

2.1. Military Archives

The traits data originate from the Swedish military, which examines the health status and the cognitive, noncognitive, and physical characteristics of all conscripts. The purpose of the data collection is to assess whether conscripts are physically and mentally fit to serve in the military and are suitable for training for leadership or specialist positions. The examination spans two days and takes place at age 18. Lindqvist and Vestman (2011) offer a more comprehensive description of the testing procedure.

The data are available for Swedish males who were drafted between 1970 and 1996. Military service was mandatory in Sweden during this period, so the test pool includes virtually all Swedish men. The data record the year in which the conscript was enlisted.

The cognitive-ability test consists of four subtests designed to measure inductive reasoning (instruction test), verbal comprehension (synonym test), spatial ability (metal folding test), and

[16] The sensitive nature of the data necessitated an approval from the Ethical Review Board in Sweden and a data secrecy clearance from Statistics Sweden. The identifiers for individuals, firms, and other statistical units were replaced by anonymized identifiers, and the key that links the anonymized identifier to the real identifiers was destroyed. The data are used through Microdata Online Access service provided by Statistics Sweden.

technical comprehension (technical comprehension test). The subscores and their aggregation into a composite score are reported on a stanine (STAndard NINE) scale. On this scale, a normal distribution is divided into nine intervals, each of which has a width of 0.5 standard deviations excluding the first and last. An individual's test score thus tells how well he performed relative to an entire cohort of test takers.

Psychologists use test results and family characteristics in combination with one-on-one semi-structured interviews to assess conscripts' psychological fitness for the military. Psychologists evaluate each conscript's social maturity, intensity, psychological energy, and emotional stability and assign a final aptitude score following the stanine scale. Conscripts obtain a higher score in the interview when they demonstrate that they have the willingness to assume responsibility, are independent, have an outgoing character, demonstrate persistence and emotional stability, and display initiative. The aptitude score loads positively on extraversion ("outgoing character") and negatively on neuroticism ("emotional stability").[17] Importantly, a strong desire to serve in the military is not considered a positive attribute for military aptitude (and can even lead to a negative assessment), which means that the aptitude score can be considered a more general measure of noncognitive ability (Lindqvist and Vestman, 2011).

To assess physical aptitude for military service, the military collects physical information about conscripts, including their height. In robustness checks, we also use supplementary data from a variety of strength and fitness tests. Prior literature shows that physical fitness modifies the relation between height and labor market outcomes (Lindqvist, 2012; Lundborg, Nystedt, and Rooth, 2014). Cardiovascular fitness is measured in a cycle ergometry test and muscle strength on a combination of knee extension, elbow flexion, and hand grip tests.

2.2. Statistics Sweden

We merge the traits data to personal characteristics obtained from Statistics Sweden. The bulk of these data comes from the Longitudinal Integration Database for Health Insurance and Labor

[17] See McCrae and Costa (1987) for evidence on the degree various adjective factors load onto the so-called big five traits (openness, conscientiousness, extroversion, agreeableness, and neuroticism). After the sample period, the Swedish military also experimented with other personality tests, such as the Understanding Human Potential (UPP) test. This test has 19 scales, and it includes all the big five traits. Sjöberg, Bäccman, and Gustavsson (2011) report that successful applicants to the military academy score high values in extraversion and emotional stability and moderately high values in conscientiousness; they do not differ significantly from a benchmark group in agreeableness and openness.

Market Studies (LISA) that covers the whole Swedish population of individuals who are at least 16 years old and reside in Sweden at the end of each year. This database integrates information from registers held by various government authorities. We extract information on labor and total income, corporate ownership at the person-firm level, field and level of education, profession, and family relationships. Labor income includes all income taxed as labor income in a given year; base salaries, stock option grants, bonus payments, and benefits qualify as taxable labor income.[18] The education levels consist of five categories that vary from basic education to graduate studies. We use the fields of education to classify degrees into law, business, administration, government, natural sciences, agriculture, engineering, medicine, and other fields. Occupation codes, based on the International Standard Classification of Occupations (ISCO-88) classification, define physicians, lawyers, engineers, and other occupations. We define finance professionals as individuals who work in finance-related occupations in the finance industry, as defined by Statistics Sweden, and who have at least a college degree. The family records allow us to map each individual to their parents and siblings.

2.3. Swedish Companies Registration Office

The Swedish Companies Registration Office keeps track of all companies and their top executives and directors. The firm data are available for all corporate entities that have a limited liability structure ("aktiebolag") and that have appointed a CEO ("verkställande direktör"), excluding firms that operate as banks or insurance companies. These data record various financial statement items, including the total value of assets and the number of employees. By law, each firm has to supply this information to the registration office within seven months from the end of the fiscal year. Financial penalties and the threat of forced liquidation discourage late filing. The 40 industries in our data are based on the Statistical Classification of Economic Activities in the European Community (NACE) Rev.1.1 classification. The data also list the identification number of each firm and the individual who serves as its CEO at the end of each year.

We classify companies as family firms on the basis of family relations among major shareholders, called "owners" by the tax authorities, and directors. An individual's family comprises

[18] Tax authorities deem the taxable income to occur in the year when an employee or executive exercises his stock options or purchases his company's shares at a price that is less than their fair value.

his parents, grandparents, children, grandchildren, siblings, and partner(s). A partner is the person with whom the individual has a child.

For each owner and director in a firm, we calculate the number of other family members who are directors or owners in the company. A company is a family firm if at least two family members are owners or board members, or at least one owner and one director comes from the same family.

A family-managed company is a family firm whose CEO is related to at least one director or owner of the company. We classify a family-managed firm as heir managed if the CEO was between the age of 0 and 18 at the time the firm was founded, he is at least 20 years younger than the oldest family member who is a director or owner, or he is at least 20 years younger than the family member who previously served as the CEO of the company. We assign all family firms that are not managed by the later generation to the founder category.

The data we use to characterize family ownership originate from the tax filings in which individuals declare ownership in limited liability firms. Importantly, individuals must also declare ownership of a firm through another holding company in the tax form. This allows us to track ultimate owners of a company. Following Bennedsen, Pérez-González, and Wolfenzon (2017), we exclude micro firms from the sample, defined here as having fewer than five employees or an asset base below SEK 1 million (1 SEK ≈ 0.13 USD). The former restriction also helps in excluding holding companies without their own industrial operations from the sample.

Our sample includes about 26,000 unique CEOs. We assign CEOs to firm-size categories based on the size of the largest firm they manage during the period 2004−2010. Small companies—those with less than SEK 100 million (USD 13 million) in total assets—account for 84% of the firm population. Small-to-medium size companies are those with assets between SEK 100 million and 1 billion. Medium-to-large companies have assets between SEK 1 billion and 10 billion, and large companies have more than SEK 10 billion in assets (USD 1.3 billion).

Our entire sample encompasses about nine million person-years. Given the sample size, almost all of our results are highly significant. Therefore, our reporting generally focuses on coefficient values and patterns, rather than on their statistical significance.

3. Ranking CEOs by their traits

This section compares the traits of CEOs to those of other high-skilled professionals and members of the population. We analyze how the traits an individual possesses map into the likelihood of attaining a CEO position later in life, inferring how much weight the CEO labor market gives to each trait. We use these weights to analyze the combinations of CEO traits and ask how unique they are when compared with the population and with other men pursuing managerial careers in the corporate sector.

3.1. Comparing CEOs to other high-skill professionals and members of the population

In Table 1, we report mean values for the traits, education, and income for the population for CEOs as a function of firm size, ownership, and family management status, and for four high-skill professions.[19] Future CEOs differ from the population in all measures we consider. Small-company CEOs have about one-half of a standard deviation higher cognitive and noncognitive ability, and they are about one-fifth of a standard deviation taller than the population average, placing them at about par with engineers, lawyers, and finance professionals in all traits except for cognitive ability. CEOs are also better educated than the population in general. About one-third of the small-company CEOs have a college degree; the corresponding fraction for the population is about one-fourth.

———Insert Table 1 about here———

On average, CEO traits are better in larger firms. When we move from small to large companies, CEOs' average cognitive and noncognitive ability increase about two-thirds of a standard deviation, and their height increases by about one-half of a standard deviation. All traits of large-company CEOs are at about par or higher than those of physicians, lawyers, engineers, and finance professionals. Table IA2 shows that this largely applies, even when we compare CEOs to equally well-paid professionals. Large-firm CEOs have higher noncognitive ability and are taller than the other professionals, but they have a slightly lower cognitive ability than all but finance professionals.

Table 1 also compares the traits of CEOs of nonfamily- and family-owned companies, subdividing family-owned companies to those managed by the founder, an heir, or an external CEO. Nonfamily company CEOs have slightly higher cognitive ability than external CEOs in family

[19] Table IA1 in the Internet Appendix reports the standard deviations for the variables listed in Table 1.

companies and about one-half of a standard deviation higher cognitive ability than founder- or heir-managed family companies. Noncognitive ability and height follow the same ranking between firm types. Table IA3 reports similar results in a regression framework, where we also control for firm size. Consistent with Pérez-González (2006) and Bennedsen et al. (2007), founders tend to have higher trait values than heirs, but the difference in their trait values is small, at most 0.1 standard deviations. These results suggest that family firms make compromises in the traits of the CEOs or that family-firm CEOs possess other characteristics that make up for what they lack in the three traits we study.

Carlstedt and Mårdberg (1993) argue that induction and verbal reasoning are more highly associated with the "general factor" in intelligence, the g-factor, than the other subcomponents of cognitive ability. Among CEOs, these factors increase the most as a function of firm size. For example, the average induction score increases by about one-half of a standard deviation from small to large companies, while the average technical ability only increases by one-quarter of a standard deviation. These results are consistent with Murphy and Zábojník (2004, 2007) and Frydman (2017)'s arguments that general managerial skills (i.e., skills transferable across companies, or even industries) are important in the CEO labor market.

———Insert Fig. 1 about here———

Panels A and B of Table IA4 report the distribution of the traits across stanines in the population, high-skilled professions, and among CEOs of companies of varying sizes and family-firm statuses. Panel A of Fig. 1 graphs the distribution of the traits, both for the population and for CEOs of small and large companies. The figure illustrates that the difference in the average scores between the population and CEOs does not arise from a preponderance of any one stanine in any of the groups. There are relatively fewer CEO participants in every below-average trait group and relatively more in every above-average trait group.

3.2. Ranking CEOs based on their traits and trait combinations

How do the traits CEOs possess compare with the population? Panel A of Table 2 analyzes this question by computing the fraction of the population with smaller trait values than the CEOs. The median large-company CEO is above 83% of the population in cognitive ability, above 92% in

noncognitive ability, and above 74% in height.[20] While CEOs have considerably higher trait values than the population as a whole, a substantial fraction of the population has higher trait values than the CEOs. For example, 17% of the population have a higher cognitive ability than the median large-firm CEO.

———Insert Table 2 about here———

While CEOs are smarter than average, they are not as smart as one might infer from prior literature. Less than one-fifth of Swedish large-firm CEOs belong to the "cognitive elite" comprising the top 5% of individuals, as defined by Herrnstein and Murray (1996) in The Bell Curve, not to mention the "higher professional" category of the top 0.1% of individuals of Burt (1924). In fact, the cognitive ability of the average Swedish large-firm CEOs is even lower than Herrnstein and Murray's (1996) estimate of the cognitive ability of 12.9 million Americans working in executive, administrative, and managerial positions in the corporate sector.[21] This category contains many more jobs at many more levels and in much smaller companies than the position of a large-firm CEO.

Looking at CEOs one trait at a time may be too narrow of an approach. Many argue that leadership ability is not one dimensional (e.g., Heckman, 1995). And the fact that CEOs score well on all traits we consider suggests that CEOs excel in the combination of their traits. To gain understanding on the relative importance of the traits, Table IA5 runs a series of linear probability model regressions that relate the CEO dummy to the three traits and fixed effects for the year of the data and the individual's enlistment year.[22] Since the predicted probabilities of attaining a CEO position in Table IA5 are linear combinations of standardized traits, it is natural to use predicted

[20] Since the traits attain discrete values, we smooth them by interpolating between 1% intervals of the CEO distribution. For example, Table 1 shows that the median CEO of a firm with more than 10 billion in assets has a cognitive ability score of seven. Panel B of Table IA4 shows that the cognitive ability of this CEO falls between the sixth and seventh stanines, and that the cumulative shares of CEOs representing stanines 1−6 and 1−7 are 31% and 62%, respectively. The corresponding population shares are 75% and 88%, respectively. Therefore, the cumulative share of the population increases by (88% − 75%) / (62% − 31%) = 0.42 for each 1% increase in the CEO population. Because the median is 50% − 31% = 19% away from the lowest point of the sixth stanine, the median CEO has higher cognitive ability than 75% + 0.42×19% = 83% of the population.

[21] On p. 60, Herrnstein and Murray estimate that 70%−80% of the Americans occupying these positions have an IQ of 120, i.e., belong to the top 18% of the population in cognitive ability. The median Swedish large-firm CEO belongs to the top 17% of the population in cognitive ability.

[22] We add controls for year and enlistment year to control for possible time variation in the quality of CEOs and an upward trend in mean ability scores and height in the population (Flynn, 1984; Floud, Wachter, Gregory, 1990; Jokela et al., 2017).

probabilities as measures of combined traits to rank CEOs relative to the population (see, e.g., Rosenthal, 1978).

The coefficients in Column 4 suggest relative weights of 58% for noncognitive ability, 31% for cognitive ability, and 12% for height in a combined trait.[23] Using these weights, the left-hand side of Panel B of Table 2 tabulates the proportion of the population with a lower combination of trait values than that possessed by the CEOs of small and large firms at various points of the CEO trait distribution. Panels A and B of Fig. 2 provide graphical representations of the data for small and large firms; Panel C shows a more detailed visual comparison of the distributions of the combined trait by firm size.

———Insert Fig. 2 about here———

Consistent with the idea that leadership ability is multifaceted, CEOs differ more from the population in the combination of traits than in any individual trait. This result can be most easily seen in Panels A and B of Fig. 2, where the plot of the combined trait is always above the plots of each individual trait. However, the difference between the combined and the best individual trait is relatively small, except for the bottom third of the CEOs of the largest companies. The median (top quartile) small-company CEO has a larger combination of traits than 77% (91%) of the population. The median (top quartile) large-company CEO dominates 95% (99%) of the population in the combined trait. This means that about 5% of the population, or more than 60,000 individuals, have a better trait combination than the median large-firm CEO. In Table IA6, we consider alternative weightings of the traits and show that this conclusion is robust to different weighting schemes.

Panel C in Fig. 2 illustrates how the proportion of the population with a lower trait combination than CEOs changes as a function of the size of the firms they manage. There is a large difference in combined traits of small-company CEOs and those of firms whose total assets range from SEK 100 million to 1 billion. The trait difference between CEOs in other firm-size categories is smaller, particularly among the higher-ability CEOs.

[23] To get a better sense of what these numbers mean, one can do the following thought experiment. Following the convention that one standard deviation in cognitive ability corresponds to 15 IQ points, and using the Table IA1 result that the population standard deviation in height is 6.54 centimeters, the results imply that in CEO selection each centimeter in height corresponds to $(0.12 \times 15) / (6.54 \times 0.31) = 0.91$ IQ points.

3.3. What do the people with CEO-caliber traits do?

Not everybody wants to become a CEO. For example, some talented individuals choose an academic or medical career without any intention of pursuing a career as a corporate executive. To gain a better idea of the career intentions of talented individuals, we study the occupational outcomes of all test takers with at least as good of a combination of traits as the median CEO in various firm-size categories. This analysis allows us not only to exclude from our investigation of prospective CEOs those talented individuals who are unlikely to have considered a career as an executive but also allows us to identify those individuals who have chosen to pursue a similar career, but with less success.

Panel C of Table 2 reports the career outcomes of the individuals with high-trait values. We divide their occupations into low-, medium-, and high-skill categories as per Statistics Sweden. For the high-skill group, we report specific occupational categories. Most high-trait individuals work in high-skill professions such as management, IT, or engineering. While some high-trait individuals enter into academia (the teaching category) or become doctors (medicine), many of them pursue management careers that in principle should culminate in a CEO position. Thirty-three percent of test takers (18,000 individuals) with combined traits larger than those of the median large-firm CEO belong to this category. Of these individuals, 3,610 are CEOs of smaller companies. Thus, there are more than 100 times as many high-trait individuals pursuing a lower-level managerial career and about 25 times as many high-trait smaller-firm CEOs as there are large-firm CEOs. Thus it appears as if preferences alone cannot explain why some talented individuals do not become CEOs.

4. Traits, pay, and firm policies

Do the differences in traits help explain why CEOs are paid so much? The fact that many individuals, including those in managerial positions in the corporate sector, have higher trait values than CEOs, suggests that the answer to this question is not obvious. We analyze the ability of traits to account for CEO pay by first establishing the position of the CEOs in the income distribution of the population. We then estimate the CEO pay premium and examine whether it can be attributed to CEOs' traits. To put our analysis in perspective, we compare the strength of CEOs' trait-pay relation with that of physicians, engineers, lawyers, and finance professionals. After that, we study the extent to which traits explain pay among CEOs and whether traits moderate the relationship

between firm size and CEO pay. Finally, we examine whether the traits are able to explain the management styles of CEOs.

4.1. Position of CEOs in the income distribution

The four rightmost columns in Panel B of Table 2 report the proportion of the population that has lower taxable labor income than the CEOs. The median small-firm CEO has higher income than 87% of the population. The median CEO in the 100 million to 1 billion size category has higher income than 98.8% of the population, and the median large-firm CEO has higher income than 99.9% of the population. In other words, only 0.1% of the population earns more than the median large-firm CEO, even though 5% of the population has a better combination of traits than this CEO. CEOs appear to differ from the population more in their pay than in their traits, suggesting that the traits we measure are not the scarce resource that explains why CEOs are paid so much. Comparing Panels C and D of Fig. 2 provides visual confirmation of this result.

4.2. How the CEO pay premium varies with traits

Table 3 formalizes the analysis of the previous subsection by providing regression evidence on the role of traits in CEO pay in the population. The dependent variable is the logged taxable labor income an individual receives in a given year. Individuals with no taxable labor income are not included in the regression.

We first compare CEO pay to income in other high-skill professions and the population. This analysis yields estimates of the pay premiums of CEOs and of other high-skill professions. Then we add the traits and other controls to the regressions. The regression that includes traits helps us estimate how much of a profession's pay premium over the population cannot be attributed to the traits of the typical member of the profession. We can infer this by subtracting the predicted pay premium based on the traits in a profession from the observed pay premium.

Column 1 reports results from a specification that includes dummies for CEOs of various-sized companies, dummies for physicians, lawyers, engineers, and finance professionals, and controls for year and enlistment year. The omitted group consists of all other professions in the population. The coefficient estimates for CEOs increase monotonically with firm size, ranging from 0.60 for the small-firm CEOs to 2.53 for large-firm CEOs. This means that small-firm CEOs earn about 1.8 times as much as the population ($e^{0.60} = 1.8$) and large-firm CEOs about 12 times as much as the

population. Physicians earn 2.3 times, finance professionals 2.2 times, lawyers 1.9 times, and engineers 1.7 times as much as the population.

———Insert Table 3 about here———

Column 2 adds controls for the three traits. The coefficient for large-firm CEOs drops from 2.53 to 2.27, suggesting that 10% of the large-firm CEO pay can be attributed to the three traits. A similar analysis of the changes of coefficients for the other professional groups suggests that the traits explain less of the pay premium of finance professionals (17%) than of the other high-skill professions (23%−29%). Large-firm CEOs earn 9.7 times as much as the population after controlling for traits, while the equivalent premiums for the other high-skill professions are much smaller, ranging from 1.4 (engineers) to 1.9 (finance professionals). It appears that CEOs' traits are not sufficiently high to match the levels of their pay.

Columns 3−4 control for education and family fixed effects. The physician, lawyer, and engineer dummies drop out of these regressions because we control for the field of education.[24] In Column 4, the coefficients for CEOs, particularly for large-company CEOs, drop markedly. Despite the drop, the pay premium for CEOs remains higher than what it is for the high-income professions in the other specifications. Our results are qualitatively similar if we use total income in lieu of ordinary income (Table IA7) or if we replace cognitive ability with its subcomponents (Table IA8).

4.3. Traits, firm size, and CEO pay

Do traits explain pay across individuals who have made it to the CEO level? To address this question, it is useful to study whether the assignment of CEOs with firms is attributable to traits. Gabaix and Landier (2008), Terviö (2008), and others suggest that more talented CEOs are allocated to bigger firms. At a large firm, even a small difference in ability that increases firm value by a small percentage can translate into a high absolute amount of value creation, so even modest differences in ability could have important effects on pay. We first provide some visual evidence on the role of assignment and then examine the relation between traits, firm size, and pay.

We sort CEOs into 250 quantiles based on firm size. In Panel A of Fig. 3, we plot for each quantile the mean standardized traits (vertical axis) against logged average total assets (horizontal

[24] This does not apply to finance professionals, who are spread among different fields of education. We drop them for symmetry.

axis). In Panel B, we plot logged mean CEO pay against logged average total assets; in Panel C we plot mean standardized traits (vertical axis) against logged mean CEO pay.

The plots in Fig. 3 are consistent with assignment models. The relation between traits and pay is monotonic and close to linear, suggesting that more talented CEOs are allocated to larger firms. There is also a monotonic and close to linear relation between firm size and CEO pay. The size elasticity of pay, 0.27, is quite close to the 0.3 estimate reported for US firms (see, e.g., Murphy, 1999). Finally, the traits have a monotonic and close to linear relation with logged pay. However, the association of traits with firm size and CEO pay is far from perfect. Table IA9 shows that 7% of the variance in firm size associates with the variance in traits. The correlation between traits and firm size is much lower in family-managed firms than in other firms. This result is consistent with the idea that the CEO labor market focuses less on the traits we study among family-managed companies.

———Insert Fig. 3 about here———

Table 4 shows regressions of CEO pay on firm size and traits. If CEOs are rewarded for their traits and the traits largely explain the assignment of CEOs to larger firms, we should expect to find that the inclusion of traits moderates the size-pay relation. We implement this test by regressing CEO pay on firm size and then adding traits to the regression.

———Insert Table 4 about here———

Column 1 serves as the baseline specification for the association between firm size and pay. The coefficient for firm size, 0.25, is similar to the one reported in Fig. 3. Column 2 regresses firm size on traits and controls for year and enlistment year. Cognitive ability has the largest coefficient, followed by noncognitive ability and height. The adjusted *R*-squared of the model is 0.092, i.e., much less than the adjusted *R*-squared in Column 1, 0.39. In other words, traits explain much less of the variation in CEO pay than firm size. Column 3 includes both firm size and traits. The coefficients for the traits drop to about one-half from those reported in Column 2, while the corresponding coefficient for firm size remains almost intact. This suggests that the explanatory power traits have on pay largely passes through firm size, while controlling for traits has little effect on the size-pay relation.

Studies on CEO pay often regress pay on the level of education (e.g., Graham, Li, and Qiu, 2012; Fernandes et al., 2013; Frydman 2017) and on whether the CEO has an MBA or other business degree (e.g., Custodio, Ferreira, and Matos, 2013; Frydman, 2017), although often not both at the

same time (in the above list of papers, Frydman, 2017 is the exception). Column 4 adds the level and field of education to the regression but leaves out the traits. CEO pay increases in the level of education, with graduates from medicine, law, and natural sciences commanding the highest salaries. The coefficient for business education is close to zero and about two percent greater than the corresponding coefficient for engineering. Column 5 adds traits to Column 4's regression specification. The coefficients for all trait variables drop from those reported in Column 3. The coefficient for cognitive ability decreases by almost two-thirds, reflecting the positive correlation between cognitive ability and the level of education (across CEOs, their rank correlation is 0.40). This result is echoed by the fact that the coefficients for the level of education variables decrease on average by one-third from those reported in Column 4. Inclusion of traits in the regression has less effect on the field of education coefficients, presumably because there is less variation in cognitive ability between fields after controlling for the level of education. The sensitivity of the results to the (generally unobservable) traits suggests that one should interpret the education coefficients reported in the literature with caution.

Finally, we present results from two specifications where we replace the left-hand side variable with coefficients on CEO fixed effects, estimated from pay regressions that require each CEO to have switched firms at least once during our sample period. The resulting sample is more than three times as large as that in Bertrand and Schoar (2003), containing 2,521 firms and 1,683 individual executives who can be followed in at least two different firms for at least four years. We then regress the coefficients on fixed effects on traits and enlistment year dummies.[25] In Column 6 the right-hand side variables in the first-stage regression are confined to CEO and firm fixed effects, while in Column 7 the first-stage model also includes logged firm size. In these models, CEO fixed effects are jointly highly significant, and the adjusted *R*-squareds equal 0.85. If we were to run the first-stage regressions with CEO fixed effects alone, the *R*-squareds would be 0.76 and 0.77, virtually identical to those reported in Graham, Li, and Qiu (2012).

The trait coefficients reported in Column 6 are similar to those reported in Column 2, and they are all highly significant. The trait coefficients decrease markedly in Column 7, as they do in Column 3 where we add firm size to the regression equation. This offers further support to the notion that the explanatory power traits have on pay largely passes through firm size.

[25] We use the estimator developed by Correia (2016) and implemented in the reghdfe package in Stata.

Our regression analysis implicitly assumes that standardized trait measures are linearly related to logged pay. Yet, the effects of traits variables could be nonlinear and perhaps nonmonotonic; for example, excessively high intelligence could be a handicap for a CEO. We study the linearity assumption by replacing cognitive and noncognitive ability scores and height in specification 3 of Table 4 with stanine score dummies, and further decomposing the top cognitive ability and height stanines into four dummies representing about 1% of the population each.[26] Fig. IA1 plots the coefficient estimates and 95% confidence bands for the dummies for the three traits. With the exception of the very lowest trait values, the linearity assumption appears to fit the data quite well.

Two patterns emerge from our results. First, the vast majority of the variation in firm size and CEO pay is unrelated to the traits we study. Second, the size-pay relation is largely unaffected by the traits. These results suggest that the early life traits economists frequently use to predict labor market outcomes are quite different from the traits the labor market uses to rank CEO candidates.

4.4. Traits and firm policies

Can the traits explain CEOs' management styles? Bertrand and Schoar (2003) find that CEO fixed effects have incremental explanatory power over various firm policies. In this subsection, we study whether the CEO fixed effects in five firm policies and one performance measure, adapted from Bertrand and Schoar, correlate with the traits we study.

We address this question by extracting CEO fixed effects from the sample of CEOs who switched companies during our sample period. We first regress the firm policies and performance on CEO fixed effects while controlling for firm fixed effects. Table IA10 reports descriptive statistics on the policies, firm performance, and the CEO fixed effects. In the second stage, we extract the CEO fixed effects and correlate them with traits.

———Insert Table 5 about here———

Table 5 reports the results from these regressions. The *F*-statistics of the CEO fixed effects are statistically highly significant in each specification, which is consistent with the idea that CEOs matter for firm policy and performance. Three of the 18 trait coefficients are statistically significantly different from zero at the 5% level. The strongest correlation is that between cognitive

[26] Our access to raw cognitive ability subscores allows us to partition cognitive ability into more than the nine groups implied by the composite stanine score. Unfortunately, we cannot do the same for noncognitive ability, for which we do not have data on the subscores.

ability and leverage (*t*-value = 3.5). This result can stem from smarter executives being more likely to understand the value of the tax shields associated with higher leverage (see, e.g., Modigliani and Miller, 1963; Graham, 2000). The relation between cognitive ability and the number of acquisitions is also positive, though less significant (*t*-value = 2.3). One plausible explanation for this result is that acquisitions are complicated, and smarter people are better able to handle complexity; Rose and Shepard (1997) argue that more complex firms are led by managers with higher ability. Finally, cognitive ability is significantly negatively correlated with the operating performance of the firm (operating return on assets, OROA, *t*-value = –2.0). This on surface surprising result can be driven by reverse causality: when a firm underperforms, it may wish to hire a better CEO (for evidence of the link between performance and executive turnover, see, e.g., Weisbach, 1988). Like Bertrand and Schoar (2003) and others, we interpret our estimated coefficients as correlations instead of as causal relations.

Despite the significance of some coefficients on traits, the explanatory power of the traits on firm outcomes is low: the second-stage adjusted *R*-squared varies between 0.015 and 0.031. Table IA11 shows that the results reported in Table 5 remain qualitatively similar, even if we tighten the requirement of four observations for each CEO to six observations. As a whole, our findings on CEO fixed effects suggest that only a small part of the management styles CEOs carry from one company to another stem from differences in the traits we study.

5. Conclusion

Perhaps the oldest theory of leadership, going back to Plato (2008) as well as Carlyle (1841), maintains that leaders are born to their roles. We test a version of this theory by studying the traits of a comprehensive sample of future Swedish top business leaders at age 18 and by comparing them to the male population. The median large-company CEO belongs to the top 17% of the population in cognitive ability and to the top 5% in the combination of cognitive and noncognitive ability and height. Yet, more than 60,000 men in our sample have a similar or better trait combination than the median large-firm CEO.

The CEOs' high position in the trait distribution is not matched by their position in the income distribution: the labor market returns to the traits leave the CEO pay premium largely unexplained. The traits also explain only about 7% of the variation in firm size and 9% of the variation in CEO

pay, and they have virtually no explanatory power on CEO management styles. These results speak against the idea that the traits we measure are in scarce supply in the market for CEOs.

What prevents individuals with impressive portfolios of traits from entering top business positions? One possibility relates to the supply of talent: the nonpecuniary aspects of the executive job can make it unappealing to some talented individuals. We test this conjecture by studying all men who display a similar or better combination of the three traits than the median large-firm CEO and who work in managerial roles in the corporate sector. There are more than 100 times as many high-talent men in lower-level managerial careers and about 25 times as many high-talent smaller-firm CEOs as there are large-firm CEOs. While pressure, uncertainty, and the public nature of a top executive job can render it unattractive, such preferences would need to apply to a large share of these individuals to keep them from pursuing a career as a top executive. Although preferences are notoriously difficult to measure, these considerations make us skeptical about their ability to explain why we do not find more of the high-trait individuals in CEO positions.

We can also check whether future CEOs excel in other ways. CEOs often have to endure long working hours and may need to be in excellent physical condition to meet the challenges in their work, so we test whether two physical condition proxies, cardiovascular fitness and muscle strength at age 18, have predictive power for CEO pay.[27] Table IA12 shows that physical condition is of little consequence once we control for the other traits, perhaps because physical condition can change substantially between the military service and the appointment to a CEO position.

As our findings on the low-trait values of firm founders suggest, business acumen does not necessarily coincide with high-trait values. This raises the possibility that the job as a CEO primarily requires other qualifications than the ones we can measure. Work experience relevant for the CEO position may not correlate strongly with traits beyond a threshold level that is required to enter careers that can lead to a CEO position. Knowing the right people through early life connections or landing a valuable internship through a stroke of luck can put an individual's career on a fast track that an inexperienced, yet highly talented, individual may not be able to compete against (see Terviö, 2009 for a model). Although we do not attempt to quantify the importance of work experience, connections, and luck in becoming a CEO, we can conclude that the early life traits frequently used

[27] Lindqvist (2012) and Lundborg, Nystedt, and Rooth (2014) find these variables to predict life outcomes.

in predicting labor market outcomes are quite different from the traits the labor market uses to rank CEO candidates.

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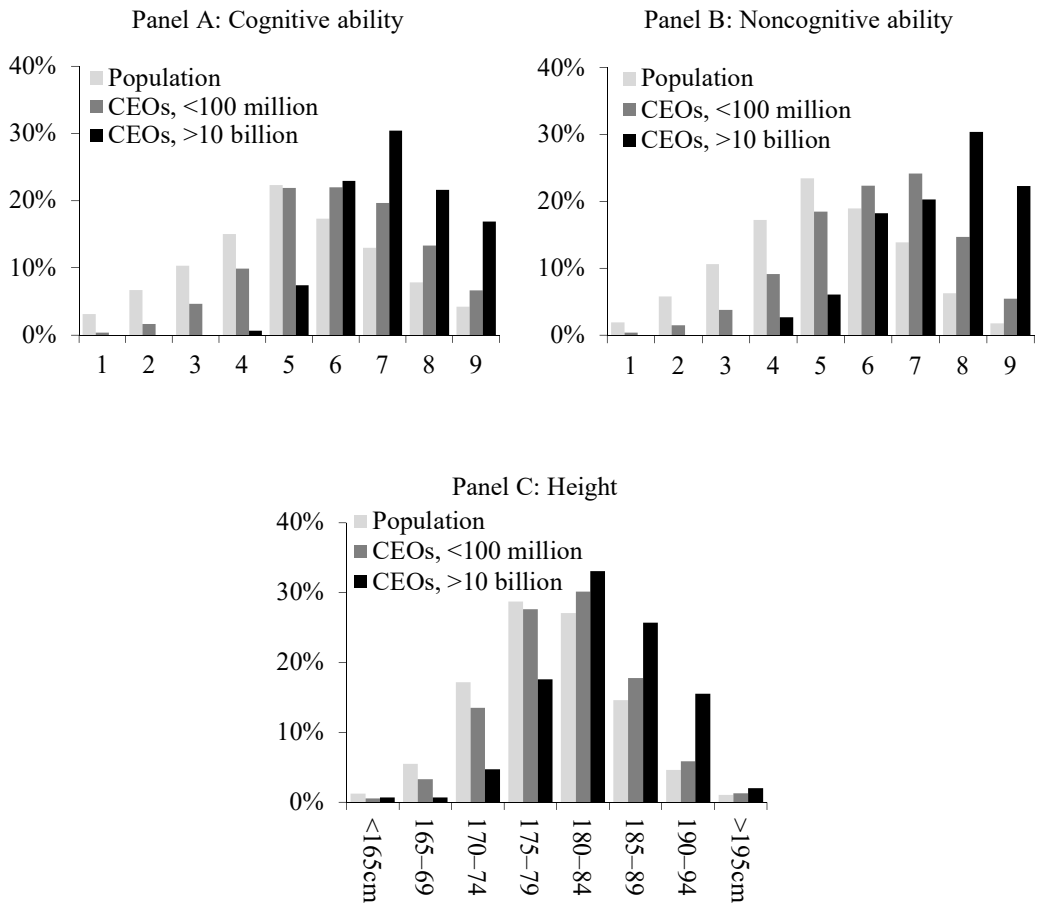

Fig 1. Distributions of personal traits of CEOs in different firm-size categories and the population at large. The light bars indicate the population whereas the gray and black bars show the distributions for CEOs in firms with less than 100 million and more than 10 billion in total assets, respectively. The sample includes 1.3 million Swedish men born in 1951−1978, of which 26,000 hold a CEO position in at least one of the years in 2004−2010.

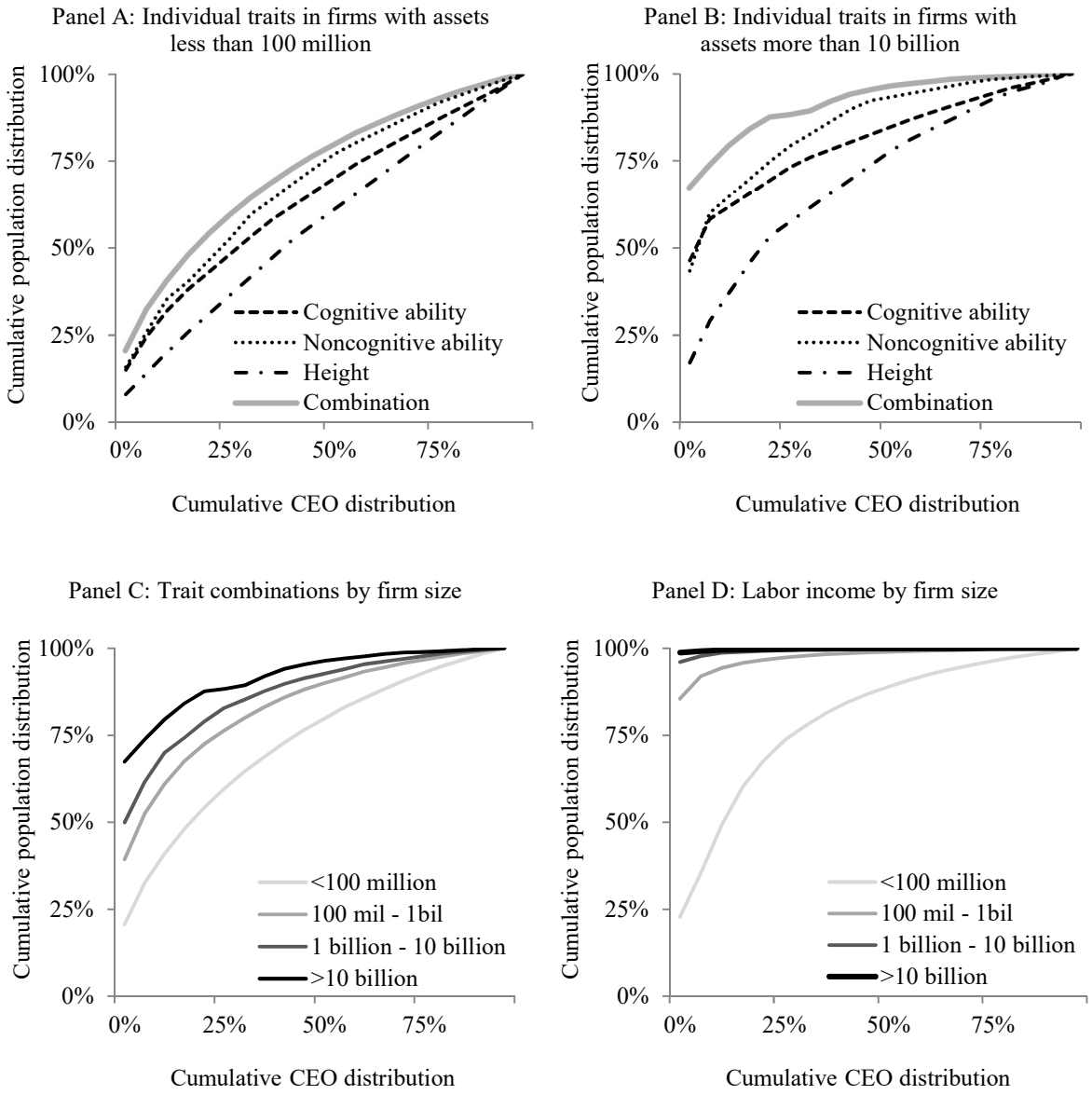

Fig 2. Cumulative distributions of CEOs' traits and labor income compared to the population at large. For each firm size category, each point in the graphs depicts the cumulative probability of each CEO trait, the combination of CEO traits, or CEO's labor income relative to the corresponding value in the population. The sample includes 1.3 million Swedish men born in 1951−1978, of which 26,000 hold a CEO position in at least one of the years in 2004−2010. See Table 2 for further description.

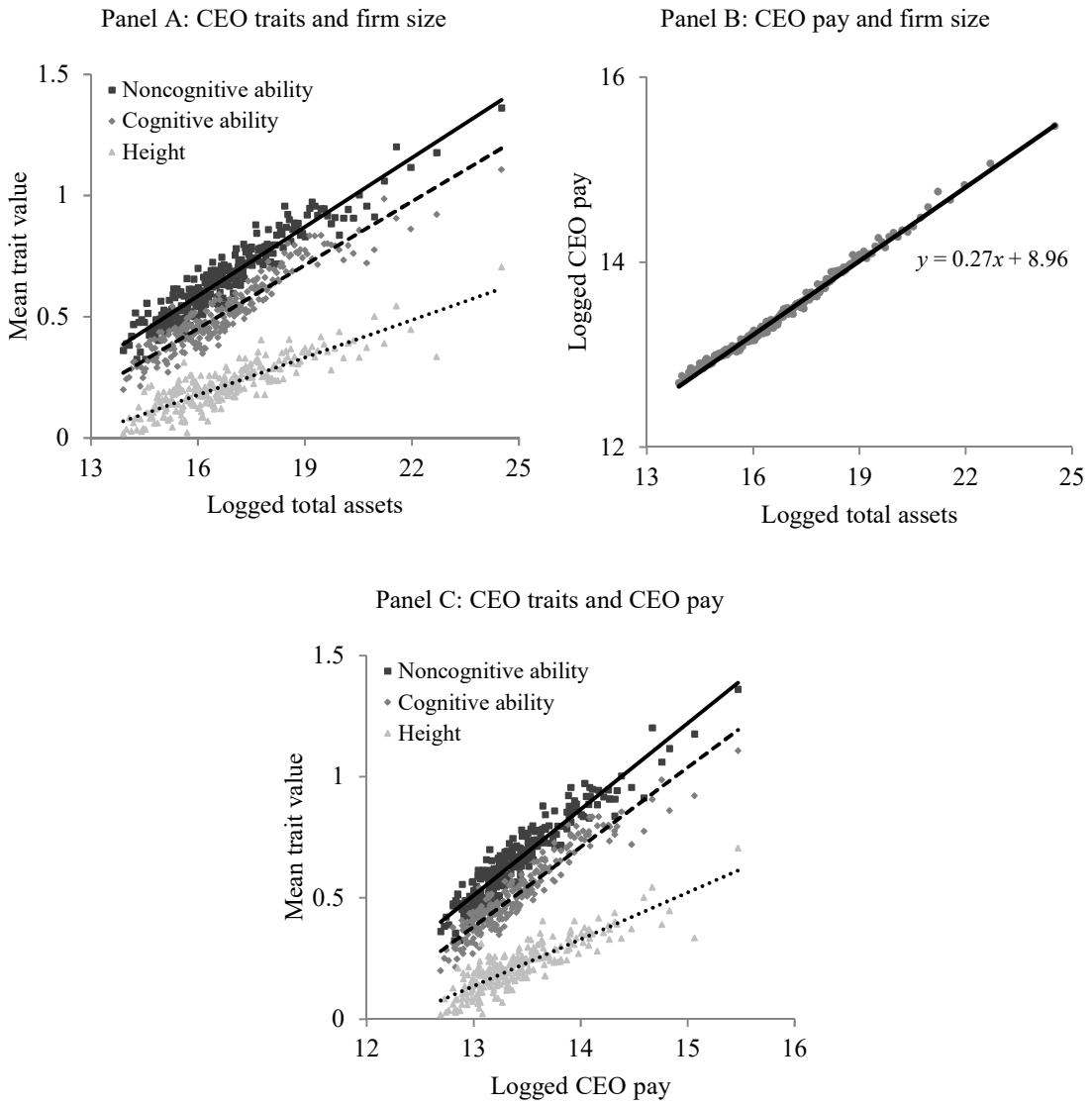

Fig 3. Relations between CEOs' traits, pay, and firm size. The graphs sort the sample of CEOs into 250 quantiles based on their firms' total assets. Panel A plots, for each quantile, the mean of each standardized trait as a function of logged total assets of the firm. The standardization transforms the traits to have mean of zero and standard deviation of one. Panel B plots logged CEO pay against logged total assets and reports the regression equation from a linear regression that explains logged CEO pay with logged total assets. Panel C graphs the mean of each standardized trait as a function of logged CEO pay. The sample includes 26,000 Swedish men born in 1951−1978 who hold a CEO position in at least one of the years in 2004−2010.

Table 1

Traits for the population, for CEOs by firm size and family-firm status, and for other high-skill professions

The table reports means of traits, the year an individual was enlisted, level of education, taxable labor income (in SEK), and, for CEOs, the total assets of the firm they manage (in SEK; 1 SEK ≈ 0.13 USD). The statistics are calculated separately for the population and for physicians, engineers, lawyers, and finance professionals, and for CEOs of various types. Bachelor's degree refers to a post-secondary education of not more than three years, whereas the duration of master's degree is at least four years. In Sweden, most physicians fall in the master's degree category. The unit of observation is an individual. The CEOs are assigned to categories according to the largest firm they have managed during the sample period 2004−2010.

	Popu-lation	CEOs by firm size				CEOs by family-firm status				High-skill professions			
		<100 mil	100 mil – 1bil	1 bil – 10 bil	>10 bil	Non-family firm	Family firm, external	Family firm, founder	Family firm, heir	Physi-cians	Lawyers	Engi-neers	Finance profes-sionals
Cognitive ability	5.15	6.02	6.60	6.84	7.16	6.29	6.15	5.77	5.73	7.49	6.66	7.11	6.32
Induction	5.12	5.95	6.55	6.87	7.06	6.23	6.16	5.67	5.66	7.32	6.79	6.87	6.50
Verbal	5.01	5.71	6.30	6.63	6.99	5.99	5.83	5.47	5.39	7.17	6.85	6.44	6.35
Spatial	5.25	5.82	6.12	6.21	6.48	5.96	5.84	5.70	5.73	6.63	5.92	6.73	5.87
Technical	4.96	5.59	5.86	5.91	6.08	5.73	5.60	5.45	5.40	6.67	5.64	6.81	5.60
Noncognitive ability	5.09	6.14	6.67	6.93	7.36	6.35	6.19	6.00	5.90	6.37	6.13	5.89	6.21
Height (cm)	179.1	180.3	181.4	181.6	183.5	180.8	180.5	179.9	179.9	181.0	180.7	180.5	180.7
Enlistment year	1983	1982	1980	1979	1977	1981	1982	1981	1980	1982	1984	1986	1987
Level of education													
Basic	13.2%	8.9%	2.8%	0.7%	0.7%	5.6%	6.7%	12.1%	16.7%	0.0%	0.0%	0.0%	0.0%
Vocat. or high school	60.7%	59.2%	41.3%	24.4%	13.5%	51.1%	57.2%	65.0%	66.1%	0.0%	0.0%	0.0%	0.0%
Bachelor's	15.4%	17.6%	28.0%	32.9%	33.1%	22.2%	20.2%	13.9%	11.3%	0.0%	7.0%	34.5%	61.6%
Master's	9.2%	12.9%	25.8%	40.6%	44.6%	19.1%	14.9%	8.4%	5.8%	72.3%	91.2%	57.7%	36.2%
Doctoral	1.5%	1.4%	2.1%	1.3%	8.1%	2.0%	1.0%	0.6%	0.1%	27.7%	1.8%	7.8%	2.1%
Income, 1,000 SEK	400	752	1,773	3,402	6,219	1,151	985	615	642	834	761	572	1,071
Total assets, mill. SEK		21	312	3,021	50,100	600	409	38	71				
Number of individuals	1,268,176	21,937	3,266	672	148	16,609	1,503	6,417	1,494	9,384	6,192	39,567	8,823

Table 2

Fraction of population with lower traits values than CEOs

The table reports the fraction of the population with lower personal trait values than the CEOs. The analysis considers each trait separately and in combination with the other traits. Panel A compares, separately for small and large firms, each trait to the population by calculating the proportion of the population with lower trait values than CEOs at different parts of the CEOs' trait distribution. The results have been smoothed by means of interpolation; see the text for additional details. The four leftmost columns in Panel B predict, for each individual, the probability of attaining a CEO position based on the regression in Column 4 of Table IA5. The predicted probability then determines the proportion of the population with a lower combination of trait values than the CEO. The four rightmost columns report the proportion of the population with lower taxable labor income than the CEOs. Panel C reports the occupational distribution of the individuals with a larger trait combination than the median CEO in each firm-size category. A skill level is attributed to each occupation using the mapping of the ISCO-88 standard of occupations into the International Standard Classification of Education (ISCED-76) classification of education. The management category includes corporate management only; nonprofit management is excluded. Academics are in the teaching category. The number of observations in Panel C is less than that implied by Panel B because occupational codes are not available for all individuals.

Panel A: Fraction of population with lower trait values than CEOs, by firm size

Cumulative CEO trait distribution	<100 million			>10 billion		
	Cognitive ability	Non-cognitive ability	Height	Cognitive ability	Non-cognitive ability	Height
5%	15.0%	15.8%	8.0%	46.4%	43.5%	17.0%
25%	43.4%	46.8%	31.4%	69.6%	75.0%	53.4%
50%	66.2%	72.9%	57.0%	82.7%	92.4%	73.9%
75%	84.0%	89.0%	78.8%	92.5%	97.6%	89.8%
90%	93.3%	96.1%	91.7%	97.3%	99.2%	96.5%
95%	96.5%	98.2%	95.8%	98.7%	99.6%	98.0%
100%	100.0%	100.0%	100.0%	100.0%	100.0%	101.0%

Panel B: Fraction of population with lower combinations of trait values and lower labor income than CEOs

Cumulative CEO trait or income distribution	Combination of traits				Labor income			
	<100 mil	100 mil − 1 bil	1 bil − 10 bil	>10 bil	<100 mil	100 mil − 1 bil	1 bil − 10 bil	>10 bil
5%	20.6%	39.3%	49.9%	67.4%	22.8%	85.5%	96.1%	98.8%
25%	54.3%	72.5%	79.0%	87.7%	67.7%	96.7%	99.3%	99.7%
50%	76.6%	88.2%	91.4%	95.4%	86.9%	98.8%	99.8%	99.9%
75%	90.8%	95.8%	97.1%	98.8%	95.2%	99.6%	99.9%	99.98%
90%	96.9%	98.6%	99.1%	99.5%	98.3%	99.8%	99.97%	99.997%
95%	98.6%	99.4%	99.6%	99.8%	99.1%	99.9%	99.99%	99.999%
100%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Panel C: Occupational distribution of individuals with a larger combination of trait values than the median CEO				
	Size of the firm managed by the median CEO			
	<100 mil	100 mil − 1 bil	1 bil − 10 bil	>10 bil
Low skill	20.9%	15.0%	12.9%	9.8%
Medium skill	20.2%	18.2%	17.3%	15.9%
High skill	58.9%	66.8%	69.7%	74.2%
Management	23.7%	28.9%	30.9%	33.4%
IT	7.7%	7.7%	7.6%	7.6%
Engineering	6.3%	6.6%	6.6%	6.6%
Teaching	5.9%	6.1%	6.2%	6.5%
Business	4.3%	4.6%	4.8%	5.0%
Medicine	2.4%	3.2%	3.6%	4.6%
Military	2.4%	2.9%	3.1%	3.4%
Law	0.9%	1.1%	1.1%	1.2%
Other	5.4%	5.6%	5.8%	5.9%
Total	100.0%	100.0%	100.0%	100.0%
Number of individuals	275,624	143,286	103,690	53,927

Table 3

Pay premium of CEOs and other professions

The table estimates the pay premiums of CEOs, physicians, lawyers, engineers, and finance professionals relative to the population. The dependent variable is the logged taxable labor income that captures base salaries, bonus payments, stock option grants, and benefits awarded to an individual in a given year. Individuals with no taxable labor income are not included in the regression. Column 1 includes dummies for CEOs in different firm-size categories and for physicians, lawyers, engineers, and finance professionals, and dummies for year and enlistment year. Column 2 includes the standardized values of cognitive and noncognitive ability and height. Column 3 adds dummies for five levels and eight fields of education, and Column 4 adds fixed effects for brothers who are born to the same mother. All regressions in this table include a constant. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level in all but the family fixed effects specifications where the clustering is at the level of the family.

Dependent variable	Logged income			
Specification	1	2	3	4
CEO, <100 mil	0.604	0.498	0.464	0.282
	(160.34)	(135.17)	(127.92)	(52.51)
...100 mil − 1 bil	1.393	1.223	1.117	0.579
	(126.98)	(112.62)	(102.61)	(39.65)
...1 bil − 10 bil	1.962	1.762	1.615	0.762
	(68.49)	(62.34)	(57.88)	(19.68)
...>10 bil	2.526	2.269	2.098	0.986
	(30.32)	(27.89)	(26.42)	(8.69)
Physician	0.825	0.626		
	(189.87)	(136.87)		
Lawyer	0.633	0.488		
	(88.51)	(68.73)		
Engineer	0.509	0.359		
	(251.89)	(166.22)		
Finance professional	0.790	0.658		
	(114.39)	(99.02)		
Cognitive ability		0.092	0.056	0.068
		(134.97)	(75.44)	(34.28)
Noncognitive ability		0.109	0.103	0.077
		(154.76)	(144.77)	(42.92)
Height		0.021	0.020	0.018
		(34.59)	(32.81)	(9.36)
Controls				
Year	Yes	Yes	Yes	Yes
Enlistment year	Yes	Yes	Yes	Yes
Education	No	No	Yes	Yes
Family fixed effects	No	No	No	Yes
Mean dependent variable	12.55	12.55	12.55	12.55
Adjusted R^2	0.045	0.079	0.092	0.531
Number of observations	7,765,917	7,765,917	7,765,917	7,687,378

Table 4

CEO pay, firm size, and traits

The table estimates the returns to traits for CEOs. Columns 1 through 5 explain logged taxable labor income. Column 1 includes logged total assets for the firm the CEO manages, Column 2 includes the standardized values of personal traits, and Column 3 includes logged total assets and traits. Column 4 adds dummies for five levels and eight fields of education but removes the personal traits. Column 5 adds the traits back. Columns 6 and 7 explain coefficients on CEO pay fixed effects with personal traits, estimated for CEOs that have at least four pay observations from at least two firms, controlling for logged total assets in Column 7 and omitting the firm-size control in Column 6. These columns report the *F*-statistic for CEO fixed effects and the adjusted R^2 from first-stage regressions that include CEO and firm fixed effects. All specifications include dummies for enlistment year. Columns 1 through 5 also include year dummies. Adjusted R^2 would be 0.024 with these variables alone. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level.

Dependent variable	Logged CEO pay					CEO fixed effects of logged CEO pay	
Specification	1	2	3	4	5	6	7
Logged total assets	0.251		0.239	0.233	0.229		
	(113.33)		(107.29)	(104.04)	(102.16)		
Cognitive ability		0.125	0.071		0.031	0.112	0.083
		(25.38)	(18.92)		(7.92)	(5.37)	(4.73)
Noncognitive ability		0.106	0.050		0.039	0.126	0.089
		(22.07)	(13.91)		(10.85)	(6.76)	(5.68)
Height		0.049	0.021		0.019	0.051	0.042
		(11.29)	(6.67)		(5.96)	(3.01)	(2.96)
Vocational or high school				0.144	0.107		
				(11.63)	(8.47)		
Bachelor's				0.296	0.237		
				(20.74)	(16.00)		
Master's				0.387	0.312		
				(25.84)	(19.48)		
Doctoral				0.479	0.403		
				(16.58)	(13.83)		
Law				0.073	0.079		
				(2.41)	(2.59)		
Business				0.004	0.002		
				(0.40)	(0.24)		
Medicine				0.287	0.268		
				(5.35)	(5.04)		
Administration				−0.075	−0.064		
				(−1.94)	(−1.70)		
Government				0.054	0.046		
				(1.17)	(0.98)		
Natural sciences				0.091	0.088		
				(4.32)	(4.21)		
Agriculture				−0.352	−0.353		
				(−10.96)	(−11.05)		
Engineering				−0.019	−0.020		
				(−2.28)	(−2.40)		

First stage of CEO fixed effects:							
F-statistic						21.20	10.37
Adjusted R^2						0.849	0.851
Adjusted R^2	0.394	0.092	0.412	0.428	0.433	0.113	0.093
Number of observations	96,815	96,815	96,815	96,815	96,815	1,683	1,676

Table 5

CEO traits, firm policies, and performance

The table estimates the association between CEO traits, firm policies, and performance. The dependent variable is the CEO-firm policy fixed effect, estimated from a first-stage regression where the dependent variable is a firm policy or performance variable winsorized at the 5th and 95th percentiles. The first-stage regressions require each CEO to have at least four observations from at least two firms. The policy and performance variables, reported in the respective columns, are defined as follows: 1) relative change in gross fixed assets, 2) number of acquisitions, 3) total debt scaled by total assets, 4) cash and marketable securities scaled by total assets, 5) dividends scaled by net income, and 6) earnings before interest and taxes (EBIT) scaled by average total assets. All second-stage regression specifications include the standardized values of cognitive and noncognitive ability, and height, and dummies for enlistment year. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level.

Dependent variable	Investment	Number of acquisitions	Leverage	Cash ratio	Payout ratio	OROA
Specification	1	2	3	4	5	6
Cognitive ability	0.044	0.009	0.020	−0.007	−0.008	−0.008
	(1.52)	(2.25)	(3.54)	(−1.41)	(−1.47)	(−2.04)
Noncognitive ability	−0.028	0.002	0.005	0.003	0.006	−0.006
	(−1.08)	(0.61)	(0.96)	(0.78)	(1.13)	(−1.68)
Height	−0.016	−0.001	0.004	0.007	0.006	−0.001
	(−0.70)	(−0.46)	(0.78)	(1.61)	(1.32)	(−0.39)
F-statistic of CEO fixed effects	2.76	1.62	12.81	9.38	3.14	4.92
First stage R^2	0.366	0.166	0.792	0.729	0.410	0.559
Second stage R^2	0.024	0.031	0.029	0.015	0.016	0.025
Number of observations	1,644	1,683	1,683	1,683	1,673	1,678

Internet Appendix for

Are CEOs born leaders? Lessons from traits of a million individuals

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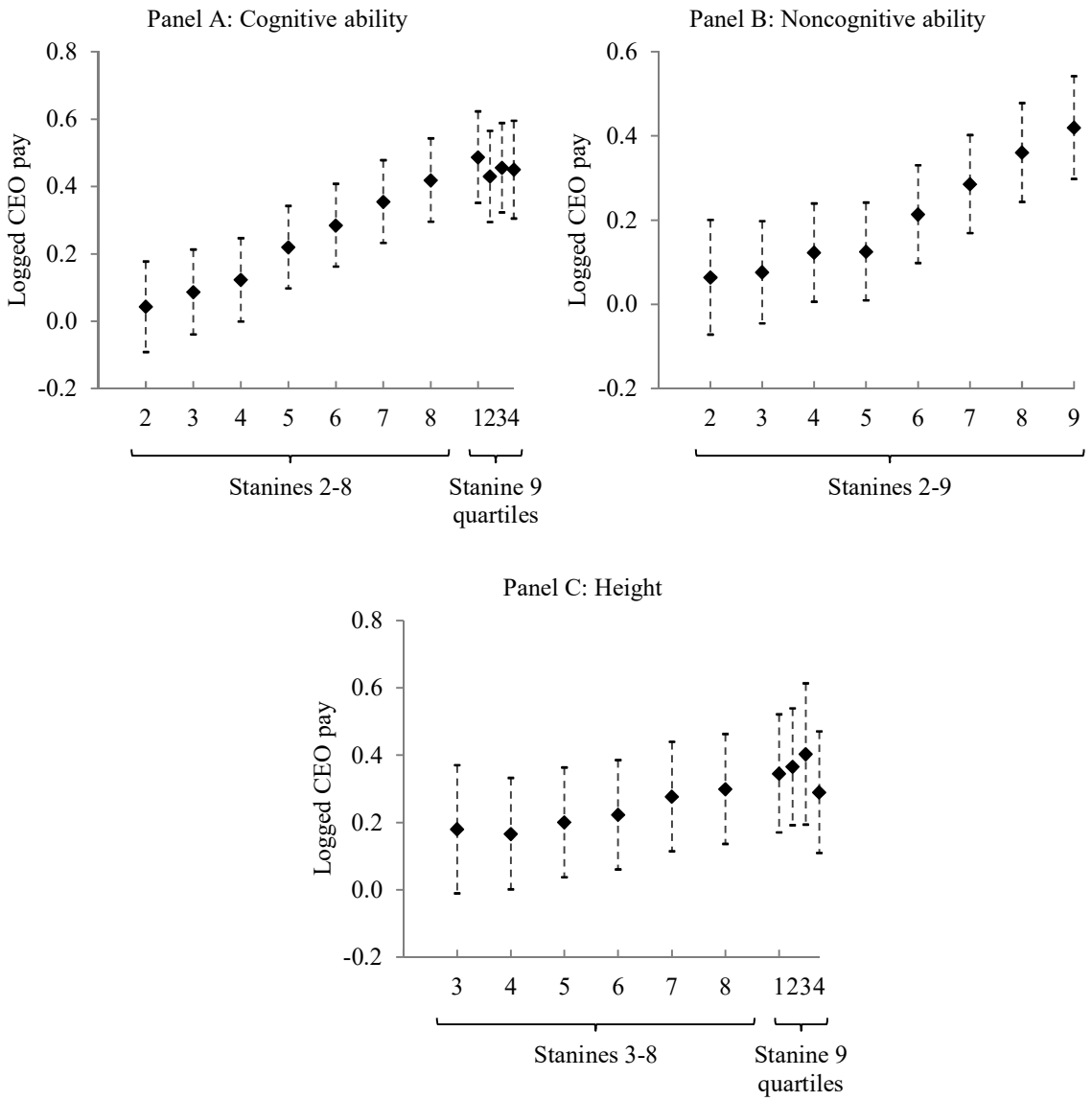

Fig. IA1. CEO pay at the top of the trait distributions. This figure reports results from regressions that replace the traits in Table 4 Column 2 with their stanine indicators. The top stanine for cognitive ability is further divided into quartiles according to the sum of the four subscores (induction, verbal, spatial, and technical). The omitted category for height includes the two lowest stanines as the bottom stanine has a small number of observations. Breakdown of the top height stanine uses raw height. The top stanine for noncognitive ability cannot be stratified to finer categories as the underlying test scores are not available. The figure reports the coefficients for indicators along with their 95% confidence intervals.

Table IA1

Standard deviations of the traits for the population, for CEOs by firm size and family firm status, and for other high-skill professions

The table reports standard deviations of traits, the year an individual was enlisted, taxable labor income (in SEK), and, for CEOs, the total assets of the firm they manage. The statistics are calculated separately for the population and for physicians, engineers, lawyers, and finance professionals, and for CEOs of various types. The unit of observation is an individual. The CEOs are assigned to categories according to the largest firm they have managed during the sample period 2004−10.

	Popu-lation	CEOs by firm size				CEOs by family firm status				High-skill professions			
		<100 mil	100 mil – 1bil	1 bil – 10 bil	>10 bil	Non-family firm	Family firm, external	Family firm, founder	Family firm, heir	Physi-cians	Lawyers	Engi-neers	Finance profes-sionals
Cognitive ability	1.93	1.65	1.48	1.41	1.21	1.60	1.58	1.67	1.67	1.35	1.42	1.43	1.46
Induction	1.93	1.68	1.53	1.44	1.27	1.63	1.65	1.70	1.69	1.41	1.46	1.49	1.50
Verbal	1.82	1.58	1.49	1.46	1.27	1.56	1.49	1.61	1.58	1.43	1.39	1.45	1.42
Spatial	1.90	1.73	1.66	1.58	1.47	1.70	1.69	1.77	1.73	1.58	1.65	1.57	1.68
Technical	1.88	1.71	1.67	1.59	1.71	1.70	1.68	1.72	1.72	1.63	1.63	1.57	1.62
Noncognitive ability	1.74	1.59	1.47	1.42	1.32	1.57	1.55	1.61	1.60	1.71	1.63	1.51	1.51
Height (cm)	6.54	6.25	6.17	5.94	5.96	6.23	6.33	6.21	6.27	6.34	6.27	6.44	6.16
Enlistment year	7.69	6.92	6.27	5.83	5.35	6.79	6.68	6.84	7.70	8.08	7.82	7.28	7.46
Income, 1,000 SEK	370	635	1,601	3,263	5,362	1,438	1,272	427	456	357	567	241	1,394
Total assets, mill. SEK		27.1	287	2,594	94,100	9,901	5,712	287	711				
Number of individuals	1,268,176	21,937	3,266	672	148	16,609	1,503	6,417	1,494	9,384	6,192	39,567	8,823

Table IA2

Traits of high-skill professionals whose income matches that of CEOs

The table reports average traits for high-skill professionals whose income matches that of CEOs. The analysis determines the position of each CEO and high-skill professional in the income distribution. It then calculates average traits for high-skill professionals that fall between the 25th and 75th percentiles of CEOs in each firm-size category.

	CEOs				Physicians			
	<100M	100M - 1B	1B - 10B	>10B	<100M	100M - 1B	1B - 10B	>10B
Cognitive ability	6.02	6.60	6.84	7.16	7.49	7.57	7.45	7.45
Induction	5.95	6.55	6.87	7.06	7.33	7.38	7.36	7.37
Verbal	5.71	6.30	6.63	6.99	7.19	7.26	7.30	7.32
Spatial	5.82	6.12	6.21	6.48	6.62	6.67	6.49	6.55
Technical	5.59	5.86	5.91	6.08	6.71	6.64	6.53	6.53
Noncognitive ability	6.14	6.67	6.93	7.36	6.33	6.64	6.55	6.92
Height (cm)	180.3	181.4	181.6	183.5	181.2	181.3	181.3	180.8

	Lawyers				Engineers			
	<100M	100M - 1B	1B - 10B	>10B	<100M	100M - 1B	1B - 10B	>10B
Cognitive ability	6.69	6.93	7.02	7.24	7.23	7.48	7.40	7.36
Induction	6.82	7.06	7.22	7.34	6.97	7.25	7.22	7.04
Verbal	6.91	7.03	7.08	7.14	6.52	6.81	6.79	6.92
Spatial	5.89	6.10	6.12	6.16	6.78	6.79	6.73	6.67
Technical	5.63	5.79	5.80	5.90	6.91	6.91	6.68	6.55
Noncognitive ability	6.14	6.54	6.70	6.77	5.97	6.45	6.71	6.91
Height (cm)	180.7	181.2	181.0	181.2	180.6	180.9	181.3	181.7

	Finance professionals			
	<100M	100M - 1B	1B - 10B	>10B
Cognitive ability	6.31	6.68	6.81	6.90
Induction	6.46	6.75	6.88	7.01
Verbal	6.33	6.59	6.62	6.67
Spatial	5.83	6.14	6.21	6.24
Technical	5.58	5.83	5.97	6.01
Noncognitive ability	6.22	6.56	6.68	6.76
Height (cm)	180.8	181.1	181.1	181.0

Table IA3

Regressions of traits on family firm indicators

The table regresses each trait on firm characteristics. Three dummies indicate family firms (nonfamily firm omitted) and logged total assets measures firm size. Columns 1−2 report regressions of the standardized value of cognitive ability. The first specification includes dummies for each year and each enlistment year. The second specification adds fixed effects for industries. Columns 3−4 and 5−6 follow the same structure for standardized values of noncognitive ability and height, respectively. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the CEO level. The *p*-values in brackets report the tests of equality for each pairing of the family firm coefficients.

Dependent variable	Cognitive ability		Noncognitive ability		Height	
Specification	1	2	3	4	5	6
Family, external	−0.075	−0.034	−0.094	−0.066	−0.032	−0.017
	(−2.96)	(−1.38)	(−3.42)	(−2.45)	(−1.04)	(−0.55)
Family, founder	−0.226	−0.115	−0.120	−0.049	−0.095	−0.065
	(−16.21)	(−8.24)	(−8.03)	(−3.20)	(−5.97)	(−4.02)
Family, heir	−0.271	−0.145	−0.226	−0.138	−0.092	−0.057
	(−10.23)	(−5.49)	(−7.95)	(−4.79)	(−3.03)	(−1.85)
Total assets	0.069	0.073	0.088	0.096	0.049	0.050
	(20.56)	(20.89)	(23.59)	(24.30)	(11.99)	(11.31)
Tests of coeff., *p*-values						
External = founder	[<0.01]	[<0.01]	[0.38]	[0.56]	[0.06]	[0.15]
External = heir	[<0.01]	[<0.01]	[<0.01]	[0.06]	[0.16]	[0.35]
Founder = heir	[0.11]	[0.28]	[<0.01]	[<0.01]	[0.93]	[0.79]
Controls						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Enlistment year	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes
Mean dependent variable	0.51	0.51	0.65	0.65	0.21	0.21
Adjusted R^2	0.053	0.112	0.040	0.061	0.013	0.018
Number of observations	96,815	96,815	96,815	96,815	96,815	96,815

Table IA4

Distributions of personal traits for the population, high-skill professions, and CEOs

This table reports the distribution of cognitive ability, noncognitive ability, and height. In Panel A, the statistics are calculated separately for the population and for physicians, engineers, lawyers, and finance professionals. In Panel B, the statistics are separately calculated for the CEOs of firms with less than 100 million, 100 million to 1 billion, 1 billion to 10 billion, and more than 10 billion in total assets. Panel C reports the statistics for firms that are and are not family owned. The family firms are further divided into companies managed by a professional nonfamily CEO, the founder, or a later-generation family member.

Panel A: Population and high-skill professions									
Ability score stanines	1	2	3	4	5	6	7	8	9
Height categories		<165cm	165–69	170–74	175–79	180–84	185–89	190–94	>195cm
Population									
Cognitive ability	3.1%	6.7%	10.4%	15.0%	22.3%	17.3%	13.0%	7.9%	4.2%
Noncognitive ability	2.0%	5.8%	10.7%	17.2%	23.4%	18.9%	13.9%	6.3%	1.8%
Height		1.2%	5.5%	17.2%	28.7%	27.1%	14.6%	4.7%	1.0%
Physicians									
Cognitive ability	0.1%	0.2%	0.5%	1.4%	6.5%	13.4%	23.2%	26.5%	28.1%
Noncognitive ability	0.6%	1.8%	3.9%	7.8%	14.3%	18.8%	25.4%	18.2%	9.2%
Height		0.4%	2.7%	11.8%	26.4%	29.6%	20.0%	7.1%	2.0%
Engineers									
Cognitive ability	0.1%	0.2%	0.8%	2.7%	10.5%	17.9%	24.8%	23.8%	19.3%
Noncognitive ability	0.2%	1.4%	4.4%	11.8%	21.8%	24.1%	22.2%	11.1%	3.1%
Height		0.6%	3.4%	13.4%	26.9%	29.2%	18.0%	6.7%	1.7%
Lawyers									
Cognitive ability	0.2%	0.4%	1.2%	3.9%	15.2%	22.7%	27.3%	19.3%	9.8%
Noncognitive ability	0.6%	1.7%	4.4%	9.3%	16.5%	21.9%	25.4%	15.3%	4.9%
Height		0.4%	3.1%	12.3%	26.7%	30.6%	18.8%	6.8%	1.4%
Finance professionals									
Cognitive ability	0.1%	0.6%	2.1%	6.4%	20.7%	25.1%	22.6%	15.2%	7.2%
Noncognitive ability	0.2%	1.4%	3.0%	8.1%	17.5%	23.4%	27.2%	14.7%	4.5%
Height		0.3%	3.3%	11.8%	27.1%	30.2%	19.8%	6.1%	1.3%

Panel B: CEOs by firm size									
CEOs, <100 million									
Cognitive ability	0.4%	1.7%	4.6%	9.9%	21.9%	22.0%	19.7%	13.3%	6.6%
Noncognitive ability	0.4%	1.5%	3.8%	9.1%	18.5%	22.4%	24.2%	14.7%	5.5%
Height		0.6%	3.3%	13.5%	27.6%	30.1%	17.8%	5.8%	1.3%
CEOs, 100 million − 1 billion									
Cognitive ability	0.1%	0.3%	1.6%	5.3%	16.2%	23.1%	24.4%	18.5%	10.6%
Noncognitive ability	0.0%	0.8%	2.0%	5.1%	13.0%	19.9%	27.6%	23.0%	8.7%
Height		0.2%	2.1%	10.7%	25.9%	29.6%	22.2%	7.5%	1.9%
CEOs, 1 billion − 10 billion									
Cognitive ability	0.0%	0.0%	0.7%	4.3%	14.1%	18.8%	28.0%	20.8%	13.2%
Noncognitive ability	0.0%	0.4%	1.2%	3.4%	11.9%	16.2%	30.5%	22.8%	13.5%
Height		0.3%	1.9%	9.5%	23.2%	34.4%	22.2%	7.3%	1.2%
CEOs, >10 billion									
Cognitive ability	0.0%	0.0%	0.0%	0.7%	7.4%	23.0%	30.4%	21.6%	16.9%
Noncognitive ability	0.0%	0.0%	0.0%	2.7%	6.1%	18.2%	20.3%	30.4%	22.3%
Height		0.7%	0.7%	4.7%	17.6%	33.1%	25.7%	15.5%	2.0%

Panel C: CEOs by family ownership									
CEOs, Nonfamily firms									
Cognitive ability	0.3%	1.1%	3.1%	7.6%	19.6%	22.4%	21.6%	15.9%	8.5%
Noncognitive ability	0.4%	1.2%	3.1%	7.3%	15.9%	21.7%	25.9%	17.7%	6.8%
Height		0.5%	2.8%	11.9%	26.6%	30.9%	19.0%	6.7%	1.5%
CEOs, Family firms, external									
Cognitive ability	0.1%	1.2%	3.7%	9.5%	20.2%	22.8%	21.2%	14.8%	6.6%
Noncognitive ability	0.3%	1.1%	3.6%	9.4%	16.7%	23.0%	26.1%	14.6%	5.2%
Height		0.6%	3.1%	14.0%	26.9%	28.9%	18.3%	7.0%	1.3%
CEOs, Family firms, founder									
Cognitive ability	0.4%	2.3%	6.5%	12.1%	23.7%	20.7%	18.4%	10.8%	5.1%
Noncognitive ability	0.4%	1.7%	4.2%	10.4%	21.3%	21.6%	22.3%	12.7%	5.4%
Height		0.5%	3.7%	15.1%	28.5%	29.0%	17.2%	4.8%	1.2%
CEOs, Family firms, heir									
Cognitive ability	0.8%	2.4%	5.5%	12.7%	23.6%	23.4%	16.7%	9.7%	5.2%
Noncognitive ability	0.4%	1.8%	5.2%	11.4%	20.1%	24.0%	20.3%	13.4%	3.4%
Height		0.6%	3.9%	14.9%	28.8%	28.3%	17.6%	4.9%	0.9%

Table IA5

Contribution of traits to attaining a CEO position

The table reports results from linear probability models which explain the dummy for CEOs with standardized values of cognitive and noncognitive ability and height. Columns 1−3 add each trait separately. They, along with all other specifications, also include dummies for each year and each enlistment year. Column 4 includes all traits in the regression. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level. The mean dependent variable and the coefficients are multiplied by one hundred.

Dependent variable	CEO dummy			
Specification	1	2	3	4
Cognitive ability	0.552			0.307
	(71.09)			(38.51)
Noncognitive ability		0.724		0.591
		(81.81)		(64.64)
Height			0.244	0.122
			(31.09)	(15.56)
Mean dependent variable	1.113	1.113	1.113	1.113
Adjusted R^2	0.004	0.006	0.002	0.007
Number of observations	8,760,402	8,760,402	8,760,402	8,760,402

Table IA6

Alternative trait combinations by firm size

The table reports the fraction of the population that has a lower combination of personal traits than the CEOs. Panel A reports the results for firms whose total assets are less than 100 million and Panel B for firms whose total assets exceed 10 billion. The three leftmost columns assign cognitive ability, noncognitive ability, and height in turn a weight of zero, with the two remaining traits attaining equal weights. The multiplicative specification calculates the product of the standardized traits in which the standardized traits have been transformed to have a minimum value of one. The minimum specification uses the smallest standardized value of the three traits to rank CEOs.

Panel A: <100 million					
Cumulative CEO trait distribution	Trait combination				
	0%-50%-50%	50%-0%-50%	50%-50%-0%	Multiplicative	Minimum
5%	16.4%	16.5%	20.2%	19.9%	17.1%
25%	48.4%	44.0%	51.4%	51.4%	45.4%
50%	72.5%	67.3%	74.0%	73.8%	69.5%
75%	88.8%	85.0%	89.5%	89.3%	87.8%
90%	96.2%	94.1%	96.2%	96.2%	95.3%
95%	98.2%	97.1%	98.4%	98.2%	97.9%
100%	100.0%	100.0%	100.0%	100.0%	100.0%

Panel B: >10 billion					
Cumulative CEO trait distribution	Trait combination				
	0%-50%-50%	50%-0%-50%	50%-50%-0%	Multiplicative	Minimum
5%	50.1%	52.6%	57.1%	66.0%	46.7%
25%	79.1%	74.2%	83.2%	83.3%	73.2%
50%	91.0%	86.0%	93.6%	93.1%	90.5%
75%	97.9%	95.3%	97.8%	97.7%	96.2%
90%	99.3%	98.4%	99.5%	99.5%	99.3%
95%	99.8%	99.0%	99.6%	99.7%	99.7%
100%	100.0%	100.0%	100.0%	100.0%	100.0%

Table IA7

Pay premiums using total income in lieu of labor income

The table estimates the pay premiums of CEOs, physicians, lawyers, engineers, and finance professionals compared to the population. The regressions follow the structure of Table 3, but replace the dependent variable with total taxable income. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level in all but the family fixed effects specifications where the clustering is at the level of the family.

Dependent variable	Logged income			
Specification	1	2	3	4
CEO, <100 mil	0.750	0.635	0.605	0.321
	(175.62)	(150.91)	(144.98)	(57.85)
...100 mil − 1 bil	1.528	1.344	1.239	0.593
	(130.65)	(114.85)	(104.77)	(39.60)
...1 bil − 10 bil	2.040	1.821	1.677	0.768
	(65.54)	(58.80)	(55.22)	(19.68)
...>10 bil	2.628	2.348	2.179	0.970
	(25.59)	(23.33)	(21.59)	(8.62)
Physician	0.813	0.595		
	(194.72)	(134.21)		
Lawyer	0.677	0.519		
	(89.70)	(69.79)		
Engineer	0.501	0.337		
	(253.53)	(159.30)		
Finance professional	0.828	0.679		
	(104.68)	(89.15)		
Cognitive ability		0.103	0.065	0.072
		(159.73)	(91.48)	(38.36)
Noncognitive ability		0.116	0.106	0.078
		(172.80)	(158.09)	(46.36)
Height		0.024	0.022	0.018
		(41.19)	(38.05)	(10.08)
Controls				
Year	Yes	Yes	Yes	Yes
Enlistment year	Yes	Yes	Yes	Yes
Education	No	No	Yes	Yes
Family fixed effects	No	No	No	Yes
Mean dependent variable	12.60	12.60	12.60	12.60
Adjusted R^2	0.050	0.094	0.110	0.522
Number of observations	7,765,917	7,765,917	7,765,917	7,687,378

Table IA8

Pay premium of CEOs and other professions when cognitive ability subcomponents are controlled for

The table estimates the pay premiums of CEOs, physicians, lawyers, engineers, and finance professionals relative to the population. The regressions follow the structure of Table 3, but break down cognitive ability into its four subcomponents. The number of observations is smaller than in Table 3 because the subscores are missing for about 135,000 individuals. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level in all but the family fixed effects specifications where the clustering is at the level of the family.

Dependent variable	Logged income			
Specification	1	2	3	4
CEO, <100 mil	0.601	0.489	0.460	0.279
	(154.10)	(128.70)	(123.00)	(49.55)
...100 mil − 1 bil	1.389	1.204	1.101	0.568
	(124.58)	(109.71)	(99.52)	(38.06)
...1 bil − 10 bil	1.965	1.744	1.598	0.754
	(67.56)	(61.07)	(56.48)	(19.25)
...>10 bil	2.519	2.246	2.076	0.981
	(30.25)	(27.61)	(26.14)	(8.58)
Physician	0.843	0.622		
	(182.36)	(127.67)		
Lawyer	0.643	0.476		
	(81.36)	(60.72)		
Engineer	0.506	0.344		
	(223.38)	(142.58)		
Finance professional	0.811	0.669		
	(111.14)	(95.56)		
Induction		0.074	0.052	0.049
		(74.42)	(51.67)	(19.31)
Verbal		0.024	0.011	0.015
		(25.48)	(11.43)	(6.50)
Spatial		0.005	−0.001	0.002
		(6.30)	(−1.63)	(1.12)
Technical		0.020	0.012	0.024
		(23.14)	(13.66)	(10.85)
Noncognitive ability		0.106	0.098	0.074
		(139.44)	(128.72)	(37.25)
Height		0.021	0.019	0.017
		(32.00)	(29.47)	(8.07)
Controls				
Year	Yes	Yes	Yes	Yes
Enlistment year	Yes	Yes	Yes	Yes
Education	No	No	Yes	Yes
Family fixed effects	No	No	No	Yes
Mean dependent variable	12.57	12.57	12.57	12.57
Adjusted R^2	0.035	0.074	0.093	0.549
Number of observations	6,815,471	6,815,471	6,815,471	6,744,952

Table IA9

Correlations of CEOs' traits with firm size

The regressions in this table correlate firm size with the standardized values of CEO traits. Column 1 reports the regression that includes traits and dummies for each year and each enlistment year for the full sample. Columns 2−5 run the regression in subsamples stratified by family firm status. The explanatory power is separately reported for models that include and exclude traits. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the CEO level.

Dependent variable	Logged total assets				
Specification	All firms	Nonfamily firms	Family firms, external	Family firms, founder	Family firms, heir
	1	2	3	4	5
Cognitive ability	0.224	0.217	0.129	0.104	0.110
	(17.05)	(12.43)	(2.28)	(5.52)	(2.73)
Noncognitive ability	0.234	0.296	0.094	0.081	0.057
	(18.40)	(17.79)	(1.70)	(4.59)	(1.47)
Height	0.113	0.130	0.150	0.040	−0.022
	(9.75)	(8.49)	(3.49)	(2.43)	(−0.59)
R^2 with controls only	0.025	0.043	0.043	0.007	0.022
R^2 with controls and traits	0.071	0.091	0.063	0.021	0.031
Mean dependent variable	9.80	10.06	9.85	9.22	9.61
Number of observations	96,815	61,437	4,207	25,427	5,744

Table IA10

Descriptive statistics of firm policies and their CEO fixed effects

Panel A reports descriptive statistics on five firm policies and the operating return on assets. The variables, reported in the respective rows, are defined as follows: 1) relative change in gross fixed assets, 2) number of acquisitions, 3) total debt scaled by total assets, 4) cash and marketable securities scaled by total assets, 5) dividends scaled by net income, and 6) EBIT scaled by average total assets. All variables are winsorized at the 5th and 95th percentiles. Panel B reports descriptive statistics on CEO fixed effects, estimated by requiring each CEO to have at least four observations from at least two firms.

Panel A: Descriptive statistics of firm policies							
	Mean	Median	Sd	10%	25%	75%	90%
(1) Investment	0.706	0.171	1.254	0.000	0.003	0.678	2.313
(2) # of acquisitions	0.020	0.000	0.181	0.000	0.000	0.000	0.000
(3) Leverage	0.305	0.260	0.219	0.050	0.130	0.440	0.630
(4) Cash ratio	0.138	0.050	0.188	0.000	0.004	0.213	0.411
(5) Payout ratio	0.111	0.000	0.237	0.000	0.000	0.000	0.521
(6) OROA	0.095	0.089	0.155	−0.109	0.011	0.190	0.307

Panel B: Descriptive statistics of CEO fixed effects							
	Mean	Median	Sd	10%	25%	75%	90%
(1) Investment	0.020	−0.262	0.868	−0.677	−0.547	0.327	1.089
(2) # of acquisitions	−0.002	−0.026	0.557	−0.614	−0.351	0.320	0.667
(3) Leverage	−0.002	−0.026	0.176	−0.207	−0.140	0.113	0.235
(4) Cash ratio	−0.002	−0.055	0.153	−0.135	−0.117	0.066	0.212
(5) Payout ratio	−0.001	−0.088	0.167	−0.120	−0.113	0.069	0.243
(6) OROA	−0.004	−0.009	0.115	−0.139	−0.071	0.066	0.147

Table IA11

CEO traits, firm policies, and performance requiring longer tenure in the sample

The table estimates the association between CEO traits, firm policies, and performance assuming at least six observations from at least two firms as opposed to four observations from at least two firms in Table 5. The dependent variable is the CEO-firm policy fixed effect, estimated from a first-stage regression where the dependent variable is a firm policy or performance variable winsorized at the 5th and 95th percentiles. The policy and performance variables, reported in the respective columns, are defined as follows: 1) relative change in gross fixed assets, 2) number of acquisitions, 3) total debt scaled by total assets, 4) cash and marketable securities scaled by total assets, 5) dividends scaled by net income, and 6) EBIT scaled by average total assets. All second-stage regression specifications include the standardized values of cognitive and noncognitive ability, and height, and dummies for enlistment year. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level.

Dependent variable	Investment	Number of acquisitions	Leverage	Cash ratio	Payout ratio	OROA
Specification	1	2	3	4	5	6
Cognitive ability	0.007	0.006	0.019	−0.007	−0.010	−0.005
	(0.22)	(1.61)	(2.31)	(−0.98)	(−1.24)	(−0.99)
Noncognitive ability	−0.017	0.005	0.007	0.001	0.007	−0.006
	(−0.58)	(1.45)	(0.93)	(0.20)	(1.01)	(−1.57)
Height	−0.049	−0.006	−0.003	0.000	0.005	−0.001
	(−1.82)	(−1.89)	(−0.52)	(0.00)	(0.87)	(−0.31)
F-statistic of CEO fixed effects	3.12	1.85	15.57	11.30	3.48	5.18
First stage R^2	0.378	0.192	0.803	0.743	0.412	0.541
Second stage R^2	0.035	0.037	0.042	0.029	0.023	0.037
Number of observations	832	837	837	837	833	835

Table IA12

Additional traits

Panel A reports means, medians, and standard deviations of cardiovascular fitness and muscle strength for the population, high-skill professions, and for CEOs. The statistics for CEOs are calculated separately by firm size and by family firm status. Panel B builds on the regressions in Columns 2 and 6 of Table 4 by regressing logged CEO pay or CEO pay fixed effects on standardized values of cardiovascular fitness, muscle strength, cognitive and noncognitive ability, and height. Cardiovascular fitness is measured in a cycle ergometry test and muscle strength in a combination of knee extension, elbow flexion, and hand grip tests. The number of observations is smaller than in Table 4 because additional traits are missing for some individuals. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level.

Panel A: Descriptive statistics

		Cardiovascular fitness	Muscle strength
Population	Mean	6.26	5.65
	Sd	1.71	1.90
	Median	6	5
Physicians	Mean	7.10	5.96
	Sd	1.67	1.87
	Median	7	6
Engineers	Mean	6.80	5.91
	Sd	1.60	1.82
	Median	6	6
Lawyers	Mean	6.78	5.98
	Sd	1.63	1.88
	Median	6	6
Finance professionals	Mean	6.89	5.72
	Sd	1.56	1.84
	Median	7	5
CEOs, <100 million	Mean	6.77	5.98
	Sd	1.71	1.88
	Median	7	6
CEOs, 100 million − 1 billion	Mean	7.16	5.93
	Sd	1.65	1.87
	Median	7	6
CEOs, 1 billion − 10 billion	Mean	7.38	5.86
	Sd	1.64	1.87
	Median	8	6
CEOs, >10 billion	Mean	7.47	5.75
	Sd	1.58	1.83
	Median	8	5

Panel A continued			
		Cardiovascular fitness	Muscle strength
CEOs, nonfamily firms	Mean	6.92	5.96
	Sd	1.70	1.87
	Median	7	6
CEOs, family firms, external	Mean	6.83	5.91
	Sd	1.71	1.82
	Median	7	6
CEOs, family firms, founder	Mean	6.50	6.02
	Sd	1.69	1.89
	Median	6	6
CEOs, family firms, heir	Mean	6.70	5.99
	Sd	1.73	1.89
	Median	7	6

Panel B: Regressions of CEO pay on additional traits						
Dependent variable	Logged CEO pay					
Specification	Full sample				CEO fixed effects	
	1	2	3	4	5	6
Cardiovascular fitness	0.088	0.027			0.039	
	(19.17)	(5.47)			(2.20)	
Muscle strength			0.106	0.021		0.042
			(18.43)	(3.33)		(1.83)
Cognitive ability		0.125		0.126	0.113	0.107
		(23.99)		(24.08)	(5.40)	(4.86)
Noncognitive ability		0.101		0.105	0.109	0.112
		(17.99)		(18.74)	(5.46)	(5.10)
Height		0.042		0.042	0.047	0.039
		(9.16)		(8.94)	(2.75)	(2.12)
F-statistic for CEO fixed effects						
Adjusted R^2	0.043	0.099	0.042	0.098	0.100	0.100
Number of observations	83,530	83,530	83,530	83,530	1,485	1,485