RESEARCH INSTITUTE OF INDUSTRIAL ECONOMICS

IFN Working Paper No. 1024, 2014

Are CEOs Born Leaders? Lessons from Traits of a Million Individuals

Renée Adams, Matti Keloharju and Samuli Knüpfer

Research Institute of Industrial Economics
P.O. Box 55665
SE-102 15 Stockholm, Sweden
info@ifn.se
www.ifn.se

Are CEOs Born Leaders?
Lessons from Traits of a Million Individuals*

Renée Adams

University of New South Wales, ECGI, and FIRN

Matti Keloharju

Aalto University School of Business, CEPR, and IFN

Samuli Knüpfer

London Business School, CEPR, and IFN

April 15, 2015

Abstract

Our study combines a near-exhaustive sample of CEOs of Swedish companies with data on their cognitive and non-cognitive ability and height at age 18. Although CEOs, and large-company CEOs in particular, have better traits than the population on average, they are neither exceptional in any of the traits nor their combination. Large-company CEOs belong to the top 5% of the population in their traits, but to top 0.2% in pay. The mismatch between the moderately high trait values and the exceptionally high pay explains why less than a quarter of the CEO pay premium over the population can be attributed to the traits.

JEL-classification: G30, J24; J31

* E-mails: renee.adams@unsw.edu.au, matti.keloharju@aalto.fi, sknupfer@london.edu. We are grateful to Joao Cocco, Francesca Cornelli, James Dow, Alex Edmans, Andrea Eisfeldt, Julian Franks, Xavier Gabaix, Denis Gromb, Magnus Henrekson, Dirk Jenter, Ross Levine, Daniel Metzger, Paul Oyer, Matti Sarvimäki, Henri Servaes, Luke Taylor, Marko Terviö, Joacim Tåg, David Yermack, and Luigi Zingales, and to seminar and conference participants at the Aalto University, Birkbeck College, Erasmus University Rotterdam, London Business School, Maastricht University, Research Institute of Industrial Economics (IFN), Tilburg University, University of Bergen, University of Edinburgh, University of Geneva, and the Adam Smith Workshop for Corporate Finance for valuable comments and suggestions. We thank Antti Lehtinen, Ivan Baranov, Petri Hukkanen, and Lari Paunonen for superb research assistance, Deloitte Institute of Innovation and Entrepreneurship, Jan Wallander and Tom Hedelius Research Foundation, Marianne and Marcus Wallenberg Foundation, OP-Pohjola Foundation, SNS Centre for Business and Policy Studies, and Wihuri Foundation for financial support, and IFN for hospitality.

1. Introduction

Life histories of military leaders such as Alexander the Great, Napoleon Bonaparte, or Gustavus Adolphus of Sweden suggest that they were able to achieve remarkable success already in their twenties or thirties (Grossman 2007). Similarly, businessmen such as Bill Gates, Mark Zuckerberg, and Michael Dell founded and ran highly successful companies before their thirties (Davidson and Bolmeijer 2009). The early success of these and many other individuals have lead researchers to ask whether successful leaders are born to their roles—and which traits set them apart (Bertrand 2009 and Kaplan, Klebonov, and Sorensen 2012). This question is difficult to address because the traits top leaders are endowed with, and how they differ from the traits of individuals who do not make it to the top, are generally not known.

This study uses unique data from Sweden to compare the personal traits of a comprehensive sample of top business leaders to other skilled professions and to the population. The traits data come from the Swedish military, which examines the health status and the cognitive, non-cognitive, 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 suitable for training for leadership or specialist positions. Military service was mandatory in Sweden during our sample period, so the test pool includes virtually all Swedish men. Our sample includes 1.3 million men, of whom 26,000 served as CEOs of companies of varying sizes. For comparison purposes, we also study the traits of 6,000 lawyers, 9,000 medical doctors, and 40,000 engineers.

Our tests focus on three trait variables: cognitive and non-cognitive ability and height. There are two good reasons for using these variables. First, the traits measured by these variables are general in nature and have been previously used by a large literature on the labor market

outcomes 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. Second, the use of these trait variables greatly enhances the comparability of the sample executives and the population. Apart from their general nature, the timing of the measurement of the traits works to our advantage. The traits are measured at age 18, i.e. before any substantial leadership experience or professional or educational specialization, so they can be largely viewed as innate. Beauchamp et al. (2011) find that 66%−93% of the variation in the traits can be attributed to genetic and environmental factors shared by the male siblings of a family.

We document that all three traits matter to future CEOs. Non-cognitive ability is the best predictor of appointment to a CEO position, followed by cognitive ability and height. Among cognitive ability subcomponents, the ones measuring general ability have the most predictive power for CEO appointment decisions.[3] These general ability components are more important for larger companies, which are more likely to hire their CEOs externally.

CEOs and large-company CEOs in particular display considerably higher trait values than the population as a whole. All of the traits of large-company CEOs (defined here as having at least SEK 10 billion or USD 1.1 billion in total assets) are about at par or higher than those of medical doctors, lawyers, and engineers. CEOs managing smaller firms and family firms have lower traits, particularly if they come from the founding family and have not founded the

[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 and Schmidt and Hunter 1998). Others argue that non-cognitive skills are also important for predicting labor market outcomes (e.g. Heckman 1995 and Heckman, Stixrud and Urzua 2006). Yet another sizeable literature documents that height is related to labor market outcomes and leadership (e.g. Steckel 1995, 2009; Persico, Postlewhite, and Silverman 2004; Case and Paxson 2008; and Lindqvist 2012).

[3] Murphy and Zábojník (2004, 2007) and Frydman (2007) argue that general managerial skills (i.e., skills transferable across companies, or even industries) have become relatively more important for the CEO job in the past decades.

company themselves. Consistent with Pérez-González (2006), Bennedsen et al. (2007), and others, these results suggest that family firms appear to be making compromises in the traits of the CEO by limiting their selection of the CEO to a narrow pool of family candidates. Somewhat surprisingly, even 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 non-family company CEOs. As a manifestation of their business acumen, they make up for about half of this trait gap by selecting into industries where the gap relative to competitors is smaller.

While CEOs score well in all the traits, their scores are by no means exceptional, even when assessed as a whole. Using a weighting scheme implied by the traits' impact on CEO appointments, we find that the median large-company CEO belongs to the top 5% of the population in the combination of the three traits. At the same time, he belongs to the top 0.1% of the population in pay. The mismatch between the moderately high trait values and the exceptionally high pay explains why less than a quarter of the CEO pay premium over the population can be attributed to differences in the traits.

How much do the traits count in executive careers? Our sample includes about 18,000 men who have a similar or better trait combination than the median large-firm CEO and are pursuing a business career in a managerial role. Less than one percent of these individuals became a large-firm CEO during our seven-year sample period. Being born with a favorable mix of traits may be a necessary but is far from a sufficient condition for making it to the executive suite.

Do our results on CEO traits generalize to other countries, including those with large and sophisticated companies? We believe they do. Sweden has had many world-class companies since the late 19th century (Olsson 1993); on a per capita basis, there were above 50% more Swedish companies in the 2013 Forbes Global 2000 list than US or UK corporations. Few large

Swedish companies are government-owned (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 thus expect Swedish CEOs to be selected at least as carefully as their peers in most other industrialized countries.

Our paper is related to four 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.[4] Bertrand and Schoar (2003) and Graham, Li, and Qiu (2012) document that CEO-level fixed effects matter for corporate policies and firm performance. To find out what accounts for these fixed effects, researchers have looked into observable CEO characteristics, collected usually from bibliographic data[5] or surveys.[6] In some studies, CEO ability or characteristics are inferred from stock price reactions or operating performance[7] or from personal portfolio decisions.[8]

Many of these studies focus on the CEOs of family companies and the differences between the founder and later generations.[9] 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

[4] For a related management literature, see, for example, Lieberson and O'Conner 1972; Hambrick and Mason 1984; Thomas 1988; Finkelstein, Hambrick, and Cannella 2009; and 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.

[5] Adams, Almeida, and Ferreira 2005; Malmendier and Tate 2009; Schoar and Zuo 2011; Benmelech and Frydman 2012; Falato, Li, and Milbourn 2012; Custódio, Ferreira, and Matos 2013; Custódio and Metzger 2013; and Graham, Harvey, and Puri 2013.

[6] Graham, Harvey, and Puri 2013; Mullins and Schoar 2013; and Bandiera et al. 2014.

[7] Johnson et al. 1985; Pérez-González 2006; Bennedsen et al. 2007; Bennedsen, Pérez-González, and Wolfenzon 2010; Bennedsen, Pérez-González, and Wolfenzon 2012; and Chang, Dasgupta, and Hilary 2010.

[8] Malmendier and Tate 2005, 2008; Malmendier, Tate, and Yan 2011; and Hirshleifer, Low and Teoh 2013.

[9] Pérez-González 2006; Bennedsen et al. 2007; and Bennedsen, Pérez-González, and Wolfenzon 2010, 2012.

equilibrium forces that render the relations between outcomes and managerial inputs difficult to detect.[10]

Second, our paper is related to a vast literature on CEO pay.[11] 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, and 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, and 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. By analyzing general, and largely innate, traits, we show that executives' raw talent explains their matching into firms, although far from perfectly. Whatever are the traits the labor market uses to rank CEO candidates, they do not appear to be confined to the narrow set of early-life traits economists frequently use to predict labor market outcomes.

Third, our paper is related to papers that analyze the characteristics or compensation of other well-paid professionals, including lawyers (Kaplan and Rauh 2010, 2013 and Oyer and Schaefer 2012), finance professionals (Kaplan and Rauh 2010, 2013; Philippon and Resheff 2012; and Célérier and Vallée 2014), and entrepreneurs (Levine and Rubinstein 2015). Perhaps the closest to ours are the studies by Lindqvist and Vestman (2011) and Lindqvist (2012), which match

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

[11] Murphy (1999), Frydman and Jenter (2010), Murphy (2012), and Edmans and Gabaix (2015) review this literature. Fernandes et al. (2012) report comparative evidence on CEO compensation in 14 countries.

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.

Fourth and finally, our paper is related to the labor and finance literature that studies the relationship between ownership structure and employment decisions. Bloom and Reenen (2007) study the link between ownership structure and various management practices, including those concerning monitoring and incentives. Olsson and Tåg (2015) investigate the employment effects of private equity firms. Sraer and Thesmar (2007) and Mueller and Philippon (2011) study family firms. Matsa and Miller (2014) study employment practices as a function of gender. Our paper differs from these papers both in its use of rich talent proxies and focus on CEOs.

2. Data

Our data set combines information from the Military Archives, Statistics Sweden, and Swedish Companies Registration Office.[12]

Military Archives. The traits data originate from the Swedish military, which examines the health status and the cognitive, non-cognitive, 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 suitable for training for leadership or specialist positions. The

[12] 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.

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 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. Importantly, a strong desire for doing military service is not considered a positive attribute for military aptitude (and may even lead to a negative assessment), which means that the aptitude score can be considered a more general measure of non-cognitive ability (Lindqvist and Vestman 2011).

To assess physical aptitude for the military, 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 relationship 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.

Statistics Sweden. We merge the traits data to personal characteristics obtained from Statistics Sweden. The bulk of these data comes from the LISA database that covers the whole Swedish population of individuals who are at least 16 years old and resident 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.[13] 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 ISCO-88 classification, define physicians (referred to in the text as medical doctors), lawyers, engineers, and other occupations. The family records allow us to map each individual to their parents and siblings.

[13] 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.

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 international NACE Rev.1.1 classification. The information on service as CEO tells us, at the end of each year, the identification number of each firm and the individual who serves as its CEO.

We identify family companies based on their ownership and board structure. A firm is deemed a family company if two or more individuals belonging to the same family are directors or major shareowners in the company. Family firms are categorized as first- or later-generation firms based on the firm's and the CEO's age. Following Bennedsen et al. (2012), we exclude from the sample micro firms, defined here as having fewer than five employees or an asset base below SEK 1 Million (1 SEK ≈ 0.11 USD). The former restriction also helps in excluding from the sample holding companies without industrial operations on their own.

Our sample encompasses about 9 million person-years and 26,000 unique CEOs. 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. How Do the Personal Traits of CEOs Differ from the Population?

This section compares the traits of CEOs to other high-skill professionals and those in the population. We analyze how much weight the CEO labor market gives to each trait and whether it considers more general ability components to be more important. We also study the traits as a function of firm size and whether the firm is family owned or managed. We ask whether the CEO labor market allocates CEOs with higher trait values to more productive positions as heads of larger companies, and whether the relationship between traits and firm size is weaker for family-managed firms that have a smaller talent pool to draw from.

3.1. CEOs' Traits by Firm Size Compared to Other Skilled Professions and the Population

In Table 1 Panel A, we report descriptive statistics of the traits, education, and income for the population and three high-skill professions. The average member of the population has a cognitive ability score of 5.2, a non-cognitive ability score of 5.1, and is 179.1 cm tall. Medical doctors, engineers, and lawyers score better in all traits. The average cognitive ability scores of these professions are 7.5, 7.1, and 6.7, respectively, denoting a difference of 0.8−1.2 standard deviations relative to population. The corresponding difference in non-cognitive ability ranges from 0.5 to 0.7 standard deviations, and in height from 0.2 to 0.3 standard deviations.

Table 1 Panel B reports descriptive statistics of the traits, education, and income for CEOs, classified according to the size of the company they manage. Future CEOs differ from the population in all measures we consider. The CEOs of small companies, defined here as companies with less than SEK 100 million in total assets, and accounting for 84% of the firm population, have a cognitive ability score of 6.0, a non-cognitive ability score of 6.1, and are 180.3 cm tall. Small-company CEOs thus have about one-half of a standard deviation higher cognitive and non-cognitive ability, and about one-fifth of a standard deviation higher height

than the population on average, placing them at about at par with engineers and lawyers in all traits except for cognitive ability. CEOs are also better educated than the population in general. For example, about one-half of the small-company CEOs have at least a college degree, whereas the corresponding fraction for the population is about one-third.

The values of all the traits increase as a function of firm size. For example, the average cognitive ability of the CEO increases from 6.0 to 7.2, i.e. about two-thirds of a standard deviation, when we move from small to large companies (defined here as having at least SEK 10 billion in total assets). The corresponding increase for non-cognitive ability is from 6.1 to 7.4 and for height from 180.3 cm to 183.5 cm. This puts all of the traits of large-company CEOs about at par or higher than those of medical doctors, lawyers, and engineers. The average CEO pay increases from SEK 752 thousand in small companies to about SEK 6 million in large companies. CEOs working for large companies are also better educated: 95% of them have at least a college degree. They are also on average five years older.

Among the cognitive-ability subcomponents, induction (which measures logical ability and numeracy) and verbal ability increase most as a function of firm size. The average induction score increases from 6.0 to 7.1 from small to large companies. The corresponding increase for verbal ability is from 5.7 to 7.0. CEOs' average scores for the cognitive-ability components that are less generic in nature differ less from the population and increase less with firm size. For example, spatial ability increases from 5.8 to 6.5 when we move from small to large companies, and technical ability from 5.6 to 6.1. These results are consistent with the idea that the CEO market and large companies in particular value most such traits that are generic in nature.[14]

[14] See Frydman (2007) and Custódio, Ferreira, and Matos (2013) for related empirical evidence.

Figure 1 Panel A graphs the distribution of the three key traits, both for the population and for the CEOs of small and large companies. It 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. Panels A and B in Table IA1 in the Internet appendix report more formally the distribution of the traits in the population, in three high-skill professions, and among the CEOs of companies of varying sizes.

3.2. Role of Ownership Structure and its Mediating Impact on Size-related Patterns

Table 2 Panel A divides the sample CEOs according to the ownership structure of the firm. By far the largest category is non-family owned firms, which account for 64% of the firm population. The remaining family owned companies are further divided into companies managed by the founder (25% of the sample), an heir (6%), or an external CEO (6%). The cognitive ability of non-family company CEOs, 6.3, is somewhat higher than that of external CEOs, 6.2, and about one-third of a standard deviation larger than that of founder- (5.8) or heir-managed family firms (5.7). Non-cognitive ability and height follow the same ranking between firm types. For example, the non-cognitive ability of non-family firms (6.4) trumps that of externally managed family firms (6.2), which again is greater than the non-cognitive ability of owner-managed firms (6.0) and heir-managed firms (5.9).

Figure 1 Panel B illustrates the difference between family- and non-family companies by graphing the distribution of the three key traits for the population and for the CEOs of family and non-family companies. Panels A and C in Table IA1 report these results more formally.

These univariate results suggest that family firms, and in particular those with family management, employ CEOs with lower trait values. At the same time, these same types of firms

also tend to be the smallest. For example, the non-family companies have on average total assets worth SEK 600 million, while founder-managed (heir-managed) companies have mean total assets of 38 million (71 million), respectively.

Because family firms tend to be smaller than other firms, we disentangle the effects associated with family firms from those related to firm size by running regressions of traits in the sample of CEOs. Table 2 Panel B regresses each CEO trait on indicators for externally managed, founder-managed, and heir-managed family companies, and on logged total assets. The family-related dummy variables are thus implicitly compared against the omitted non-family firm category. There are two specifications for each trait: one excluding industry fixed effects (columns marked with odd numbers), and another including them (columns marked with even numbers). To control for possible time variation in the quality of CEOs and an upward trend in mean cognitive ability scores and height in the population (Flynn 1984, Floud, Wachter, and Gregory 1990), we add controls for year and enlistment year in all specifications.

Column 1 reports the results for cognitive ability. Here, as well as in every other trait and specification, all the family-related dummies are negative. Externally managed family-firm CEOs have 0.08 standard deviations lower cognitive ability than non-family firms. The corresponding numbers for founder- and heir-managed family firms are 0.23 and 0.27 standard deviations, respectively. These results indicate that family firms employ less talented CEOs than non-family companies, especially when the CEO comes from their own family. The coefficient for logged total assets is positive, as it is in every other specification. This suggests that, controlling for family firm status, larger companies hire more talented CEOs.

Columns 3 and 5 show that the talent gap between the CEOs of family-managed and -owned companies persists also in non-cognitive ability and height. As a general rule, heir-managed

family-company CEOs have the lowest and founder-CEOs the second-lowest trait values. The difference between these two categories is greatest for non-cognitive ability, where heirs have on average 0.11 standard deviations lower trait values than founders. These results are consistent with the evidence of Pérez-González (2006) and Bennedsen et al. (2007), who find that family appointments due to a generation change tend to lead to lower firm performance.

Columns 2, 4, and 6 add industry fixed effects in the regressions. This reduces the size of all of the family-related coefficients. Each coefficient in the cognitive ability specification in column 2 decreases by at least 46%, while the corresponding drops for the non-cognitive and height coefficients in columns 4 and 6 are at least by 30% and 32%, respectively. These results are consistent with the idea that family firms select into industries where they face a smaller talent disadvantage relative to their competitors.

Our analyses have thus far already established that CEO traits and firm size are positively related, as predicted by the assignment models of Gabaix and Landier (2008), Terviö (2008), and others. But how strong is this relationship, and is it stronger for non-family managed companies which have a larger talent pool to draw from? Figure 2 Panel A illustrates the relationship by sorting CEOs into 250 quantiles based on firm size and plotting for each quantile the logged average total assets on the horizontal axis and the mean standardized traits on the vertical axis. The relationship is monotonic and close to linear, suggesting that the more talented individuals are allocated to the larger firms. Panel B shows that there also is a monotonic and close to linear relationship between firm size and CEO pay. The size elasticity of pay, 0.27, is quite close to the 0.3 estimate reported for U.S. firms (see, e.g., Murphy 1999). Panel C shows that all of our trait measures have a monotonic and close to linear relationship with logged pay.

Table 3 analyzes more formally the extent to which the CEO labor market allocates more talented individuals to bigger firms. We regress firm size on traits and controls in the four family ownership and management groupings. The correlations uncovered by these regressions are based on observed equilibrium outcomes and thus do not directly lend themselves to a causal interpretation. Nevertheless, the adjusted R^2 values tell us the extent to which our talent measures associate with firm size in different types of companies. Here, our analyses benefit from the fact that family ownership and management can because of legacy and control reasons be considered largely exogenous. We expect the *R*-squareds to be lower in family-managed companies, where the private benefits associated with employing a family member generate friction in the talent allocation process.

Column 1 reports for non-family firms the results from our baseline specification, which includes the trait variables and controls for year and enlistment year. While all the trait variables have *t*-values that are above 8, the adjusted R^2 is no more than 0.09. In other words, more than 90% of the variation in firm size is not related to our trait variables. The *R*-squared is somewhat lower for externally managed family firms in column 4 (0.06), and much lower for founder- and heir-managed firms in columns 7 and 10 (0.02 and 0.03, respectively). The R^2 difference between the non-family firms and externally managed family firms persists in the other specifications as well. For example, in the specification including industry fixed effects, both types of family-managed firms have an adjusted R^2 of 0.12, while for the professionally managed companies the R^2 ranges from 0.21 to 0.24.

These results suggest two things. First, the vast majority of the variation in firm size is not related to the traits we use in our paper. While we do not know what traits the labor market uses to rank CEO candidates, we can at least say that they do not appear to be confined to the narrow

set of early-life traits economists frequently use to predict labor market outcomes. Second, the traits associate much less with firm size in family-managed firms than in other firms. This result is consistent with the idea that the CEO labor market works less well among family-managed companies, where the private benefits associated with hiring a family member or working in the family company may trump the goal of achieving the best possible CEO-firm match.

4. How Do Personal Traits Contribute to the CEO Pay Premium?

The cross-section of companies and their CEOs suggest that the most talented CEOs are found in large firms. Because such executives are the focus of a vast CEO pay literature, it is natural to ask how much their traits contribute to their pay. We first rank the CEOs against the population as a function of their traits, and study the career paths of the individuals who outrank CEOs. We then establish the position of the CEOs in the income distribution of the population. Finally, we estimate whether and how much of the CEO pay premium can be attributed to the executives' traits.

4.1. Ranking CEOs' Traits against the Population

We analyze how the combination of traits an individual possesses maps into the likelihood of attaining a CEO position later in life. Table 4 Panel A addresses this question with a series of linear probability models that relate the dummy for CEOs to the three traits and a battery of control variables. Columns 1−3 incorporate each trait separately whereas columns 4−6 include all three traits or their combination with varying sets of control variables.

All three traits are significantly positively associated with attaining a CEO position. When analyzed alone, the coefficient for non-cognitive ability is 0.55, whereas the corresponding coefficients for cognitive ability and height are 0.72 and 0.24, respectively. Adding all trait

variables simultaneously in the regression in column 4 decreases their coefficients, but their relative importance remains: with a coefficient of 0.59, non-cognitive ability has most predictive power on CEO appointments, followed by cognitive ability with a coefficient of 0.31, and height with a coefficient with 0.12. Following the convention that one standard deviation in cognitive ability corresponds to 15 IQ points, and using the Table 1 result that the population standard deviation in height is 6.54 centimeters, these results imply that each centimeter in height corresponds to $(0.12 \times 15) / (6.54 \times 0.31) = 0.91$ IQ points. The trait ranking persists in column 5 which controls for educational attainment: the non-cognitive ability coefficient (0.55) is more than twice as large as the cognitive ability coefficient (0.23) and five times as large as the coefficient for height (0.11). The non-cognitive ability coefficient also remains the largest in the family fixed effects regression in column 6.

Table 4 Panel B analyzes how the components of cognitive ability are associated with CEO appointments. Columns 1−4 report the results using only one of the components at a time. Induction, which captures logical ability and numeracy, attains the largest coefficient, followed by verbal ability, technical ability, and spatial ability. As a general rule, this ranking remains the same also in columns 5−7, which include all cognitive ability components at the same time along with the level and field of education (column 6) and family fixed effects (column 7).

Table 5 Panel A reports the proportion of the population that is dominated by the small-company CEOs in individual traits. Given that the traits attain discrete values, we smooth our results by interpolating them at one-percent intervals of the CEO distribution. For example, Table 1 Panel B shows that the median CEO of a firm with more than 10 billion in assets has a cognitive-ability score of 7. Table IA1 Panel B finds that the cognitive ability of this CEO falls between the sixth and seventh stanines; 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 percent increase in the CEO population. Because the median is 50% − 31% = 19% away from the lowest point of the sixth stanine, the median CEO dominates 75% + 0.42×19% = 83% of the population. Table 5 Panel A reports this and other percentiles obtained from the interpolation.

The median small-company CEO is above 66% of the population in cognitive ability, above 73% in non-cognitive ability, and above 57% in height. The corresponding fractions of the population dominated by large-company CEOs are 83%, 92%, and 74%, respectively. These results suggest that CEOs and large-company CEOs in particular have considerably higher trait values than the population as a whole. At the same time, their traits do not appear to be exceptional, at least when analyzed one at the time. For example, 17% of the population have a higher cognitive ability than the median large-firm CEO.

Our results are consistent with the idea that leadership ability is not one-dimensional (see, e.g., Heckman, 1995). CEOs score better on all attributes we consider. It is therefore worthwhile to study whether the combination of traits CEOs possess is exceptional. We form this combination by using the predicted probabilities of attaining a CEO position from the regression reported in column 4 of Table 4 Panel A. In addition to non-cognitive and cognitive skills, and height, the model includes indicators for each enlistment year, which take into account the lower likelihood of younger individuals to attain a CEO position.

The predicted probabilities implicitly add up the weighted standardized trait scores into a combination variable which we use to rank CEOs relative to the population (see e.g. Rosenthal 1978). The coefficients in the model imply that non-cognitive ability attains a relative weight of

58%, while the corresponding weights for cognitive ability and height are 30% and 12%, respectively. For comparison purposes, we divide the distribution of each CEO trait and their combination into quintiles. The right tail of the trait distribution is analyzed in even greater detail. The results are reported for the small- and large-firm categories in Figure 3, and more formally in Table 5 Panel B.

The results indicate that CEOs differ more from the population in the combination of traits than in any individual trait. This result can be most easily seen in Figure 3, where the curve indicating the combination of traits is above the curves indicating individual traits. However, the difference between the combination 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 dominates 77% (91%) of the population in these traits. Among large companies, the median (top quartile) CEO dominates 95% (99%) of the population. This means that about 5% of the population, or more than 50,000 individuals, have a better trait combination than the median large-firm CEO. Table IA2 studies alternative weightings of the traits and shows that a substantial fraction of the population dominates CEOs in traits regardless of how the information about individual traits is combined.

The left-hand side of Figure 4 Panel A illustrates how the proportion of the population dominated by the CEOs changes as a function of firm size. As in Table 5 Panel B, we perform the analysis based on the combination of the traits implied by their impact on CEO appointments. There is a sizeable difference in the traits of small-company CEOs and those of firms whose total assets range from SEK 100 million to 1 billion. The trait differences between the CEOs belonging to the other firm-size categories are smaller, particularly among the higher-ability CEOs. The right-hand side of Figure 4 Panel A reports how the proportion of the population

dominated by the CEOs varies as a function of family ownership and management. The biggest differences in traits are between companies that are family managed, and those that are not; the differences within these categories are fairly small. For example, the median CEO in the former category dominates 68−73% of the population, while in the latter category he dominates 78−82% of the population.

4.2. What Do the People with CEO-Caliber Traits Do?

All talented individuals do not want to become CEOs. 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.

Table 5 Panel C reports the career outcomes of the talented individuals. Not surprisingly, most of them work in high-skill professions such as corporate managers, IT professionals, or in engineering. As expected, the fraction of individuals in high-skill professions increases as a function of the size of the firm managed by the CEO; for example, it is 74% for the large-firm category. The profession most closely related to the CEO is the corporate manager: as many as 33% of the test takers with traits dominating those of the median large-firm CEO, or 18,000 individuals, belong to this category. 3,610 of these individuals pursue an executive career as a CEO of a smaller company. All in all, we are left with more than 100 times as many high-talent

individuals pursuing a managerial career, and about 25 times as many high-talent smaller-firm CEOs, as there are large-firm CEOs. Adding other professional groups with potential CEO ambitions, such as non-managerial business roles and engineering, into the analysis would tilt the imbalance between CEO-caliber individuals and CEOs even further. Being born with a favorable mix of traits is thus far from enough from assuring a career as a chief executive of a major company.

4.3. Position of CEOs in the Income Distribution

Table 5 Panel D reports the proportion of the population that is dominated by CEOs according to taxable labor income. As shown in the left-most column, the median small-firm CEO dominates 87% of the population in income. The fraction of the population dominated increases considerably in firm size. For instance, the median chief executive belonging to the 100 million to 1 billion size category dominates 98.8% of the population, and the median CEO belonging to the largest-firm category dominates 99.9% of the population. In other words, only 0.1% of the population earns more than median large-firm CEO, and 13% of the population earns more than the median small-firm CEO. Chief executives differ from the population much more in their pay than in their traits. For example, 5% of the population has a better combination of traits than the median large-firm CEO, and 23% of the population have a better combination than the median small-firm CEO.

The left-hand side of Figure 4 Panel B illustrates the fraction of the population dominated in pay as a function of firm size. Two patterns emerge from this figure. First, the smallest firm-size category differs much more from the other firm-size categories than the other categories differ from one another. Second, a comparison of the figure with the corresponding figure in Panel A

offers a clear visual confirmation to the result that CEOs differ from the population much more in their pay than in their traits.

The four rightmost columns in Table 5 Panel D study the fraction of the population dominated by CEOs in pay as a function of family ownership and management. Non-family company CEOs are most well paid; the median non-family company CEO dominates 94% of the population in pay. Founders who tend to lead smaller companies dominate 79% of the population in pay. Heirs' and professional family-company CEOs' pay fall in between these two extremes. The right-hand side of Figure 4 Panel B illustrates these results graphically.

4.4. Contribution of Traits to the CEO Pay Premium

Table 6 estimates the pay premium CEOs enjoy compared to the population and to other high-prestige professionals. 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.

Panel A Column 1 reports results from a specification that includes dummies for CEOs of various-sized companies, dummies for medical doctors, lawyers, and engineers, and controls for year and enlistment year. The coefficient estimates for CEOs increase monotonically with firm size, ranging from 0.60 for the small-firm CEOs to 2.52 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. Medical doctors earn 2.3 times, lawyers 1.9 times, and engineers 1.7 times as much as the population.

Column 2 adds controls for the three traits. This allows us to estimate how much of the CEO pay premium can be attributed to the returns to the three traits. The coefficient for large-firm CEOs drops from 2.52 to 2.26, suggesting that large-firm CEOs earn 9.6 times as much as the

population on average when the traits are controlled for. This means that the three traits account for about 23% of the pay premium of large-company CEOs. This fraction increases monotonically as a function of firm size; it is 10% for small-firm companies and 16−18% for the intermediate firm size categories. It is 18% for medical doctors and 14% both for lawyers and engineers.

Columns 3−4 control for education and family fixed effects. Both columns drop the medical doctor, lawyer, and engineer dummies because we control for the field of education. In Column 4 the coefficients for CEOs, particularly for large-company CEOs, drop markedly: large-company CEOs make no more than 2.7 times as much as their equally well educated brothers. This suggests that CEOs, and particularly large-company CEOs, come from families in which other siblings are also very well paid.

Table 6 Panel B performs similar analyses as Panel A except that it replaces cognitive ability with its subcategories. The specification in column 1 serves as the benchmark regression that other columns build on. The sample is smaller than in Panel A because subcategory scores are not available for all individuals.

Column 2 adds trait scores to the regression. Among the cognitive ability subscores, induction is by far the most important trait, followed by verbal and technical ability. Spatial ability is clearly the least important trait. The ranking of the traits is the same as the one reported in Table 4 Panel B which studies the likelihood of becoming a CEO. As in Table 4 Panel B, the relative importance of technical ability increases when we control for education and family fixed effects (in column 4). However, the coefficient on induction is clearly the largest in all specifications.

5. Conclusion

What were CEOs like before starting their professional careers? How do their personal traits differ from those of individuals who do not make it to the top? Do more talented individuals get to work as CEOs in larger companies, where they can earn a higher return on their talent? Does the limited candidate pool in family-managed companies compromise the quality of the CEO? Is it possible to explain CEO pay by their traits? We address these and many other research questions by using a unique combination of registry-based data sets on the Swedish male population.

Our results suggest that CEOs display considerably higher trait values than the population as a whole. CEO traits are positively correlated with firm size. Cognitive and non-cognitive skills of future large-company CEOs are more than one standard deviation higher and their height two-thirds of a standard deviation higher than in the population. All of the traits of large-company CEOs are about at par or higher than those of medical doctors, lawyers, and engineers.

The CEOs of family companies display lower trait values than those of non-family companies, even when the comparison is between firms of similar size. The talent gap is strongest for the CEOs of family-managed companies, especially if they do not belong to the founder generation. The talent gap narrows when talent differences between industries are controlled for. This suggests that family firms select into industries where they face a smaller talent disadvantage relative to their competitors.

Although CEOs tend to be endowed with a well-balanced portfolio of traits, their traits are by no means exceptional—much less exceptional than their salaries. The median large-firm CEO belongs to the top 5% of the population in traits but to the top 0.1% in pay. The discrepancy in CEOs' trait and pay rankings implies that any attempts to explain the pay premium that CEOs

enjoy over the population are unlikely to be successful. Indeed, we find that the traits explain less than a quarter of the CEO pay premium.

The traits also play a limited role in executive careers. Less than 10% of the variation in the size of the firm managed by a CEO can be accounted for by his traits. Our sample includes about 18,000 men who have a similar or better trait combination than the median large-firm CEO and are pursuing a business career in a managerial role. Less than one percent of these individuals became a large-firm CEO during our seven-year sample period. Being born with a favorable mix of traits may be a necessary but is far from a sufficient condition for making it to the executive suite.

What prevents individuals born with impressive portfolios of traits to enter top business positions? One possibility relates to the supply of talent: the non-pecuniary aspects of the executive job may make it unappealing to some talented candidates. While pressure, uncertainty, and the public nature of an executive job can certainly render it unattractive, such preferences would need to apply to a very large share of the 18,000 high-talent individuals pursuing managerial roles—of whom 3,600 work as CEOs in smaller firms—to keep them away from pursuing a career as a professional executive. Although preferences are notoriously difficult to measure, these considerations make us skeptical about their ability to explain the lack of supply of CEO talent.

Another possibility is that the CEO labor market emphasizes other traits than the ones studied in our paper. We have focused on three early-life traits economists frequently use to predict labor market outcomes, and that the Swedish military itself uses for officer selection. We complement this analysis by checking whether future CEOs excel in other, less obvious ways. CEOs often have to endure long working hours and may need an 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 attaining a CEO position.[15] Table IA4 Panel B finds little evidence of this after controlling for the other traits, perhaps because physical condition can change so much between the military service and appointment to a CEO position. Although we obviously cannot rule out the importance of traits we cannot observe, we consider it unlikely that the most important traits left out from our analysis would be ones the CEOs are born with.

The third and final possibility is that imperfections in the CEO labor market, such as on-the-job revelation of talent, may induce firms to demand experienced individuals at the expense of new talent (Terviö 2009). A proven track record in the early stages of an individual's career may outweigh the high talent of an inexperienced candidate. Personal traits may still play a role in such a market if it is easier for talented individuals to gain valuable experience. However, the relationship between traits and experience is bound to be noisy: candidates for early-career positions are screened less intensively, and some applicants find a job through sheer luck. Given that moderately talented individuals outnumber highly talented individuals, this noise means that the most talented individuals may not gain the best work experience. Although the role of experience remains challenging to identify, we see much hope in future analyses of the interplay between personal traits and work experience.

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

References

Adams, Renée, Heitor Almeida and Daniel Ferreira, 2005, Powerful CEOs and Their Impact on Corporate Performance, Review of Financial Studies 18(4), 1403–1432.

Bandiera, Oriana, Luigi Guiso, Andrea Prat, and Raffaella Sadun, 2014, Matching Firms, Managers, and Incentives, Journal of Labor Economics, forthcoming.

Beauchamp, Jonathan, David Cesarini, Magnus Johannesson, Erik Lindqvist, and Coren Apicella, 2011, On the Sources of the Height–Intelligence Correlation: New Insights from a Bivariate ACE Model with Assortative Mating, Behavior Genetics, 41(2), 242–252.

Bebchuk, Lucian and Jesse Fried, 2004, Pay without Performance: The Unfulfilled Promise of Executive Compensation, Harvard University Press, Cambridge.

Benmelech, Efraim and Carola Frydman, 2012, Military CEOs, Journal of Financial Economics, forthcoming.

Bennedsen, Morten, Francisco Pérez-González, and Daniel Wolfenzon, 2010, Do CEOs Matter? Stanford University working paper.

Bennedsen, Morten, Francisco Pérez-González, and Daniel Wolfenzon, 2012, Evaluating the Impact of The Boss: Evidence from CEO Hospitalization Events, Stanford University working paper.

Bennedsen, Morten, Kasper M. Nielsen, Francisco Pérez-González, and Daniel Wolfenzon, 2007, Inside the Family Firm: The Role of Families in Succession Decisions and Performance, Quarterly Journal of Economics 122(2), 647–691.

Bertrand, Marianne, 2009, CEOs, Annual Review of Economics, 1(1), 121–150

Bertrand, Marianne, and Sendhil Mullainathan, 2001, Are CEOs Rewarded for Luck? The Ones without Principals Are, Quarterly Journal of Economics 116(3), 901–932.

Bertrand, Marianne and Antoinette Schoar, 2003, Managing with Style: The Effect of Managers on Firm Policies, Quarterly Journal of Economics 118(4), 1169–1208.

Bloom, Nicholas, and John Van Reenen, 2007, Measuring and Explaining Management Practices across Firms and Countries, Quarterly Journal of Economics 122(4), 1351−1408.

Bloom, Nicholas, and John Van Reenen, 2010, Why Do Management Practices Differ across Firms and Countries? Journal of Economic Perspectives 24(1), 203−224.

Case, Anne and Christina Paxson, 2008, Height, Ability, and Labor Market Outcomes, Journal of Political Economy 116(3), 499−532.

Chang, Yuk Ying, Sudipto Dasgupta, and Gilles Hilary, 2010, CEO Ability, Pay, and Firm Performance, Management Science 56(10), 1633–1652.

Célérier, Claire and Boris Vallée, 2014, Are Bankers Worth Their Pay? Evidence from a Talent Measure, HEC working paper.

Custódio, Cláudia, Miguel Ferreira, and Pedro Matos, 2013, Generalists versus Specialists: Lifetime Work Experience and Chief Executive Officer Pay, Journal of Financial Economics 108(2), 471−492.

Custodio, Claudia, and Daniel Metzger, 2013, How Do CEOs Matter? The Effect of Industry Expertise on Acquirer Returns, Review of Financial Studies 26(8), 2008−2047.

Bolmeijer, Marjan, and Andrew Davidson, 2009, 1000 CEOs, Dorling Kindersley.

Edmans, Alex, and Xavier Gabaix, 2015, Executive Compensation: A Modern Primer, New York University working paper.

Edmands, Alex and Xavier Gabaix, 2011, The Effect of Risk on the CEO Market, Review of Financial Studies 24(8), 2822−2863.

Eisfeldt, Andrea and Camelia Kuhnen, 2013, CEO Turnover in a Competitive Assignment Framework, Journal of Financial Economics 109(2), 351−372.

Faccio, Mara, and Larry HP Lang, 2002, The Ultimate Ownership of Western European Corporations, Journal of Financial Economics 65(3), 365–395.

Falato, Antonio, Dan Li, and Todd Milbourn, 2012, Which Skills Matter in the Market for CEOs? Evidence from Pay for CEO Credentials, Washington University in St Louis working paper.

Fernandes, Nuno, Miguel A. Ferreira, Pedro P. Matos, and Kevin J. Murphy, 2012, Are US CEOs Paid More? New International Evidence, USC working paper.

Finkelstein, Sydney, Donald C. Hambrick, and Albert A. Cannella, 2009, Strategic Leadership: Theory and Research on Executives, Top Management Teams, and Boards (Oxford University Press, UK).

Floud, Roderick, Kenneth Wachter, and Annabel Gregory, 1990, Height, Health and History: Nutritional Status in the United Kingdom, 1750-1980 (Cambridge University Press, UK).

Flynn, James R., 1984, The Mean IQ of Americans: Massive Gains 1932 to 1978, Psychological Bulletin 95(1), 29–51.

Forbes, The World's Biggest Public Companies 2013, http://www.forbes.com/global2000/.

Frydman Carola, 2007, Rising Through the Ranks. The Evolution of the Market for Corporate Executives, 1936–2003, MIT working paper.

Frydman, Carola and Dirk Jenter, 2010, CEO Compensation, Annual Review of Financial Economics 2(1), 75−102.

Gabaix, Xavier, and Augustin Landier, 2008, Why Has CEO Pay Increased So Much? Quarterly Journal of Economics 123(1), 49–100.

Gabaix, Xavier, Augustin Landier, and Julien Sauvagnat, 2014, CEO Pay and Firm Size: An Update after the Crisis, Economic Journal 124(574), F40–F59.

Graham, John R., Campbell Harvey, and Manju Puri, 2013, Managerial Attitudes and Corporate Actions, Journal of Financial Economics 109(1), 103−121.

Graham, John R., Si Li and Jiaping Qiu, 2012, Managerial Attributes and Executive Compensation, Review of Financial Studies 25(1), 144−186.

Grossman, Mark, 2007, World Military Leaders: A Biographical Dictionary, Infobase Publishing.

Hambrick, Donald C., and Phyllis A. Mason, 1984, Upper Echelons: The Organization as a Reflection of its Top Managers, Academy of Management Review 9(2), 193–206.

Heckman, James J., 1995, Lessons from the Bell Curve, Journal of Political Economy 103(5), 1091–1120.

Heckman, James J., Jora Stixrud, and Sergio Urzua, 2006, The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior, Journal of Labor Economics, 24(3), 411–482.

Herrnstein, Richard J., and Charles A. Murray, 1996, The Bell Curve: Intelligence and Class Structure in American Life, Free Press.

Hiller, Nathan, Leslie DeChurch, Toshio Murase, and Daniel Doty, 2011, Searching for Outcomes of Leadership: A 25-year Review, Journal of Management 37(4), 1137–1177.

Hirshleifer, David, Angie Low, and Siew Hong Teoh, 2012, Are Overconfident CEOs Better Innovators? Journal of Finance 67(4), 1457−1498.

Johnson, W. Bruce, Robert Magee, Nandu Nagarajan, and Harry Newman, 1985, An Analysis of the Stock Price Reaction to Sudden Executive Deaths: Implications for the Managerial Labor Market, Journal of Accounting and Economics 7(1–3), 151–174.

Kaplan, Steven and Joshua Rauh, 2010, Wall Street and Main Street: What Contributes to the Rise in the Highest Incomes, Review of Financial Studies 23(3), 1004−1050.

Kaplan, Steven and Joshua Rauh, 2013, It's the Market: The Broad-Based Rise in the Return to Top Talent, Journal of Economic Perspectives 27(3), 35−55.

Kaplan, Steven, Mark Klebanov, and Morten Sorensen, 2012, Which CEO Characteristics and Abilities Matter? Journal of Finance 67(3), 973−1007.

Levine, Ross and Yona Rubinstein, 2015, Smart and Illicit: Who Becomes an Entrepreneur and Do They Earn More? University of California at Berkeley working paper.

Lieberson, Stanley, and James F. O'Connor, 1972, Leadership and Organizational Performance: A Study of Large Corporations, American Sociological Review 37(2), 117–130.

Lindqvist, Erik, 2012, Height and Leadership, Review of Economics and Statistics 94(4), 1191–1196.

Lindqvist, Erik, and Roine Vestman, 2011, The Labor Market Returns to Cognitive and Noncognitive Ability: Evidence from the Swedish Enlistment, American Economic Journal: Applied Economics 3(1), 101–128.

Lundborg, Petter, Paul Nystedt, and Dan-Olof Rooth, 2014, Height and Earnings: The Role of Cognitive and Noncognitive Skills, Journal of Human Resources 49(1), 141−166.

Malmendier, Ulrike and Geoffrey Tate, 2005, CEO Overconfidence and Corporate Investment, Journal of Finance 60(6), 2661−2700.

Malmendier, Ulrike and Geoffrey Tate, 2008, Who Makes Acquisitions? CEO Overconfidence and the Market's Reaction, Journal of Financial Economics 89(1), 20−43.

Malmendier, Ulrike and Geoffrey Tate, 2009, Superstar CEOs, Quarterly Journal of Economics 124(4), 1593−1638.

Malmendier, Ulrike, Geoffrey Tate, and Jon Yan, 2011, Overconfidence and Early-Life Experiences: The Effect of Managerial Traits on Corporate Financial Policies, Journal of Finance 66(5), 1687−1733.

Matsa, David, and Amalia Miller, 2014, Workforce Reductions at Women-Owned Businesses in the United States, Industrial & Labor Relations Review 67(2), 422−452.

Mueller, Holger M., and Thomas Philippon, 2011, Family Firms and Labor Relations, American Economic Journal: Macroeconomics 3(2), 218−245.

Mullins, William, and Antoinette Schoar, 2013, How Do CEOs See Their Role? Management Philosophy and Styles in Family and Non-Family Firms, NBER working paper.

Murphy, Kevin, 1999, Executive Compensation, In Orley Ashenfelter and David Card (eds.) , Handbook of Labor Economics 3B, Chapter 38, Elsevier, 2485−2557.

Murphy Kevin J., 2012, Executive Compensation: Where We Are, and How We Got There, In George Constantinides, Milton Harris, and René Stulz (eds.), Handbook of the Economics of Finance, Elsevier, forthcoming.

Murphy Kevin J., and Jan Zábojník, 2004, CEO Pay and Appointments: A Market-Based Explanation for Recent Trends, American Economic Review Papers and Proceedings 94(2), 192–196.

Murphy, Kevin J., and Jan Zábojník, 2007, Managerial Capital and the Market for CEOs, University of Southern California working paper.

Murphy, Kevin M., Andrei Shleifer, and Robert Vishny, 1991, The Allocation of Talent: Implications for Growth, Quarterly Journal of Economics 106(2), 503−530.

Olsson, Martin, and Joacim Tåg, 2015, Private Equity, Layoffs, and Job Polarization, IFN working paper.

Olsson, Ulf, 1993, Securing the Markets. Swedish Multinationals in a Historical Perspective, In Geoffrey Jones and Harm G. Schröter (eds.), The Rise of Multinationals in Continental Europe, Chapter 5, Aldershot: Edward Elgar, 99−127.

Oyer, Paul, and Scott Schaefer, 2012, Welcome to the Club: The Returns to an Elite Degree for American Lawyers, Stanford University working paper.

Pérez-González, Francisco, 2006, Inherited Control and Firm Performance, American Economic Review 96(5), 1559−1588.

Persico, Nicola, Andrew Postlewaite, and Dan Silverman, 2004, The Effect of Adolescent Experience on Labor Market Outcomes: The Case of Height, Journal of Political Economy 112(5), 1019−1053.

Philippon, Thomas and Ariell Reshef, 2012, Wages and Human Capital in the U.S. Finance Industry: 1909–2006, Quarterly Journal of Economics 127(4), 1551−1609.

Rosenthal, Robert, 1978, Combining Results of Independent Studies, Psychological Bulletin 85(1), 185–193.

Schmidt, Frank and John Hunter, 1998, The Validity and Utility of Selection Methods in Personnel Psychology: Practical and Theoretical Implications of 85 Years of Research Findings, Psychological Bulletin 124(2), 262−274.

Schoar, Antoinette and Luo Zuo, 2011, Shaped by Booms and Busts: How the Economy Impacts CEO Careers and Management Styles, NBER working paper.

Sraer, David, and David Thesmar, 2007, Performance and Behavior of Family Firms: Evidence from the French Stock Market, Journal of the European Economic Association 5(4), 709–751.

Steckel, Richard H., 1995, Stature and the Standard of Living, Journal of Economic Literature 33(4), 1903–1940.

Steckel, Richard H., 2009, Heights and Human Welfare: Recent Developments and New Directions, Explorations in Economic History 46(1), 1–23.

Terviö, Marko, 2008, The Difference That CEOs Make: An Assignment Model Approach, American Economic Review 98(3), 642–668.

Terviö, Marko, 2009, Superstars and Mediocrities: Market Failure in the Discovery of Talent, Review of Economic Studies 76(2), 829−850.

Thomas, Alan Berkeley, 1988, Does Leadership Make a Difference to Organizational Performance? Administrative Science Quarterly 33(3), 388–400.

Yermack, David, 1997, Good Timing: CEO Stock Option Awards and Company News Announcements, Journal of Finance 52(2), 449–476.

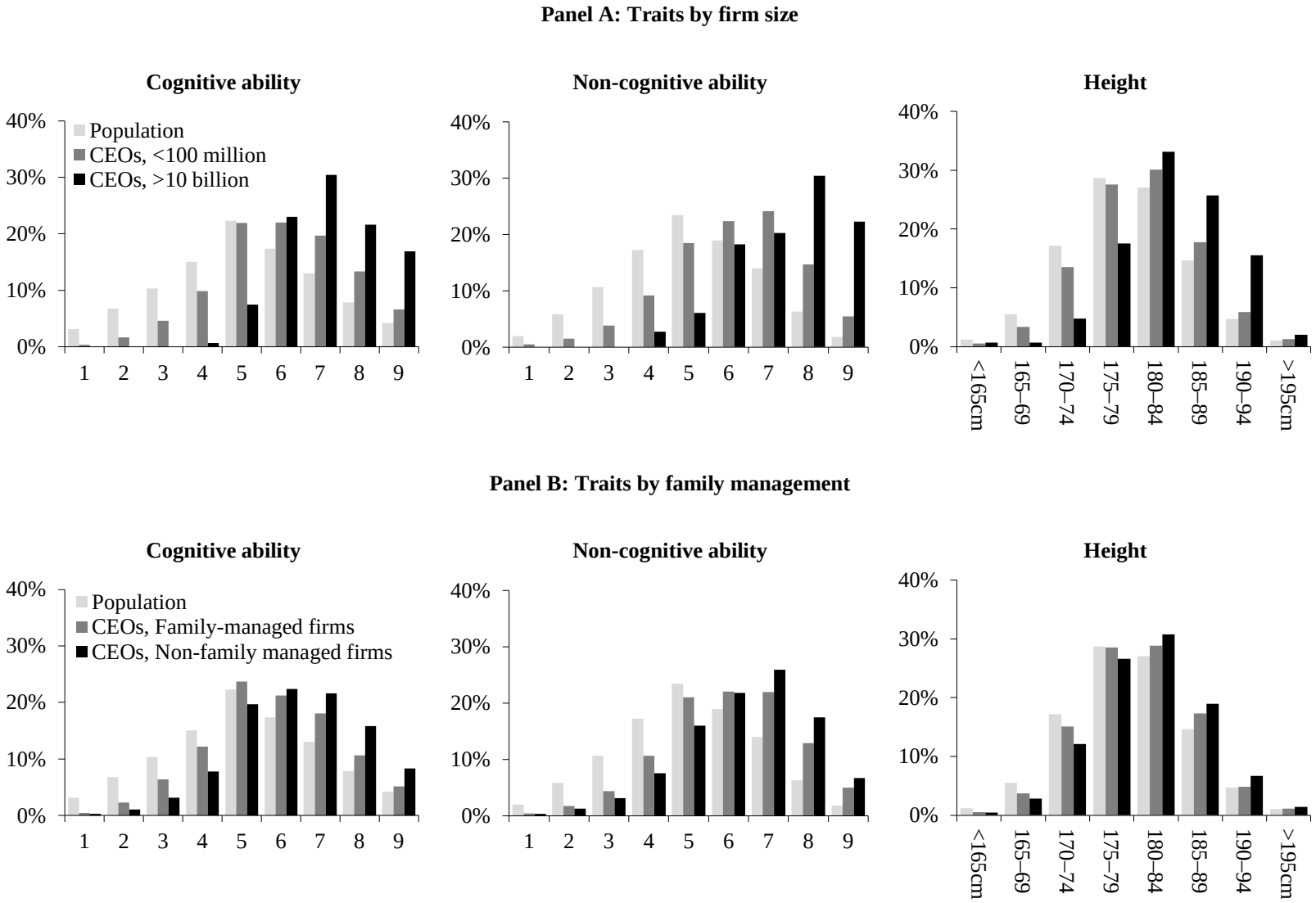

Figure 1. Distributions of personal traits of CEOs in different firm-size categories, and the population at large. The light bars indicate the population. In Panel A, the grey and black bars show the distributions for CEOs in firms with less than 100 million and more than 10 billion in total assets, respectively. The grey and black bars in Panel B report the distributions for family-managed firms and non-family managed firms, respectively.

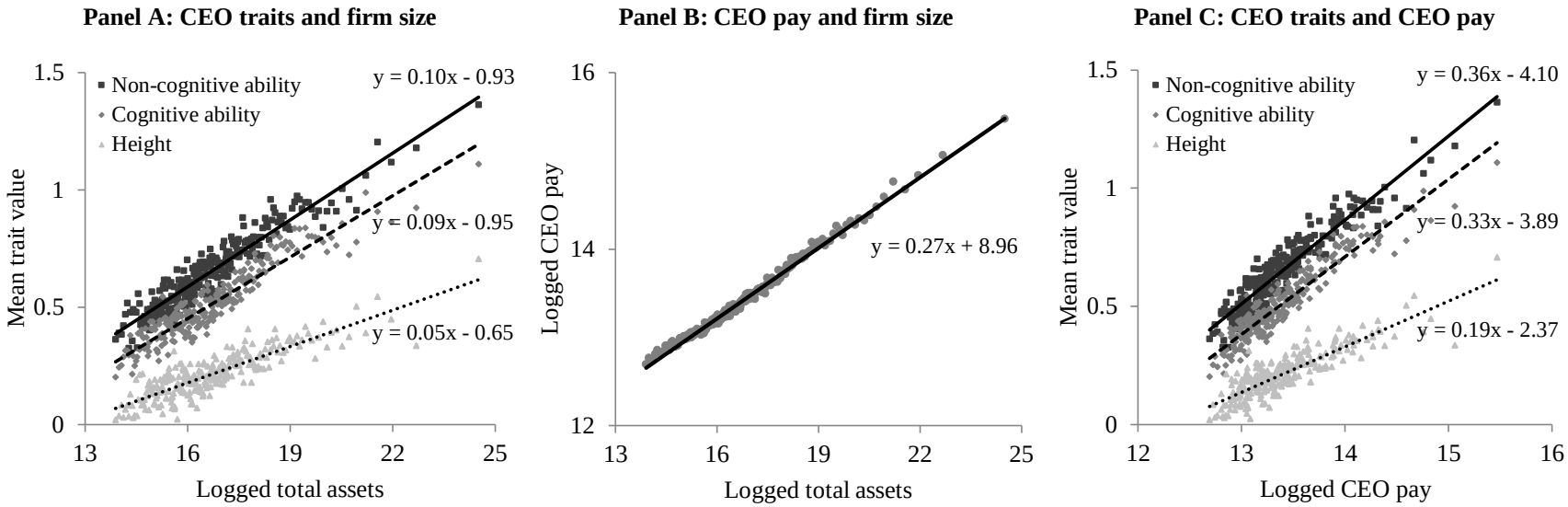

Figure 2. Relations between CEOs' traits, pay, and firm size. The graphs sort the sample of CEOs into quantiles based on their firms' total assets. Panel A plots, for each quantile, the mean of each standardized trait as a function of logged total assets of the firm. Panel B plots logged CEO pay against logged total assets. Panel C graphs the mean of each standardized trait as a function of logged CEO pay. Each graph also reports the regression equations from linear regressions that explain each variable on the vertical axis with each variable on the horizontal axis.

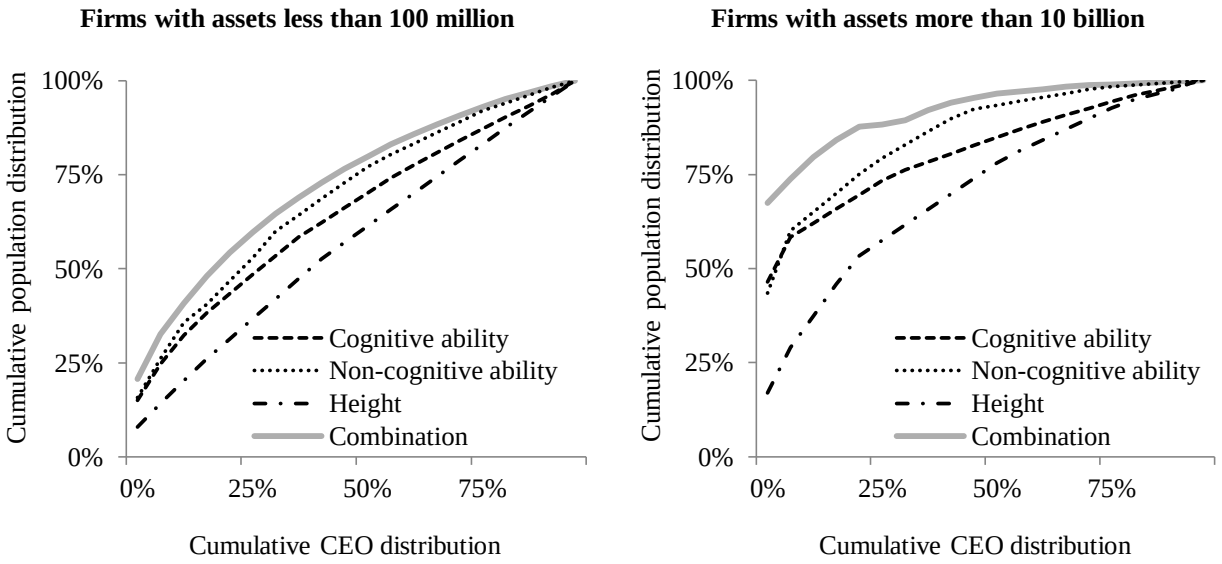

Figure 3. Cumulative distributions of CEOs' traits compared to the population at large. For each firm size category, each point in the graphs depicts the cumulative probability of each CEO trait and the combination of traits relative to the corresponding value in the population. See Table 5 for further description.

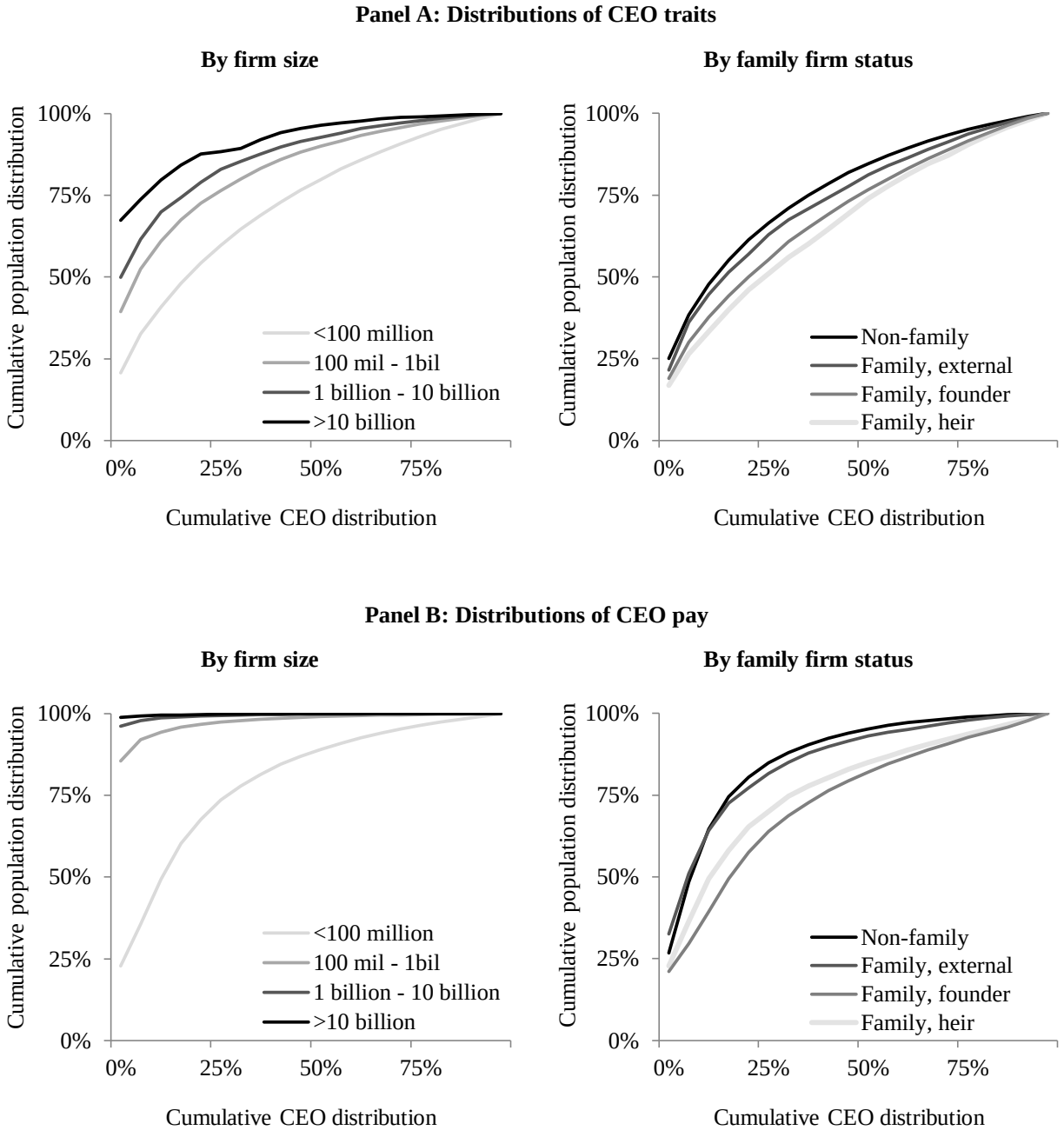

Figure 4. Cumulative distributions of CEOs' combined traits and pay compared to the population at large. Each point in the graphs in Panel A depicts the cumulative probability of attaining a CEO position based on traits by firm size and by family firm status. Panel B plots the cumulative probability of each CEO's income relative to the corresponding value in the population. See Table 5 for further description.

Table 1

Traits for the population, for CEOs in firms of different size, and for other skilled professions

This table reports means, medians, and standard deviations 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 ≈ 0.11 USD). In Panel A, the statistics are calculated separately for the population and for medical doctors, engineers, and lawyers. Panel B reports descriptive statistics for 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. 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.

Panel A: Population and skilled professions												
	Population			Medical doctors			Engineers			Lawyers		
	Mean	Sd	Median	Mean	Sd	Median	Mean	Sd	Median	Mean	Sd	Median
Cognitive ability	5.15	1.93	5.00	7.49	1.35	8.00	7.11	1.43	7.00	6.66	1.42	7.00
Induction	5.12	1.93	5.00	7.32	1.41	8.00	6.87	1.49	7.00	6.79	1.46	7.00
Verbal	5.01	1.82	5.00	7.17	1.43	7.00	6.44	1.45	6.00	6.85	1.39	7.00
Spatial	5.25	1.90	5.00	6.63	1.58	7.00	6.73	1.57	7.00	5.92	1.65	6.00
Technical	4.96	1.88	5.00	6.67	1.63	7.00	6.81	1.57	7.00	5.64	1.63	6.00
Non-cognitive ability	5.09	1.74	5.00	6.37	1.71	7.00	5.89	1.51	6.00	6.13	1.63	6.00
Height (cm)	179.1	6.54	179.0	181.0	6.34	181.0	180.5	6.44	180.0	180.7	6.27	181.0
Enlistment year	1983	7.69	1983	1982	8.08	1981	1986	7.28	1988	1984	7.82	1985
Level of education												
Basic, less than 9 years	1.0%	10.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%
Basic, 9 to 10 years	12.2%	32.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Vocational or high school	51.8%	50.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
College or university	33.5%	47.2%	0.0%	72.3%	44.8%	100.0%	92.2%	26.8%	100.0%	98.2%	13.2%	100.0%
Doctoral	1.5%	12.0%	0.0%	27.7%	44.8%	0.0%	7.8%	26.8%	0.0%	1.8%	13.2%	0.0%
Income (thousand)	400	370	358	834	357	815	572	241	531	761	567	618
Number of individuals	1,268,176			9,348			39,567			6,192		

Panel B: CEOs by firm size												
	CEOs, <100 million			CEOs, 100 million − 1 billion			CEOs, 1 billion − 10 billion			CEOs, >10 billion		
	Mean	Sd	Median	Mean	Sd	Median	Mean	Sd	Median	Mean	Sd	Median
Cognitive ability	6.02	1.65	6.00	6.60	1.48	7.00	6.84	1.41	7.00	7.16	1.21	7.00
Induction	5.95	1.68	6.00	6.55	1.53	7.00	6.87	1.44	7.00	7.06	1.27	7.00
Verbal	5.71	1.58	6.00	6.30	1.49	6.00	6.63	1.46	7.00	6.99	1.27	7.00
Spatial	5.82	1.73	6.00	6.12	1.66	6.00	6.21	1.58	6.00	6.48	1.47	7.00
Technical	5.59	1.71	6.00	5.86	1.67	6.00	5.91	1.59	6.00	6.08	1.71	6.00
Non-cognitive ability	6.14	1.59	6.00	6.67	1.47	7.00	6.93	1.42	7.00	7.36	1.32	8.00
Height (cm)	180.3	6.25	180.0	181.4	6.17	181.0	181.6	5.94	182.0	183.5	5.96	183.0
Enlistment year	1982	6.92	1982	1980	6.27	1980	1979	5.83	1978	1977	5.35	1976
Level of education												
Basic, less than 9 years	0.4%	6.4%	0.0%	0.2%	3.9%	0.0%	0.0%	0.0%	0.0%	0.7%	8.2%	0.0%
Basic, 9 to 10 years	8.5%	27.9%	0.0%	2.6%	16.0%	0.0%	0.7%	8.6%	0.0%	0.0%	0.0%	0.0%
Vocational or high school	41.5%	49.3%	0.0%	23.1%	42.2%	0.0%	11.9%	32.4%	0.0%	4.7%	21.3%	0.0%
College or university	48.2%	50.0%	0.0%	72.0%	44.9%	100.0%	86.0%	34.7%	100.0%	86.5%	34.3%	100.0%
Doctoral	1.4%	11.7%	0.0%	2.1%	14.2%	0.0%	1.3%	11.5%	0.0%	8.1%	27.4%	0.0%
Income (thousand)	752	635	626	1,773	1,601	1,349	3,402	3,263	2,448	6,219	5,362	4,159
Assets of the firm (million)	21.3	27.1	12.1	312	287	216	3,021	2,594	2,239	50,100	94,100	18,700
Number of individuals		21,937			3,266			672			148	

Table 2

CEO traits in family and non-family firms

Panel A reports descriptive statistics for firms that are and are not in family ownership. Family firms are further divided into companies where the CEO is not a member of the family, the CEO is the founder, and the CEO is the heir of the founder. 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. Panel B regresses each trait on firm characteristics. Three dummies indicate family firms (non-family 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 non-cognitive 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.

Panel A: Descriptive statistics of CEOs by family ownership

	Non-family firm CEOs			Family firm, external CEO			Family firm, founder CEO			Family firm, heir CEO		
	Mean	Sd	Median	Mean	Sd	Median	Mean	Sd	Median	Mean	Sd	Median
Cognitive ability	6.29	1.60	6.00	6.15	1.58	6.00	5.77	1.67	6.00	5.73	1.67	6.00
Induction	6.23	1.63	6.00	6.16	1.65	6.00	5.67	1.70	6.00	5.66	1.69	6.00
Verbal	5.99	1.56	6.00	5.83	1.49	6.00	5.47	1.61	5.00	5.39	1.58	5.00
Spatial	5.96	1.70	6.00	5.84	1.69	6.00	5.70	1.77	6.00	5.73	1.73	6.00
Technical	5.73	1.70	6.00	5.60	1.68	6.00	5.45	1.72	5.00	5.40	1.72	5.00
Non-cognitive ability	6.35	1.57	7.00	6.19	1.55	6.00	6.00	1.61	6.00	5.90	1.60	6.00
Height (cm)	180.8	6.2	181.0	180.5	6.3	180.0	179.9	6.2	180.0	179.9	6.3	180.0
Enlistment year	1981	1907	1981	1982	1907	1982	1981	1907	1981	1980	1908	1979
Level of education												
Basic, less than 9 years	0.2%	4.2%	0.0%	0.4%	6.3%	0.0%	0.6%	7.5%	0.0%	1.7%	12.8%	0.0%
Basic, 9 to 10 years	5.4%	22.6%	0.0%	6.3%	24.2%	0.0%	11.6%	32.0%	0.0%	15.0%	35.7%	0.0%
Vocational or high school	33.1%	47.1%	0.0%	36.9%	48.3%	0.0%	48.9%	50.0%	0.0%	50.8%	50.0%	100.0%
College or university	59.3%	49.1%	100.0%	55.4%	49.7%	100.0%	38.3%	48.6%	0.0%	32.4%	46.8%	0.0%
Doctoral	2.0%	14.1%	0.0%	1.0%	9.9%	0.0%	0.6%	8.0%	0.0%	0.1%	3.7%	0.0%
Income (thousand)	1,151	1,438	793	985	1,272	719	615	427	525	642	456	545
Assets of the firm (million)	600	9,901	20	409	5,712	21	38	287	11	71	711	16
Number of individuals		16,609			1,503			6,417			1,494	

Panel B: Regressions of traits on family company indicators and firm size						
Dependent variable	Cognitive ability		Non-cognitive 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 3

Correlations of CEOs' traits with firm size

The regressions in this table correlate firm size with the standardized values of CEO traits. The regressions are run separately by family firm status. Columns 1−3 report regressions for non-family firms. The first specification includes dummies for each year and each enlistment year. The second specification adds fixed effects for industries and the third specification adds dummies for five levels and eight fields of education. Columns 4−6, 7−9, and 10−12 follow the same structure for family firms managed by a professional CEO, the founder, or a later-generation family member, respectively. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the CEO level.

Dependent variable	Logged total assets											
	Non-family firms			Family firms, external			Family firms, founder			Family firms, heir		
Specification	1	2	3	4	5	6	7	8	9	10	11	12
Cognitive ability	0.217	0.208	0.066	0.129	0.154	0.048	0.104	0.113	0.061	0.110	0.097	0.055
	(12.43)	(12.79)	(3.88)	(2.28)	(3.12)	(0.97)	(5.52)	(6.18)	(3.16)	(2.73)	(2.52)	(1.35)
Non-cognitive ability	0.296	0.272	0.223	0.094	0.128	0.041	0.081	0.089	0.064	0.057	0.061	0.042
	(17.79)	(18.32)	(15.27)	(1.70)	(2.67)	(0.87)	(4.59)	(5.28)	(3.81)	(1.47)	(1.65)	(1.09)
Height	0.130	0.110	0.093	0.150	0.152	0.125	0.040	0.041	0.037	−0.022	−0.029	−0.038
	(8.49)	(7.93)	(6.94)	(3.49)	(3.95)	(3.28)	(2.43)	(2.62)	(2.42)	(−0.59)	(−0.79)	(−1.03)
Controls												
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enlistment year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Education level and field	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Mean dependent variable	10.06	10.06	10.06	9.85	9.85	9.85	9.22	9.22	9.22	9.61	9.61	9.61
Adjusted R^2	0.091	0.241	0.283	0.063	0.212	0.262	0.021	0.119	0.147	0.031	0.124	0.143
Number of observations	61,437	61,437	61,437	4,207	4,207	4,207	25,427	25,427	25,427	5,744	5,744	5,744

Table 4

Contribution of traits to attaining a CEO position

This table reports results from linear probability models which explain the dummy for CEOs with standardized values of cognitive and non-cognitive ability, and height. Columns 1−3 in Panel A 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. Column 5 adds dummies for five levels and eight fields of education. Column 6 further includes fixed effects for brothers who are born to the same mother. Panel B repeats the same structure for the four subcomponents of cognitive ability. The *t*-values reported in parentheses are based on standard errors that allow for clustering at the individual level or at the family level in the family fixed effects specifications. In Panel A, the number of observations is 8,760,402 in all but the family fixed effects specifications in which missing family links reduce the sample size by 94,049 observations. The corresponding numbers in Panel B are 84,251 and 7,709,018 because the subscores are missing for some individuals. The mean dependent variable and the coefficients are multiplied by one hundred.

Panel A: Baseline regressions						
Dependent variable	CEO dummy					
Specification	1	2	3	4	5	6
Cognitive ability	0.552			0.307	0.227	0.246
	(71.09)			(38.51)	(24.91)	(10.10)
Non-cognitive ability		0.724		0.591	0.552	0.380
		(81.81)		(64.64)	(60.35)	(17.31)
Height			0.244	0.122	0.112	0.137
			(31.09)	(15.56)	(14.36)	(5.77)
Controls						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Enlistment year	Yes	Yes	Yes	Yes	Yes	Yes
Education	No	No	No	No	Yes	Yes
Family fixed effects	No	No	No	No	No	Yes
Mean dependent variable	1.113	1.113	1.113	1.113	1.113	1.111
Adjusted R^2	0.004	0.006	0.002	0.007	0.010	0.501
Number of observations	8,760,402	8,760,402	8,760,402	8,760,402	8,760,402	8,666,353

Panel B. Components of cognitive ability							
Dependent variable	CEO dummy						
Specification	1	2	3	4	5	6	7
Induction	0.588				0.245	0.153	0.156
	(67.32)				(17.26)	(10.70)	(4.62)
Verbal		0.530			0.121	0.070	0.122
		(61.38)			(9.37)	(5.29)	(3.87)
Spatial			0.387		−0.009	−0.011	−0.010
			(45.81)		(−0.76)	(−0.99)	(−0.38)
Technical				0.444	0.038	0.074	0.082
				(51.32)	(3.20)	(6.17)	(2.78)
Non-cognitive ability					0.625	0.587	0.391
					(61.43)	(57.76)	(15.67)
Height					0.127	0.117	0.147
					(14.60)	(13.52)	(5.44)
Controls							
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enlistment year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education	No	No	No	No	No	Yes	Yes
Family fixed effects	No	No	No	No	No	No	Yes
Mean dependent variable	1.195	1.195	1.195	1.195	1.195	1.195	1.193
Adjusted R^2	0.004	0.003	0.002	0.003	0.007	0.008	0.514

Table 5

Fraction of population dominated by CEOs

The table reports the fraction of the population that is dominated by CEOs according to their personal traits. 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 that is dominated by CEOs at different parts of the CEOs' trait distribution. The results have been smoothed by means of interpolation; see the text for additional details. Panel B predicts, for each individual, the probability of attaining a CEO position based on the regression in Column 4 of Table 2 Panel A. The predicted probability then determines the proportion of the population a CEO dominates. Panel C reports the occupational distribution of the individuals who dominate 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 ISCED-76 classification of education. 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 D reports the population dominated by CEOs according to taxable labor income. Panels B and D calculate the cumulative probabilities separately for four firm-size categories and by family firm status.

Panel A: Fraction of population dominated by CEOs' traits, by firm size

	<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 dominated by CEOs' combinations of traits, by firm size, and by family firm status

	CEOs by firm size				CEOs by family firm status			
	<100 mil	100 mil − 1 bil	1 bil − 10 bil	>10 bil	Non-family	Family, external	Family, founder	Family, heir
5%	20.6%	39.3%	49.9%	67.4%	25.1%	21.5%	19.0%	16.9%
25%	54.3%	72.5%	79.0%	87.7%	61.3%	57.0%	50.0%	46.0%
50%	76.6%	88.2%	91.4%	95.4%	81.8%	77.7%	73.1%	69.2%
75%	90.8%	95.8%	97.1%	98.8%	93.3%	91.2%	88.9%	87.2%
90%	96.9%	98.6%	99.1%	99.5%	97.8%	97.3%	96.3%	95.8%
95%	98.6%	99.4%	99.6%	99.8%	99.0%	98.8%	98.5%	97.9%
100%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Panel C: Occupational distribution of individuals who dominate 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

Panel D: Fraction of population dominated by CEOs' labor income, by firm size, and by family firm status								
	CEOs by firm size				CEOs by family firm status			
	<100 mil	100 mil − 1 bil	1 bil − 10 bil	>10 bil	Non-family	Family, external	Family, founder	Family, heir
5%	22.8%	85.5%	96.1%	98.8%	26.8%	32.6%	21.2%	22.8%
25%	67.7%	96.7%	99.3%	99.7%	80.5%	77.2%	57.5%	65.4%
50%	86.9%	98.8%	99.8%	99.9%	93.9%	91.6%	79.3%	82.8%
75%	95.2%	99.6%	99.9%	99.98%	98.4%	97.1%	90.7%	92.2%
90%	98.3%	99.8%	99.97%	99.997%	99.6%	99.2%	95.8%	96.6%
95%	99.1%	99.9%	99.99%	99.999%	99.8%	99.6%	97.7%	98.1%
100%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6

Pay premium of CEOs and other professions

This table estimates the pay premiums of CEOs, medical doctors, lawyers, and engineers 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. In Panel A, column 1 includes dummies for CEOs in different firm-size categories and for medical doctors, lawyers, and engineers, and dummies for year and enlistment year. Column 2 includes the standardized values of cognitive and non-cognitive 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. Panel B follows the structure of Panel A, but breaks down cognitive ability into its four subcomponents. The number of observations is smaller here 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.

Panel A: Baseline regressions				
Dependent variable	Logged income			
Specification	1	2	3	4
CEO dummy, <100 mil	0.599	0.491	0.463	0.282
	(159.22)	(133.54)	(127.89)	(52.49)
...100 mil − 1 bil	1.389	1.216	1.118	0.581
	(126.72)	(112.07)	(102.70)	(39.77)
...1 bil − 10 bil	1.960	1.756	1.617	0.767
	(68.68)	(62.36)	(58.18)	(19.64)
...>10 bil	2.522	2.261	2.098	0.992
	(30.48)	(27.98)	(26.59)	(8.80)
Medical doctor dummy	0.820	0.618		
	(188.40)	(134.69)		
Lawyer dummy	0.627	0.481		
	(87.74)	(67.65)		
Engineer dummy	0.503	0.352		
	(248.76)	(162.24)		
Cognitive ability		0.094	0.056	0.068
		(137.49)	(75.44)	(34.28)
Non-cognitive ability		0.111	0.103	0.077
		(157.23)	(144.73)	(42.91)
Height		0.022	0.020	0.018
		(35.22)	(32.80)	(9.35)
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	0.040	0.076	0.092	0.531
Number of observations	7,765,917	7,765,917	7,765,917	7,687,378

Panel B: Components of cognitive ability				
Dependent variable	Logged income			
Specification	1	2	3	4
CEO dummy, <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)
Medical doctor dummy	0.843	0.622		
	(182.36)	(127.67)		
Lawyer dummy	0.643	0.476		
	(81.36)	(60.72)		
Engineer dummy	0.506	0.344		
	(223.38)	(142.58)		
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)
Non-cognitive 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 IA1

Distributions of personal traits for the population, skilled professions, and CEOs

This table reports the distribution of cognitive ability, non-cognitive ability, and height. In Panel A, the statistics are calculated separately for the population and for 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 B reports the descriptive statistics for firms that are and are not in family ownership. The family firms are further divided into companies managed by a professional non-family CEO, the founder, or a later-generation family member.

Panel A: Population and skilled 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%
Non-cognitive 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%
Medical doctors									
Cognitive ability	0.1%	0.2%	0.5%	1.4%	6.5%	13.4%	23.2%	26.5%	28.1%
Non-cognitive 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%
Non-cognitive 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%
Non-cognitive 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%

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%
Non-cognitive 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%
Non-cognitive 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%
Non-cognitive 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%
Non-cognitive 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, Non-family firms									
Cognitive ability	0.3%	1.1%	3.1%	7.6%	19.6%	22.4%	21.6%	15.9%	8.5%
Non-cognitive 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%
Non-cognitive 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%
Non-cognitive 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%
Non-cognitive 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 IA2

Alternative trait combinations by firm size and by family ownership

This table reports the fraction of the population that is dominated by CEOs according to their personal traits. 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. Panels C−F reports the results for non-family firms and family firms stratified by whether the CEO is a professional CEO, the founder, or a later-generation family member. The three leftmost columns assign cognitive ability, non-cognitive 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					
	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					
	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%

Panel C: Non-family firms					
	Trait combination				
	0%-50%-50%	50%-0%-50%	50%-50%-0%	Multiplicative	Minimum
5%	19.6%	21.0%	24.2%	24.8%	20.2%
25%	54.3%	50.4%	58.7%	59.2%	52.8%
50%	77.0%	72.6%	79.9%	79.5%	73.4%
75%	91.1%	87.9%	91.9%	92.1%	90.3%
90%	97.1%	95.5%	97.4%	97.2%	96.5%
95%	98.7%	97.8%	98.8%	98.8%	98.5%
100%	100.0%	100.0%	100.0%	100.0%	100.0%

Panel D: Family firms, external					
	Trait combination				
	0%-50%-50%	50%-0%-50%	50%-50%-0%	Multiplicative	Minimum
5%	17.8%	20.5%	22.1%	23.7%	20.6%
25%	50.4%	47.4%	55.4%	56.0%	47.6%
50%	73.4%	68.8%	75.7%	76.1%	70.3%
75%	88.7%	86.4%	89.8%	89.5%	88.8%
90%	96.1%	94.4%	96.3%	96.3%	96.2%
95%	98.2%	97.2%	98.4%	98.3%	98.4%
100%	100.0%	99.9%	100.0%	100.0%	99.9%

Panel E: Family firms, founder					
	Trait combination				
	0%-50%-50%	50%-0%-50%	50%-50%-0%	Multiplicative	Minimum
5%	13.1%	12.5%	14.8%	15.3%	14.4%
25%	42.5%	39.4%	44.1%	43.4%	40.2%
50%	66.8%	60.7%	67.2%	67.2%	66.2%
75%	86.1%	81.2%	85.9%	85.5%	83.0%
90%	95.0%	91.6%	95.1%	94.7%	94.4%
95%	97.5%	95.9%	97.5%	97.2%	97.0%
100%	100.0%	100.0%	100.0%	100.0%	100.0%

Panel F: Family firms, heir					
	Trait combination				
	0%-50%-50%	50%-0%-50%	50%-50%-0%	Multiplicative	Minimum
5%	14.3%	12.5%	14.8%	15.3%	14.4%
25%	44.0%	39.4%	44.1%	43.4%	40.2%
50%	68.9%	60.7%	67.2%	67.2%	66.2%
75%	86.6%	81.2%	85.9%	85.5%	83.0%
90%	95.6%	91.6%	95.1%	94.7%	94.4%
95%	97.8%	95.9%	97.5%	97.2%	97.0%
100%	100.0%	100.0%	100.0%	100.0%	100.0%

Table IA3

Pay premiums using total income in lieu of labor income

This table estimates the pay premiums of CEOs, medical doctors, lawyers, and engineers compared to the population. The regressions follow the structure of Table 6 Panel A, 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 dummy, <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)
Medical doctor dummy	0.813	0.595		
	(194.72)	(134.21)		
Lawyer dummy	0.677	0.519		
	(89.70)	(69.79)		
Engineer dummy	0.501	0.337		
	(253.53)	(159.30)		
Cognitive ability		0.103	0.065	0.072
		(159.73)	(91.48)	(38.36)
Non-cognitive 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 IA4

Additional traits

Panel A reports means, medians, and standard deviations of cardiovascular fitness and muscle strength for the population, skilled professions, and for CEOs. The statistics for CEOs are calculated separately by firm size and by family firm status. Panel B builds on the regression in Table 4 Panel A by regressing the dummy for CEOs on standardized values of cardiovascular fitness, muscle strength, cognitive and non-cognitive 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 in the specifications including muscle strength because this variable is missing for about 150,000 individuals. 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.

Panel A: Descriptive statistics			
		Cardiovascular fitness	Muscle strength
Population	Mean	6.26	5.65
	Sd	1.71	1.90
	Median	6	5
Medical doctors	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
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
CEOs, non-family 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						
Dependent variable	CEO dummy					
Specification	1	2	3	4	5	6
Cardiovascular fitness	0.363	0.041	0.024			
	(42.48)	(4.47)	(2.63)			
Muscle strength				0.462	0.010	−0.008
				(43.00)	(0.80)	(−0.65)
Cognitive ability		0.306	0.227		0.284	0.214
		(38.34)	(24.95)		(33.58)	(22.19)
Non-cognitive ability		0.575	0.543		0.610	0.577
		(59.25)	(55.99)		(57.12)	(53.99)
Height		0.117	0.110		0.114	0.108
		(14.98)	(14.01)		(13.26)	(12.60)
Controls						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Enlistment year	Yes	Yes	Yes	Yes	Yes	Yes
Education	No	No	Yes	No	No	Yes
Mean dependent variable	1.113	1.113	1.113	1.097	1.097	1.097
Adjusted R^2	0.003	0.007	0.010	0.003	0.007	0.011
Number of observations	8,760,402	8,760,402	8,760,402	7,665,250	7,665,250	7,665,250