Born to Lead?
The Effect of Birth Order on Non-Cognitive Abilities*

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Abstract

We study the effect of birth order on personality traits among men using population-wide data on enlistment records and occupations for Sweden. Earlier born men are found to be more persistent, socially outgoing, willing to assume responsibility, and able to take initiative than later-borns. In addition, we find that birth order affects occupational sorting; first-born children are more likely to be managers, while later-born children are more likely to be self-employed. We also find that earlier born children are more likely to be in occupations that require leadership ability, social ability and the Big Five personality traits. Finally, we find a significant role of sex composition. Later-born boys suffer an additional penalty the larger the share of boys among the older siblings. When we investigate possible mechanisms, we find that the negative effects of birth order are driven by post-natal environmental factors. We also find evidence of lower parental human capital investments in later-born children.

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Introduction

Personality[2]—for example leadership abilities or motivation—matters greatly for life success.[3] It is commonly believed that the family is important in the formation of personalities (Grönqvist, Öckert and Vlachos, 2010; Björklund and Jäntti, 2012; Anger, 2012). But personalities also vary widely across children from the same family (Plomin and Daniel 1987; Plomin 2011).[4] As early as 1927 with the work of Alfred Adler, psychologists have hypothesized that at least some of these personality differences are systematically related to birth order, with the oldest child developing a taste for power.[5] Since that time, there has been much work on the topic, most recently focusing on evolutionary theory as the dominant explanation for birth order differences in personality (Sulloway, 1996). Siblings are considered to strategically compete for limited parental resources, and do so by differentiate themselves to solicit resources by filling different "niches" within the family. The firstborn is believed to be more responsible and focused on pleasing his parents, thus acting as a role-model for the later born children, while later-born children are hypothesized as being more easy-going and sociable and with a need to be more innovative in filling a family niche.[6]

To date, however, there is little conclusive evidence on this relationship. This is likely due to the fact that estimating the relationship between birth order and personality characteristics

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[2] In the economics literature personality traits are often referred to as *non-cognitive abilities*, and denote traits which can be distinguished from intelligence as defined by the ability to solve abstract problems (Borghans et al 2008). Even if cognitive abilities and personality traits can be unrelated from a theoretical perspective, empirical measures cognitive abilities and personality traits are likely correlated.

[3] See work by Lindqvist and Vestman (2011); Heckman, Stixrud and Urzua (2006); Heckman and Rubinstein (2001); Borghans, Duckworth, Heckman and Ter Weel (2008); Bowles, Gintis, and Osborne (2001).

[4] Decomposing the variance of non-cognitive skills for a linear model $y_{ij} = \lambda_j + \varepsilon_{ij}$, where λ_j is a family fixed effect and ε_{ij} is an error term, we find that the within-family variance is about a third of the total variance.

[5] Alder's hypothesis was that oldest child develops a taste for power but suffers from the dethronement at the arrival of siblings; the youngest is pampered with lack of independence and social empathy; while the middle child is ambitious and competitive (Adler, 1927; 1928).

[6] Sulloway (1995, 1996) hypothesize that first-borns are higher than later borns in conscientiousness, neuroticism, the dominance facet extraversion and lower on agreeableness, openness and the sociability facet extraversion.

requires large datasets in order to control for all the possible confounders.[7] Later born children only exist in larger families, and to the extent that parents who choose to have larger families are inherently different, calculating a simple correlation between birth order and measures of personality without conditioning on family size would spuriously attribute these differences to birth order. In addition, mothers tend to be older when they have later born children, so estimates that do not control for mother's age might mistakenly attribute that effect to birth order. And later born children are born in more recent cohorts than their siblings, so to the extent that there are trends in outcomes over time, estimation strategies that do not adequately control for cohort effects might again mistakenly attribute these trends to birth order.

Recent research has been able to address these issues using large administrative datasets that have only recently become available. These studies have documented that first-borns have higher educational attainment and earnings, have a higher IQ, and are likely to be healthier.[8] However, there is little convincing evidence on the effect of birth order on personality.[9] We

[7] The previous psychological literature is mainly based on small data sets. Ernst and Angst (1983) concluded from a review of the literature 1946-1980 that findings of birth order effects on personality are artifacts of poor research design: In studies accounting for family size and socio-economic differences the effects of birth order on personality is negligible. Sulloway (1995, 1996) strongly contested this conclusion. Based on the same studies which control for family size and socioeconomic status and using a Meta-analytic strategy (196 studies with 120,800 subjects), Sulloway argues that the literature is in support of birth order influencing the Big Five dimensions of personality. Also the more recent literature is based on small samples with results both in support (See for example Dixon et al. 2008; Healey and Ellis, 2007; Michalski and Shackelford, 2001; Paulhus, Trapnell and Chen, 1999; Pollet et al., 2010; Rohde et al., 2003.) and with no, or limited support, (See for example Bleske-Rechek and Kelley, 2014; Dunkel, Harbke and Papini, 2009; Jefferson, Herbst and McCrae, 1998; Marini and Kurtz, 2011; Parker, 1998; Saroglou and Fiasse, 2003.) of birth order effects on personality.

[8] See Barclay (2015); Black, Devereux and Salvanes (2005, 2011, 2015); Kristensen and Bjerkedal (2007); Kantarevic and Mechoulan (2006); Booth and Kee (2008); Bu (2014).

[9] There are a few notable exceptions in the psychology literature. Sulloway (1999, 2001) use survey data (n=6,053) and a within-family strategy and finds birth order effects on the Big Five domains of personality. A drawback with this analysis is that the sample is non-representative (based on 47 separate non-random samples) and that only one subject per family is surveyed which can induce contrast effects and stereotype bias. Recent work by Rohrer, Egloff and Schmukle (2015) use pooled data from NCDS, NLSY 97 and SOEP to estimate reduced form between-family (n=17,030) and within-family (n=3,156) models, capturing the composite impact of higher birth-order, parental age and cohort effects: They do not find birth order to be related to the Big Five domains of personality except for the Intellect facet of Openness. The sampling of specific cohorts/ages in the NCDS and NLSY 97 data however implies an implicit conditioning on cohorts. By conditioning on cohort/age, in addition to sibship size, the estimates in the between-family model will be biased, as children with higher birth order either have parents born in earlier cohorts or who became parents at an earlier age. Similarly, Damian and Roberts (2015) use data from Project Talent, a large sample of 4 cohorts of high school students originally sampled in 1960 (n= 257,105). They find birth order effects that are quite small in magnitude and ultimately conclude that "the magnitude of the effects would indicate that birth order is not an important consideration to either of these outcomes [personality and cognitive ability]." page 105. A problem in their analysis is that they are unable to control for family fixed effects, and by conditioning on cohort/age in addition to sibship size they also introduce a bias. Also the economics

attempt to fill this void using data on the population of men in Sweden, with personality measured in an evaluation by a certified psychologist conducted when one enlists in the military as well as revealed by occupational sorting.[10] This is the first study using representative population data from multiple cohorts on objective measures of personality assessed at the same age[11] and exploiting within-family variation in birth order to account for (e.g. socioeconomic) confounders. A second contribution is to propose an alternative less data demanding estimation strategy that yields the same results as a family fixed effects model.

We find that first-born children are advantaged on non-cognitive dimensions, and these conclusions are robust to the inclusion of family fixed effects. Third-born children have non-cognitive abilities that are 0.2 standard deviations below first-born children. Importantly, we also demonstrate that occupational sorting is systematically related to birth orderFirst born children are almost 30 percent more likely to be Top Managers compared to third borns; high non-cognitive abilities are particularly prevalent for individuals reaching managerial positions. Later-born children are more likely to be self-employed. We also find that first-born children are more likely to be employed in occupations requiring all Big Five domains of personality—openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Interestingly, we find that all these patterns vary depending on the sex composition of the older children—effect sizes are exacerbated when the later-born son has older brothers relative to older sisters.

There are a number of possible explanations as to why birth order may be related to non-cognitive abilities. There could be biological reasons—as the mother has more children, her womb

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literature on birth order and personality is limited. Argys et al. (2006) (n=19,187) and Avarett, Argys and Rees (2011) (n=27,500) estimate birth order effects on risky adolescent behavior, utilizing similar between-family variation as Damian and Roberts. The study closest to ours is Lehmann, Nuevo-Chiquero, Vidal-Fernandez (2014), who use CNLSY79 data and a within-family specification with cohort effects (n=4,850), and find no birth-order effects for a non-cognitive index. See section III for a more detailed discussion on methodological pitfalls.

[10] Sulloway (1995) argues based on his Meta-analysis that birth order differences are more robust when personality is inferred from real life situations and observer data.

[11] By using assessments at the same age we avoid potential biases induced by personality changes throughout the life span (Dpecht, Egloff and Schmeulke (2011).

becomes more effective at nurturing the fetus (Khong, Adema and Erwich 2003), or successive children may be hypo-masculinized by maternal immunization to the H-Y antigen (Beer and Horn, 2000). Beyond biology, parents could have other influences. Childhood inputs, especially in the first years of life, are considered crucial for skill formation (Cunha and Heckman, 2007; Heckman et al, 2006). First-born children have the full attention of parents, but as families grow the family environment is diluted and parental resources become scarcer (Zajonc, 1976; Zajonc and Marcus, 1975; Price, 2008). In contrast, parents are more experienced and tend to have higher incomes when raising the later born children. In addition, for a given amount of resources, parents may treat first born children differently from second or later-born children.[12] Parents have incentives for more strict parenting practices towards the first born so as to gain reputation for "toughness" needed to induce effort among later born children (Hotz and Pantano, 2015). Children, on the other hand, may also act strategically in competing for parental resources. Rivalry and conflict is a common feature of sibling dynamics (Furman and Buhrmester, 1985; Dunn, 1993; Shantz and Hartup, 1992), where such conflicts, at least in early childhood, tend to center around possession, personal property and access to the mother (Dunn and Munn, 1987). Older siblings take a more dominant role in such conflicts and engage in more elaborate conflict strategies (Howe et al., 2002; Phinney, 1986). In this context Havnes (2010) proposes an economic model where conflict between siblings causes parents to optimally invest more in the dominant, older, sibling. Sulloway (1996) offers a similar argument for birth order effects, based on evolutionary psychology, suggesting that first borns have an advantage in following the status quo, while later borns—by having incentives to engage in investments aimed at differentiating themselves—become more sociable and unconventional in order to attract parental resources. This also implies that the peer environment that each child grows up in is different—first born children have no role models aside

[12] See Becker and Tomes (1976) and Yi et al. (2014) for discussions on how parents differentiate resources across children.

from parents but may themselves act as role models, while later-born children can learn from their elder siblings.

Even if we are unable to disentangle many of these possible mechanisms, we do attempt to understand the differential role of family environment and biology. Taking advantage of the distinction between social and biological birth order induced by adoption or the death of older siblings, we first show that the negative birth order patterns we observe are mainly driven by post-natal environmental differences. In fact, we find that biological factors tend to favor later-born children. We then augment our data with a survey of parents and children at age 13 to identify differences in children's study behavior and parental investments. We find that later-born spend substantially less time on homework and more time watching TV. Interestingly, parents are less likely to discuss school work with later-born children, suggesting that lower parental investment and attention may be one driving force behind the negative birth order effects.

More generally this paper relate to literature on how malignable non-cognitive abilities are to influences in childhood and adolescence.[13]

The paper unfolds as follows. Section 2 describes the data we are using. Sections 3 and 4 describe our estimation strategy and present our main results along with heterogeneous effects by sex composition. Section 5 then discusses possible mechanisms, including biological differences and parental time investment. Finally, Section 6 concludes.

II. Data

To analyze the impact of birth order on personality and occupational choice, we combine information from a variety of Swedish data registers. We begin with the Swedish population

[13] This literature has focused on the accusation of skills in childhood (Cuhna et al. 2006; Cunha and Heckman 2007; Cunha and Heckman 2008; Fredriksson et al 2014) and adolescence (Grönqvist and Lindqvist 2016) or used data twins or adoptees to separate nature and nurture in the transmission of non-cognitive skills (Cesarini 2009;Grönqvist, Öckert and Vlachos, 2016).

register compiled by Statistics Sweden that includes all individuals born in Sweden between 1932 and 2009. The population register contains information on birth year, a link to biological (and adoptive) parents, and a link to biological (and adoptive) siblings. We use this information to define birth order on the maternal side.

The population register is combined with military enlistment data from the Swedish War Archive. Until 2010, all Swedish men were required by law to enlist in the military. The enlistment consists of a series of physical, psychological and intellectual tests and evaluations. In most cases, the enlistment took place the year men turned 18. In our sample, over 85 percent of all men in each cohort are represented; only the physically and mentally handicapped were exempted.[14] This data is available for Swedish male citizens born between 1951 and 1982. From this data, we extract information on non-cognitive and cognitive abilities. These abilities have been shown to be highly correlated with later outcomes such as employment and earnings.[15]

We also incorporate information on employment and occupation. Annual data on employment and self-employment are available from 1985 to 2009 from Statistics Sweden. Employment is measured during a specific week in November and defined in accordance with ILO's employment definition of at least one hour of paid work during the measurement week. Self-employment is defined according to occupational status at the workplace where an individual

[14] The consequences of refusing the military service included prison in up to one year (1994:1809 Lag om totalförsvarsplikt). Importantly, the probability of having valid enlistment records is unrelated to birth order in our main (family fixed) effects specification.

[15] Lindqvist and Vestman (2011) show that non-cognitive ability is a stronger predictor of unemployment than is cognitive ability; and also for having a low annual earnings as well as having a managerial position, whereas cognitive ability is a stronger predictor for earnings above the median. Furthermore, Grönqvist, Vlachos and Öckert (2010) find that both parents' cognitive and non-cognitive abilities are strongly related to the educational and labor market outcomes of their offspring; in particular, parental cognitive abilities are relatively more important for schooling outcomes, while parental non-cognitive abilities are particularly important for labor force participation.

receives the highest income in November.[16] We utilize the information at age 45; if employment and self-employment are not observed at age 45 we take the observation closest to age 45.

The occupation data is available for the 1996 to 2009 period and includes individuals between the ages of 16 and 74 who are in the labor market. This data set covers the population of public sector workers and approximately 50 percent of workers in the private sector. In particular, the private sector data cover all firms with more than 500 employees and a stratified random sample of smaller firms by industry. In most cases the information is provided by the employers' organizations (including employers in the public sector) as part of an agreement between unions and the employer organizations. Firms not covered by this agreement are surveyed by Statistics Sweden. To make the most of the occupational data, we extract up to five years for each individual. In particular, we take the five observations closest to age 45, but restrict the window to ages 35-55. We then calculate the average of each individual's yearly observations, weighted by the inverse of the sampling probability.

Outcome Variable: Non-Cognitive Abilities

Our measure of non-cognitive abilities is based on a standardized psychological evaluation aimed at determining the conscripts' capacity to fulfill the requirements of military duty and armed combat. Central to this are the abilities to cope with stress and to contribute to group cohesion. The evaluation is performed by a certified psychologist, who conducts a 20-30 minute interview with the conscript.[17] The interview follows a specific, and secret, manual that states topics to

[16] Income from self-employment is scaled up by a factor 1.6 to account for under-reporting of income from business, for details see Statistics Sweden (2009).

[17] As a basis for the interview, the psychologist has information about the conscript's results on the tests of cognitive ability, physical endurance, muscular strength, as well as grades from school and the answers from a questionnaire on friends, family, hobbies, but the questionnaire did not ask birth order. The former chief psychologist at the Swedish National Service Administration, Johan Lothigius, who have constructed and overseen the implementation of the instrument states (telephone interview 16 February 2016) that while the relation to parents and friends were covered in the interview, there was no focus on the relation to siblings or birth order. It is highly unlikely that the psychologist knows the birth order of the draftee.

discuss and also how to grade different answers. The overall measure of non-cognitive abilities is based on the evaluation of the following four characteristics.[18]

1. Social maturity (extroversion, having friends, taking responsibility, independence)
2. Psychological energy (perseverance, ability to fulfill plans, to remain focused)
3. Intensity (the capacity to activate oneself without external pressure, the intensity and frequency of free-time activities)
4. Emotional stability (ability to control and channel nervousness, tolerance of stress, and disposition to anxiety)

A conscript is given a high score if he is considered to be emotionally stable, persistent, socially outgoing, willing to assume responsibility, and able to take initiative.[19] In the analysis, we primarily use the composite non-cognitive ability score standardized by year; when we consider individual sub-scores, these, too, are standardized by year.

The conscripts are also evaluated on cognitive ability, which consists of several subtests of logical, verbal, and spatial abilities, as well as a test of the conscript's technical comprehension. The cognitive tests are speeded multiple-choice tests.[20] The design of the test was subject to minor revisions in 1980, 1994 and 2000. The raw test results on these four subtests are combined to a discrete variable of general cognitive ability ranging from 1 to 9 (on a Stanine scale), which has been found to be a good measure of general intelligence (Carlstedt, 2000). We standardize this composite measure of general cognitive ability by enlistment year.

[18] See Mood, Jonsson and Bihagen (2012) for more details.
[19] Psychologists explicitly do not consider motivation for doing the military service when evaluating the conscript. Non-cognitive skill is measured on a 1-9 (stanine) scale, and the four sub-scores are each measured on a 1-5 scale. There is not a direct mapping between the sub-scores and the composite non-cognitive measure; the composite non-cognitive measure is rather set as an overall/general assessment based on the components.
[20] The logic test contains verbally formulated instructions on which answer the test-taker should mark, created to test logical reasoning. The verbal test asks for the synonym of a given word, out of four alternatives. The spatial test asks to find the three-dimensional object that corresponds to a two-dimensional unfolded piece of paper. Finally, the technical test consists of illustrated technical and physical problems. See Carlsson et al. (2015) for an example of the test questions.

Outcome Variable: Occupation

We also use occupation as an additional measure of personality independent from the measurement at enlistment. The occupational sorting is determined by supply and demand of skills for a specific profession, and thus reflects both individuals' preferences and comparative advantage of particular skills in that occupation. While both cognitive and non-cognitive abilities determine sorting, an important part of the variation is due to non-cognitive abilities (Lindqvist and Vestman 2011).

We first break occupations into a number of broad categories that are generally associated with particular personality characteristics and relate birth order to the likelihood of being in one of these occupations. At the broadest level of classification, occupations are divided into ten groups. One such group is classified as Managerial Work, and we define Managers as individuals belonging to this group.[21] This category contains a broad range of managerial positions, from top-level managers to middle- and lower- level management. We then characterize Top Managers in the private and public sector using 3 digit codes that include Directors and Chief Executives (ISCO 121) or Legislators and Senior Government Officials (ISCO 111). About 8 percent of the individuals in our population are Managers and 0.6 percent are Top Managers.[22] We contrast Managers to Creative Occupations since the psychological literature suggests that later borns are more creative and open to experience (Sulloway, 1995 and 1996). Using the 4-digit level occupational codes, we define architects, writers, painters, musicians, and actors, among others, as Creative Occupations.[23] In Appendix Table 1 we show that managers on average have very high

[21] The occupation data is coded according to the Swedish modification of the International Standard for Classifications of Occupations 1988 (ISCO88); at the 3 digit level the Swedish occupational codes are more or less identical to ISCO88.

[22] Non-cognitive (and cognitive) skills are monotonically increasing in these definitions of management: the average standardized non-cognitive (cognitive) skills of Top Managers are 0.80 (0.69), and 0.56 (0.50) for the broader definition of managers. For non-managers the average standardized non-cognitive (cognitive) skills is 0.04 (0.07).

[23] The creative occupations comprise the following ISCO88 codes: Architects, town and traffic planners (2141), Writers and creative or performing artists (245), Photographers (3131), Image and sound recording equipment operators (3132), Decorators and

non-cognitive and that the difference in non-cognitive abilities between (top) managers and individuals in creative occupations is substantially larger than the corresponding difference in cognitive abilities.

We also use detailed information about occupations to assign the importance of particular personality characteristics in the daily functioning of jobs. We then relate birth order to the importance of these characteristics in one's occupation. As a second metric of personality, we classify occupations based on their skill requirements and the incumbents' abilities. The U.S. Department of Labor has developed a comprehensive system of occupational descriptions known as the Occupational Information Network (O*NET) that classifies and describes occupations along several dimensions, including tasks, work behavior, abilities, skills, and work content. For each occupation, the O*NET rates the importance of a large number of personal attributes for success in that occupation.[24] With this data, we retrieve information of non-cognitive abilities to the extent that they are rated important for the job performance in workers' occupation. In particular, we construct variables capturing the importance of (1) social skills and (2) leadership abilities in performing the tasks required in occupations. Following Sackett and Walmsley (2014) we also categorize the personal attributes into the Big Five domains of personality (Bouchard, 1994): Conscientiousness, Agreeableness, Emotional Stability, Extraversion, and Openness.[25] The job attributes from O*NET are then matched to our data.[26]

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commercial designers (3471), Radio, television and other announcers (3472), Street, night-club and related musicians, singers and dancers (3473), Clowns, magicians, acrobats, and related professionals (3474), and Fashion and other models (5210).

[24] For more details see www.onetcenter.org.

[25] The variables are constructed by adding the intensity of following elements (element id); Conscientiousness: Social Perceptiveness (2.B.1.a), Service Orientation (2.B.1.f), Instructing (2.B.1.e), Dependability (1.C.5.a), Integrity (1.C.5.c), Independence (1.C.6), Initiative (1.C.1.c), Persistence (1.C.1.b), Achievement/Effort (1.C.1.a), Attention to Detail (1.C.5.b); Agreeableness: Social Perceptiveness (2.B.1.a), Service Orientation (2.B.1.f), Coordination (2.B.1.b), Negotiation (2.B.1.d), Instructing (2.B.1.e), Integrity (1.C.5.c), Cooperation (1.C.3.a), Concern for Others (1.C.3.b), Social Orientation (1.C.3.c); Emotional Stability: Integrity (1.C.5.c), Self Control (1.C.4.a), Stress Tolerance (1.C.4.b), Adaptability/Flexibility (1.C.4.c); Extraversion: Coordination (2.B.1.b), Persuasion (2.B.1.c), Negotiation (2.B.1.d), Instructing (2.B.1.e), Social Orientation (1.C.3.c), Leadership (1.C.2.b); Openness to Experience: Adaptability/Flexibility (1.C.4.c), Independence (1.C.6), Analytical Thinking

Outcome variable: Parental investments

We examine parental investment behavior using self-reported data on human capital investments at age 13 from the Evaluation-Through-Follow-up (ETF) study; children are surveyed about their effort outside of school and parents are asked about their investments in their children.[27] The ETF-data consists of 10 percent stratified samples of the cohorts born in 1967, 1972, 1982, 1987, 1992 and a 5 percent stratified sample of the cohort born in 1977.[28]

Analysis Sample

In order to observe completed family size, we consider children whose mother was born between 1917 and 1964. We restrict attention to families with at least two children and at most five children.[29] We also exclude all families with twins, as twinning confounds birth order designations. Because we only have military enlistment data for males, our main analyses focuses on men. In analyses of non-cognitive abilities from military enlistment we retain individuals from our underlying population with a valid enlistment record. Moreover, since we want to utilize the within family variation we also restrict attention to families with at least two males; in total we observe 564,789 boys from 260,807 families.[30] When we consider occupations, we again limit our

(1.C.7.b), Leadership (1.C.2.b), Innovation (1.C.7.a). If the same element is used to build up more than one domain, we deflate the intensity weight for that element with the number of times it is used.

[26] This involves several steps. First, we merge the occupational codes (SOC 2000) in O*NET version 14.0 to ISCO88, using a crosswalk table produced by The National Crosswalk Center. Second, we take the employment-weighted average of the job attributes in O*NET, using US Occupational employment statistics. Third, we translate the Swedish occupational classification into the ISCO88 using a crosswalk table from Statistics Sweden. Fourth, we match the data sources together.

[27] The survey is run by the Department of Education at the University of Gothenburg; see Härnquist (2000) for a description of the data. For some of the cohorts a few of the questions that we use were not answered at age 13, but instead at age 10 or 16. In these cases we use this alternative information.

[28] For all cohorts, a two-stage sampling procedure was used. In the first stage, a sample of around 30 municipalities (out of the 280 municipalities) was selected and stratified based on, for example, population size and political majority. In the second stage, classes (schools for the 1987 and 1992 cohort) were randomly sampled within municipality.

[29] We lose about 3 percent of the families by only including families with fewer than 6 children.

[30] Appendix Table 2 compares mean values for full population of males to those of our analysis sample.

sample to those individuals for whom we observe a valid occupation for at least two males in the same family.[31]

In the birth order analyses on human capital investments at age 13 we retain males and females with data from the ETF-survey. In total we observe 36,799 individuals (in the analyses the number of observations is 11,833-32,639 since some questions are not asked for all cohorts and due to attrition).[32]

Tables 1a and 1b present the summary statistics of our analytic samples. In both Tables, Column 1 shows the means for the full sample and Columns 2-6 break them down by birth order. When one examines the patterns by birth order, it seems clear that, along most dimensions, later-born children have worse outcomes than earlier born children. However, these simple descriptive statistics can be misleading. When one looks at background variables by birth order, one sees the same patterns—characteristics such as mother's education and mother's age at first birth are declining with birth order (and average family size is increasing), suggesting the need for a more rigorous analysis.

III. Empirical Strategy

It may be conceptually hard to think about causal effects of birth order, since the birth order of siblings cannot easily be manipulated. The hypothetical experiment we have in mind, however, is to randomly assign the order in which two fertilized eggs are placed into a woman's womb. Although this thought experiment is more or less infeasible – with the possible exception of IVF treatments – it makes clear that birth order effects should capture any differences in prenatal or postnatal environment between siblings, but hold the genetic makeup constant. As it turns out,

[31] The cognitive skills and personality traits measured at the enlistment or as manifested in the occupational choice are strongly and independently related to mid-life wages, as shown in Appendix Table 3. In Appendix Table 4a-b we also report the correlation the composite non-cognitive ability score and the sub-scores between the different measures of cognitive ability and personality traits.
[32] Appendix Table 5 presents summary statistics for this sample.

nature provides a close to ideal experiment for studying birth order effects. At conception, each child receives a random half of each parent's genes, which makes them share on average half their genes. Thus, the genetic makeup is not expected to differ systematically between siblings in general or by birth order in particular. The effect of birth order can, thus, be identified by simply comparing personalities of siblings within the same family.

In practice, most studies on birth order estimate versions of the following parsimonious model for individual i in family j:

$$Y_{ij} = \alpha + \sum_{k=2}^{5} \beta_k I(BO_{ij} = k) + \sum_{l=3}^{5} \gamma_l I(FSIZE_j = l) + \sum_{m=2}^{M} \delta_m I(YOB_{ij} = m) + \sum_{n=2}^{N} \theta_n I(MYOB_j = n) + \sum_{o=2}^{O} \pi_o I(MAGE_j = o) + \tau X_j + \varepsilon_{ij}, \quad (1)$$

where Y_{ij} is a measure of non-cognitive abilities, BO_{ij} is birth order (the omitted category is first-born child), $FSIZE_j$ is family size, YOB_{ij} is the child's year of birth, $MYOB_j$ is mother's year of birth, $MAGE_j$ is mother's age at first birth, and X_j is a vector with family background variables.

The family size controls address the fact that later-born children are more likely to be observed in larger families, and that outcomes of children may differ by family size. When data include all siblings in a family, any time-invariant family characteristic (e.g. mother's year of birth and mother's education) is balanced by birth order once family size is controlled for.[33] More generally, family background for a given sibship size is expected to be balanced by birth order in random samples of the population. In earlier studies based on non-representative samples

[33] To see this, assume there are 1,000 families with two children. Then, the 1,000 first-born children will on average have the same parental background as the 1,000 second-born children since they all come from the same 1,000 families.

conditioning on family size does not, per se, break the correlation between birth order and family background.

Hence, with representative data it is sufficient to control for family size to estimate the reduced form effects of birth order. But in order to get a more structural interpretation of the estimates, many studies on birth order typically also control for the child's year of birth (or age). This is because children with a higher birth order come from more recent cohorts, and the birth order estimates may therefore pick up cohort trends in non-cognitive abilities.[34] An unintended consequence of adding these controls is that it typically introduces imbalances in family background by birth order. This is because children of higher parity, who are born the same year as children with lower birth order, on average, have mothers who are born earlier, started to have children at a younger age, and have shorter child spacing. This tend to bias the estimates downwards[35]

It is common that studies also condition on the mother's year of birth, which both accounts for cohort differences in mothers' socio-economic status and mother's age at child's birth. But this may exacerbate the negative bias.[36] In addition, some studies control for mother's age at first birth to account for the correlation between birth order and early childbearing. Much of the remaining between-family variation in birth order then comes from differences in child spacing. To the extent that the spacing between children is related to unobserved family characteristics, the estimates of

[34] Note that the common practice to standardize outcomes by birth cohort (or age) may not be enough to account for cohort effects, since standardization typically does not hold family size or birth order constant.
[35] In our data, mothers to third-born children are on average born 7.3 years earlier, and had their first child 0.9 years earlier, than mothers to first-born children, after controlling for dummy variables for family size and child's year of birth. Mothers to third-born children also have 0.8 years less schooling, on average, than mothers to first-born children.
[36] Mothers to third-born children where 6.8 years younger when they had their first child compared to mother's to first-born children, after controlling for dummy variables for family size, child's year of birth and mother's year of birth in our data. They also had 1.3 years less schooling. The net effect of adding the controls for mother's year of birth depends, however, on (1) the selection into early childbearing, (2) the cohort trends in mother's socio-economic status and (3) the effect of mother's age at child's birth.

birth order may still be biased.[37] In an attempt to reduce any remaining bias most studies on birth order effects add socio-economic controls. In this study, we condition on mother's educational level when we estimate equation (1).[38]

As a second specification, we include family fixed effects, thereby differencing out any time-invariant characteristics within a family. This, will, thus, take care of any remaining association between birth order and family background. Formally we estimate the following model:

$$Y_{ij} = \alpha' + \sum_{k=2}^{5} \beta_k' I(BO_{ij} = k) + \sum_{l=2}^{L} \gamma_l' I(YOB_{ij} = l) + \lambda_j + \varepsilon_{ij}' \qquad (2)$$

where λ_j is a family fixed effect. We are, thus, comparing siblings within the same family to estimate our birth order effects. Note that we are still including indicators for children's year of birth, although family size, mother's year of birth, mother's age at first birth and mother's education drops out.

Estimating family fixed effects is not feasible in many data sets, since it requires repeated observations of siblings from the same family along with a unique family identifier. We therefore propose a third, less data demanding, specification that yields the same results as the family fixed effects. The defining characteristic of the family fixed effects estimator is that it exploits only the variation in birth order within families of the same type. In particular, it compares differences in outcomes by birth order in families of the same size and with children born in specific years. This can, however, also be obtained by adding fixed effects for all combinations of family size and sibling's year of birth. Formally, we would estimate the following family type fixed effects model:

[37] The correlation between birth spacing (between first and second child) and mother's schooling is highly non-linear in our data. Compared to mothers who have their first two children within a year, mother's with a birth spacing of 2-3 years are on average positively selected, whereas mother's with longer spacing typically have shorter schooling. The direction and magnitude of the bias, however, is likely to depend on the context.

[38] The education levels are: less than 7 years of primary education; 7-9 years of primary education, 1-2 years of upper-secondary education, 3-4 years of upper-secondary education; 1-2 years of post-secondary education; 3 years or more of post-secondary education; second stage of tertiary education.

$$Y_{ij} = \alpha'' + \sum_{k=2}^{5} \beta_k'' I(BO_{ij} = k) + \sum_{l=2}^{L} \gamma_l'' I(YOB_{ij} = l) +$$

$$\sum_{m=2}^{M}\sum_{n=2}^{N}\sum_{o=2}^{O}\sum_{p=2}^{P}\sum_{q=2}^{Q} \kappa_{mnopq} I(YOB_j^1 = m, YOB_j^2 = n, YOB_j^3 = o, YOB_j^4 = p, YOB_j^5 = q) + \varepsilon_{ij}'', \quad (3)$$

where YOB_j^k is the year of birth for a sibling with birth order *k* in family *j*.[39] Although this estimator has less stringent data requirements than the family fixed effects estimator, it still balances family background by birth order.[40] It also reduces the number of fixed effects substantially.[41] We will use the family type fixed effects estimator when studying possible mechanisms behind the effects in the smaller ETF-dataset.

One identifying assumption that we are implicitly are imposing—that we share with all studies on birth order effects—is that family size is pre-determined, or at least not endogenous to children's realized outcomes. For example, if parents followed an optimal stopping rule where they stopped having children when they had a "bad draw", we would find negative effects of being later born even if there were no such birth order effects. This can be viewed as a sample selection problem, where we are more likely to observe individuals with higher parity in families with "good draws" of their earlier-born children. We attempt to check how sensitive our estimates are to violations of the assumption of pre-determined family size by imputing missing—or unobserved—children. More specifically, in Sweden there is a strong two-child norm, and we therefore investigate how the effect of being second-born would have changed if single-child families had

[39] We set year of birth to zero when birth order exceeds family size.
[40] For example, for the family type with two children born 1970 and 1973, the first-born children born in 1970 will on average have the same background as the second-born children born in 1973. Since the dummy variables for birth order and year of birth are exactly collinear with the same family type, the cohort effects are identified by comparing the within-family difference in personality by birth order for families with different combinations of children's year of birth.
[41] In our data, the number of fixed effects is reduced by more than 90 percent in the family type fixed effects estimator compared to the family fixed effects estimator.

not deviated from this norm.[42] To do so, we randomly draw a hypothetical second child for single-child families under the assumption of no birth order effects. In practice, we divide families into different strata defined by the interaction between mother's year of birth (10 classes), mother's age at first birth (30 classes), mother's highest educational level (7 classes) and father's income (20 classes). Within each stratum, the missing second-born children are randomly drawn from the outcome distribution of first-born children. The observed sample of first-born children, along with the randomly drawn second-born children in single-child families, is then added to the observed sample of first- and second-born children in larger families, and the effect of being second born is re-estimated. We repeat this procedure 1,000 times and report the average point estimates and standard errors.

It is likely that this exercise tends to bias the estimates toward zero for two reasons. First, we draw the potentially missing children from the outcome distribution of first-born children, implicitly assuming that there are no birth order effects. Second, we assume that all single-child families would have had another child if the outcome of the first child would have been different. In reality, most single-child families would presumably not have wanted more children irrespectively of the outcome of the first child. To restrict the number of missing children somewhat, we also draw second-born children until we reach the probability at which mothers of different ages can have a child (Eijkemans et al, 2014).[43]

Under the assumption that all single-child families would have had another child, and assuming no birth order effects, the estimated effect of being second-born falls by roughly 30

[42] In Sweden, about 80 percent of all families have at least two children, and almost 50 percent have exactly two children.
[43] This exercise also assumes that there are no causal effects of family size on personality. This is in line with Black, et al (2005) that find no effect of family size on education and earnings in Norway.

percent.[44] Thus, even under quite extreme conditions, the lion's share of the effect of the birth order remains. If we instead impose the restriction that older women are less likely to have children, the estimated effects of being second-born falls by about 20 percent. Analogously, if we were to reduce the share of "missing" second-born children further, we would slowly come back to our baseline estimate. In sum, this exercise suggests that the birth order effects may be overstated if families determine family size in response to the realization of their offspring's outcomes. Still, it is not possible to rule out quite substantial birth order effects even in the extreme case that all observed single-child families endogenously had decided to stop having children.

IV. Results

In Table 2, Panel A, Column 1, we estimate the relationship between the standardized non-cognitive abilities measure and birth order, with first born as the omitted category, controlling for dummy variables for family size, child's year of birth, mother's year of birth, mother's age at first birth and mother's educational level. Columns 2-5 then estimate the birth order effects by family size, to allow for heterogeneous effects of birth order by family size. Two things are clear from these results. First, non-cognitive abilities are monotonically declining by birth order, with second-borns performing worse than first-borns and third-borns performing worse than second-borns, etc. Second, the patterns are similar when we estimate the model with family size dummies and when we estimate them separately them by family size.

The results with family fixed effects are presented in Panel B of Table 2. We observe very similar patterns to those from the previous specification, although the magnitudes are larger with family fixed effects. Moving from a first born to a third born child will result in approximately

[44] See Appendix Table 6.

0.20 standard deviations lower non-cognitive abilities, and the results are similar when estimated by family size.[45]

Given that cognitive and non-cognitive abilities are correlated (they have a correlation of 0.38 in our data), an obvious issue is whether the effect of birth order on non-cognitive skills is merely picking up the effect of cognitive abilities. Table 2 Column 6 addresses this issue by examining the effects of birth order on non-cognitive abilities, controlling for cognitive ability. The effects of birth order on non-cognitive ability are reduced by almost 40% with the inclusion of controls for cognitive ability. However, there remain sizable effects of birth order on non-cognitive ability, with a move from first born to third born resulting in 0.11 standard deviations decline in non-cognitive ability.[46]

While the general patterns are clear, considering only the aggregate measures of skill may mask differences across the different components of non-cognitive ability. Table 3 breaks non-cognitive abilities into sub-categories based on the different aspects of the psychological evaluation; all specifications include family fixed effects in addition to the standard controls, and all measures of non-cognitive ability are standardized. Column 1 reports the family fixed effects results from Table 2 for the aggregate measure of abilities as a point of reference, while Columns 2-5 represent the results when different components of the test are considered individually.

[45] Appendix Table 7 presents the corresponding results for cognitive skills. Consistent with earlier work, we find that cognitive skills are declining with birth order. To provide a comparison of our results on cognitive skills to the existing literature, Black, Devereux and Salvanes (2011) use data from Norway and find that moving from a first born to a third born reduces IQ by about one quarter of a standard deviation, while we find slightly larger effects of almost 30% of a standard deviation. Generally, the effect of birth order is stronger for cognitive than for non-cognitive skills; however, this could in part be explained by differing degrees of measurement error across the two variables. Because we have standardized the ability measures with the observed (instead of the true) standard deviation, the estimates of the effect of birth order on the true standardized ability distribution will be downwardly biased. In an earlier paper on intergenerational mobility, Grönqvist, Vlachos and Öckert (2010) estimated the reliability ratio for cognitive skills at 0.72 and for non-cognitive abilities to about 0.5. If we use these reliability ratios to correct our estimates of being the second child in the family, the estimate for cognitive ability becomes -0.213 (sqrt(1/0.72)×(-0.181)) and the estimate for non-cognitive skills -0.163 (sqrt(1/0.5)×(-0.115)). Thus, once adjusting for differences in the extent of measurement error in the ability measures, the effects of birth order becomes more similar for the two types of abilities.

[46] Since cognitive skills is an outcome variable the results should be interpreted with some caution. However, if we instead use the correlation between the skill measures (0.37), and reduce the estimates with this share, we find very similar results.

What is most notable about these results is the consistency of the patterns across the different components of the test. Estimates are almost exactly the same regardless of whether we measure social maturity, psychological energy, emotional stability, or intensity. First-borns score the highest and it declines by about 0.08-0.10 of a standard deviation for each of the next two births. Importantly, these results suggest that there may not be any significant cost to considering the aggregate measures of non-cognitive abilities. These birth order effects are larger and more stable than found by Damian and Roberts (2015) but smaller than the results reported in the Meta-analysis by Sulloway (2010).[47] Moreover, contrary to the hypothesis of Sulloway (1995, 1996), but consistent with findings by Damian and Roberts (2015), we find that first-borns are more emotionally stable (less neurotic) than later-borns.

Occupation[48]

Another metric of personality is reflected in occupational sorting. While there are a number of articles and books in the popular press that have highlighted the relationship between birth order and job careers, to the best of our knowledge there has yet to be a systematic analysis of the relationship between birth order and occupation using large-scale administrative data.[49]

Before considering occupation, we first examine employment probabilities. In Table 4 Column 1, we see the estimated relationship between birth order and employment. Note that in all

[47] To compare our estimates with Damian and Roberts (2015) and Sulloway (2010) we have also estimated the partial correlations for first borns versus later borns. We find the correlation for birth order to be 0.041 for overall non-cognitive ability, 0.039 for Social Maturity, 0.024 for intensity, 0.040 for Psychological Energy, and 0.034 for Emotional Stability. Damian and Roberts finds the partial correlation between personality and first versus later borns the range between 0.00 (Vigor dimension of Extraversion) and 0.04 (Mature personality dimension of Conscientiousness). The correlation reported by Sulloway is based on 10 studies with 7210 individuals and are in the range 0.00 to 0.18, but these estimates may inflated by contrast effects and stereotype effects since subjects explicitly rate their personality relative to their older/younger sibling.

[48] We here only report results for men, but the corresponding results for women are qualitatively the same. These results are available in Appendix B.

[49] For a popular example, see The Birth Order Book: Why You Are the Way You Are by Kevin Lehman (2009) or The Birth Order Effect: How to Better Understand Yourself and Others by Clifford E. Isaacson and Kris Radish (2002). Other examples include "The Achiever, the Peacemaker and the Life of the Party: How Birth Order Affects Personality" Huffington Post, December 23 2013, "Can birth order determine your career?" CNN October 22 2008, and "Firstborn Girls Are Statistically More Likely to Run the World" Slate April 28 2014.

models we are using the fixed effects specification and are estimating linear probability models unless otherwise noted. There is a clear pattern of declining employment, with increasing birth order, with third-born children almost one percentage point less likely to be employed, from a mean of .88. This is consistent with non-cognitive abilities being especially important for explaining outcomes in the lower end of the distribution (e.g. Lindqvist and Vestman, 2011).[50]

We next consider self-employment; because of the uncertainty in earnings, self-employment is often considered a decision undertaken by more risk-loving individuals. We find that later born children are more likely to be self-employed than first-born children. Note, however, that while self-employment may be viewed as a risk-loving choice, we cannot distinguish whether the higher likelihood of self-employment is a response to worse labor market prospects or due to a lower aversion to pursue risky projects.

Columns 3 and 4 consider the likelihood that an individual will be in a management position, with the first column (Top Managers) the most narrowly defined to include only CEOs and top executives, and the second column to include a broader definition of managers. It is interesting to note that, in both cases, we see that later-born children are less likely to be in a management position, regardless of definition. In fact, first-borns are 28 % more likely to be a Top Manager compared to third borns. Finally, when we examine creative occupations (Column 5), we see no such pattern.

To more directly relate occupations to non-cognitive abilities we next consider the probability to sort into occupations where certain personality traits are required to succeed in that occupation, with the skill requirements taken from the O*NET dataset. Table 5 presents the results when we consider the job skill requirements, measured on a scale of one to five (with five being

[50] In appendix Table 1 we see that a one standard deviation higher non-cognitive skill is associated with 4.25 percentage points higher employment probability in our data. The corresponding number for cognitive abilities is 3 percentage points.

most important) and then standardized. The traits we consider are Sociability, Leadership Ability, Conscientiousness, Agreeableness, Emotional Stability, Extraversion, and Openness. The five latter characteristics correspond to the Big 5 personality traits, which is often used by psychologists as metrics to describe personality. When we examine birth order patterns, we see that there are very strong birth order effects, with first-born children being in occupations with the highest requirements along all these dimensions. Interestingly, the coefficients are quite similar across characteristics. Openness and Conscientiousness appear to have the strongest relationship to birth order.

Given our earlier findings, it is not surprising that later born children are in jobs requiring less Conscientiousness or Leadership ability. However, it *is* surprising that later-borns are sorted into occupations that require less Social ability, Agreeableness, Emotional stability and Openness to experience—characteristics that are associated with later born children by Sulloway (1995, 1996). The pattern that first borns are stronger in all Big Five dimension is however consistent with the overall findings by Damian and Roberts (2015) [51]

Heterogeneous Effects

While these patterns suggest an absolute advantage for first-born children along almost all dimensions, one might think the effects of birth order may differ depending on the sex composition of the family. For example, a third born son who is the first male child in the family may have a different experience, and outcome, from a third born son who is the third male child in the family. Existing research has been mixed as to the effect of the sex composition of siblings on children's outcomes—work by Dahl and Moretti (2004), Butcher and Case (1994), Conley (2000), and

[51] The partial correlations for first borns versus later borns with our data are 0.025 for Social ability, 0.024 for Leadership ability, 0.029 for Conscientiousness, 0.021 for Agreeableness, 0.024 for Emotional stability, 0.025 for Extraversion, 0.033 for Openness. A major difference between these estimates and the results by Damian and Roberts (2015) – except for the empirical model – is that our measures of Big Five are inferred by occupational sorting, while Damian and Roberts use self-reports.

Deschenes (2002) all find some evidence of sex-composition effects, while Kaestner (1997) and Hauser and Kuo (1998) find no evidence for these effects.

Tables 6 and 7 address this issue by allowing for heterogeneous effects of birth order depending on the sex composition of the family. We parameterize the gender composition of the siblings by allowing for two birth order variables—the standard measure and then a measure of the birth order among the boys in the family.[52] When we estimate this new specification, again including family fixed effects and cohort effects, we find that there are differential effects for being born late when there are more boys among the older siblings. In Column 1 of Table 6, we see that for the composite measure of non-cognitive ability, the negative effects of birth order are more than twice as large if one is a later-born boy with older brothers.[53] Since non-cognitive abilities are strong predictors of employment, it is not surprising that birth order among boys is also strongly related to employment, as is shown in column 2. When we examine occupational outcomes in Columns 3-6, the effects are less consistent. However, it is notable that when we consider creative occupations, later-born boys are less likely to enter these occupations if they have older sisters while later-born boys are more likely to enter these occupations if they have older brothers. Finally, when we examine skill requirements for occupations (Table 7), we again find that the negative effects of birth order tend to be exacerbated among boys with older brothers. Unfortunately, however, these estimates are not significantly different from zero, but are in line with our earlier findings that later-born boys are particularly affected by the presence of older brothers.

We cannot determine whether these effects are due to parental investments or male peer influence such as increased sibling competition where younger brothers have problems competing with older brothers.

[52] Using a measure of the share of boys among the older siblings generated very similar results.
[53] Appendix Table 8 reveals that the effects of birth order among brothers are relatively smaller for cognitive skills than for non-cognitive skills.

V. Mechanisms

Given the patterns we observe, we next attempt to disentangle possible underlying mechanisms.

Nature v. Nurture

As noted earlier, there are a number of possible explanations for birth order effects in non-cognitive abilities. The first is biological—is there something about the experiences in-utero that is affecting the development of a child's personality.

To attempt to isolate this mechanism, we exploit two features of our data that allow us to distinguish biological from social birth order. Building on earlier work by Kristensen and Bjerkedal (2007), we exploit the fact that some families experienced the death or adoption of older siblings—as a result, the biological birth order is different from the social birth order in these families.[54] Table 8 presents the results when we estimate the relationship between biological and social birth order and children's non-cognitive abilities.[55] Column 1 presents the results from the earlier specification with family fixed effects and Column 2 shows results where social and biological birth order is allowed to vary. The results support the idea that the negative effect of birth order works entirely through the social birth order, suggesting that earlier born children have better outcomes as a result of their postnatal experiences as opposed to better prenatal environment.[56] In fact, we find evidence for a positive effect of biological birth order, which is consistent with studies documenting higher birth weight and better placenta for later-born children

[54] To separate social and biological birth order we use families where either a child has died before 3 months of age or where a child is adopted away. For most adopted children we unfortunately cannot observe the exact date for when they were given up. However, for children born in 1960 we see that 87 (94) percent of adopted children are given up before they are 3 (6) months old. Families receiving an adopted child are excluded from the analysis. Stillborns are not included in the analysis since they are not included in the population and never enter the population registers. However, children born alive but who dies short after delivery – possibly the same day – are included in the analysis. About 2.5 percent of the families in our sample have either lost or adopted a child.
[55] When we estimate the results separately for adoptees and deaths, we get consistent results but much less precisely estimated.
[56] The results for both cognitive and non-cognitive skills are reported in Appendix Table 9.

(e.g. Brenoe and Molitor 2015; Juntunen, et al., 1997; Khong, Adema and Erwich 2003; Wilcox et al., 1996). The overall effect is thus an underestimate of the social influence of the family as it also captures the positive biological impact of birth order on non-cognitive abilities.[57]

Parental Investment Behavior

Given the environmental nature of birth order effects, we next incorporate survey data of children at age 13 to examine how parental investment behavior and children's study habits relate to birth order.

While there has always been much interest in parental investment in children, there is surprisingly little compelling work on differences in parental behavior by birth order of children, most likely due to the stringent data requirements. One of the first convincing studies was done by Price (2008), who used data from the American Time Use Survey to examine the relationship between parental time with children and birth order. He finds that parental quality time with children is declining with birth order. Unfortunately, he is limited in that he does not observe time spent with each child and is unable to look within families. Monfardini and See (2012) also find significant birth order effects in parental time, although these differences cannot explain the differences in cognitive abilities across birth order. Hotz and Pantano (2013) document that later-born children are treated differently in that parents are more strict with first-borns and they provide a model of reputation in which strict rules for earlier born children spill over into the behavior of later-born children. In the same vein Avarett, Argys and Rees (2011) find that later born children receive less adult supervision. Most recently, work by Lehmann et al (2014) uses data from the Children of the National Longitudinal Survey of Youth 1979 (NLSY79) and documents differences in parental behavior and home environment that they argue can explain a substantial fraction of the

[57] When we do similar analyses on the occupational outcomes, our results are too imprecise to draw any conclusions. Results are available from the authors upon request.

early birth order effects they document.

We examine the issue of parental investment behavior in the Swedish context using the ETF-survey, which is a substantially larger dataset than earlier studies. The ETF-survey samples one individual from each household, which makes it impossible to estimate our preferred specification that includes family fixed effects. However, as discussed above, we can still obtain balance in family background by birth order by including fixed effects for all possible combination of the sibling's year of birth. For example, if a particular family has children born in 1993, 1995, and 1997, we would create an indicator equal to one if there were three children in the family and those three children were born in 1993, 1995, and 1997. Although we are not looking within families, we are still comparing children of different birth order but whose family birth composition, including children's ages and child spacing, is exactly the same.[58]

The results on children's effort and parental investments are presented in Table 9. Not surprising, given our results on non-cognitive abilities and the existing literature on the effects of birth order on education, earnings and cognitive abilities, we find that the number of hours per week doing homework is declining significantly with birth order, with later born children spending almost an hour less per week on homework. They are also much less likely to read books, and they spend substantially more time watching TV or playing on the computer. Interestingly, parents report that they spend less time discussing school work with later-born children, suggesting that parental investments falls by birth order. We find no consistent difference in whether or not parents help with homework or in parental expectations by birth order.

Taken together, we think these results suggest that parents invest less in later borns; e.g.

[58] To verify that this is equivalent to family fixed effects specifications, Appendix Table 10 presents the results when we estimate the relationship between birth order and non-cognitive skills using the two specifications: the first panel presents our preferred specification with family fixed effects and the second panel uses the family type fixed effects described above. Because we are so precisely controlling for family type, the results are identical, suggesting that this approach is sufficient to avoid concerns about omitted variable bias. We have also verified that covariates are balanced when we run the alternative specification.

being less strict and providing less parental supervision, as suggested by Hotz and and Pantano (2013) and Avarett, Argys and Rees (2011).

VI. Conclusion

Popular press is replete with articles and books touting the relationship between birth order and personality. However, due to data limitations, there is very little convincing evidence documenting these relationships. Using unique registry data from Sweden on a large sample of men, we are able to estimate the relationship between birth order and a variety of measures of non-cognitive abilities and occupational characteristics, all of which serve as reasonable proxies for individual personalities.

Consistent with the existing literature on earnings and IQ, we find evidence that non-cognitive abilities are declining with birth order. This is true across a variety of measures of abilities, including the Big Five dimensions of personality. These results are slightly at odds with the psychological literature where later borns are expected to be more emotionally stable, open to experience and social. We also find systematic differences in occupational sorting by birth order—first-born children are more likely to be managers, while later-born children are more likely to be self-employed. This occupational sorting is still consistent with predictions from evolutionary psychology where first borns are suggested to dominate younger siblings, whereas later borns are assumed to use more unorthodox strategies to attract attention.

All these patterns vary by the sex composition of the children—later born boys are particularly affected when their older siblings are brothers. For non-cognitive ability, the negative effects of birth order are more than twice as large if one is later born with older brothers. However, when we consider creative occupations, later-born boys are less likely to enter these occupations if

they have older sisters while later-born boys are *more* likely to enter these occupations if they have older brothers.

When we examine possible mechanisms underlying the observed birth order patterns, we find support for post-birth environmental factors driving the negative birth order effects, while biological factors tend to favor later-born children. Additionally, we find that study behaviors vary by birth order; teenagers are more likely to read books, spend more time on homework, and less time watching TV if they are first-born. We also find that some parental investments decline by birth order, which could partly explain the negative effects of birth order on non-cognitive abilities. However, this does not rule out that other factors—including parental resources or sibling competition—can help to explain these patterns.

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Table 1a. Descriptive statistics – main data

	Full Sample	First child	Second child	Third child	Fourth child	Fifth child
Outcome variables:						
Overall non-cognitive ability	0.032	0.124	0.035	-0.065	-0.190	-0.302
	(0.989)	(0.978)	(0.983)	(0.996)	(0.994)	(0.994)
Social maturity	0.016	0.093	0.014	-0.058	-0.162	-0.256
	(0.989)	(0.989)	(0.981)	(0.991)	(0.983)	(0.988)
Intensity	0.034	0.100	0.042	-0.044	-0.132	-0.217
	(0.994)	(0.990)	(0.991)	(0.996)	(0.996)	(0.986)
Psychological energy	0.020	0.099	0.019	-0.060	-0.157	-0.252
	(0.993)	(0.997)	(0.987)	(0.988)	(0.978)	(0.972)
Emotional stability	0.024	0.096	0.027	-0.050	-0.154	-0.234
	(0.987)	(0.984)	(0.981)	(0.988)	(0.982)	(0.988)
Background variables:						
Family size	2.974	2.708	2.748	3.430	4.265	5.000
	(0.897)	(0.799)	(0.815)	(0.639)	(0.441)	(0.000)
Age, 2010	43.387	45.268	42.444	41.904	42.645	42.642
	(7.853)	(7.460)	(7.985)	(7.827)	(7.427)	(6.661)
Mother's age at first birth	0.063	0.064	0.064	0.062	0.060	0.058
	(0.011)	(0.011)	(0.011)	(0.010)	(0.009)	(0.009)
Mother's years of schooling	10.064	10.303	10.191	9.756	9.039	8.460
	(2.720)	(2.717)	(2.719)	(2.698)	(2.480)	(2.147)
Observations	564,788	205,619	215,913	103,845	31,851	7,560

Notes: The sample is restricted to men in families with at least two males born 1952-82 with valid draft records. Non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Family size is the number of children to which the mother has given birth. Mother's years of schooling are measured at age 45.

Table 1b. Descriptive statistics – employment and occupational data

	Full Sample	First child	Second child	Third child	Fourth child	Fifth child
Employment and occupation:						
Employed	0.825	0.833	0.829	0.816	0.799	0.793
	(0.380)	(0.373)	(0.377)	(0.388)	(0.401)	(0.405)
Self-employed	0.057	0.057	0.057	0.059	0.060	0.057
	(0.233)	(0.232)	(0.232)	(0.236)	(0.237)	(0.232)
Top managers	0.006	0.007	0.005	0.004	0.003	0.002
	(0.068)	(0.077)	(0.066)	(0.059)	(0.052)	(0.035)
Managers	0.085	0.096	0.084	0.074	0.063	0.051
	(0.256)	(0.270)	(0.255)	(0.241)	(0.222)	(0.199)
Creative Occupations	0.006	0.006	0.006	0.007	0.007	0.007
	(0.073)	(0.069)	(0.075)	(0.079)	(0.076)	(0.079)
Job Requirements:						
Social ability	-0.096	-0.036	-0.091	-0.162	-0.261	-0.330
	(0.946)	(0.960)	(0.944)	(0.930)	(0.900)	(0.852)
Leadership ability	0.065	0.118	0.072	0.005	-0.083	-0.123
	(0.990)	(1.010)	(0.983)	(0.971)	(0.960)	(0.893)
Conscientiousness	-0.078	-0.016	-0.069	-0.148	-0.260	-0.325
	(0.969)	(0.978)	(0.964)	(0.961)	(0.943)	(0.899)
Agreeableness	-0.296	-0.248	-0.288	-0.351	-0.432	-0.492
	(0.933)	(0.944)	(0.932)	(0.921)	(0.896)	(0.857)
Emotional Stability	-0.294	-0.245	-0.285	-0.351	-0.439	-0.493
	(0.962)	(0.963)	(0.961)	(0.960)	(0.948)	(0.922)
Extraversion	-0.037	0.025	-0.031	-0.105	-0.208	-0.275
	(0.970)	(0.988)	(0.966)	(0.950)	(0.918)	(0.862)
Openness to experience	0.065	0.129	0.073	-0.007	-0.122	-0.183
	(0.970)	(0.976)	(0.963)	(0.964)	(0.958)	(0.914)
Observations	727,111	267,923	271,373	132,665	44,108	11,042

Notes: The sample is restricted to men in families with at least two males born 1941-74. The occupational information covers the 1996-2009 period, and we have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual. The information on job requirements is derived from the O*NET occupational descriptions and all measures are standardized in the full sample of workers. The data on employment and occupations covers to the full sample (employed and non-employed), while the job requirements are restricted to employed individuals.

Table 2. Effects of birth order on children's non-cognitive ability

	All families	Two-child families	Three-child families	Four-child families	Five-child families	All Families w/control for cognitive Skills
	Panel A: Family size FE					
Second child	-0.096***	-0.075***	-0.088***	-0.080***	-0.105***	-0.049***
	(0.004)	(0.007)	(0.006)	(0.009)	(0.018)	(0.003)
Third child	-0.157***		-0.171***	-0.156***	-0.178***	-0.101***
	(0.006)		(0.009)	(0.012)	(0.020)	(0.005)
Fourth child	-0.181***			-0.228***	-0.245***	-0.159***
	(0.010)			(0.017)	(0.024)	(0.008)
Fifth child	-0.196***				-0.314***	-0.215***
	(0.016)				(0.031)	(0.013)
R-squared	0.033	0.016	0.025	0.028	0.022	0.159
	Panel B: Family FE					
Second child	-0.115***	-0.111***	-0.114***	-0.093***	-0.126***	-0.061***
	(0.004)	(0.008)	(0.006)	(0.010)	(0.018)	(0.004)
Third child	-0.199***		-0.224***	-0.194***	-0.193***	-0.109***
	(0.007)		(0.011)	(0.014)	(0.022)	(0.007)
Fourth child	-0.247***			-0.290***	-0.248***	-0.135***
	(0.012)			(0.022)	(0.031)	(0.011)
Fifth child	-0.302***				-0.334***	-0.172***
	(0.019)				(0.043)	(0.018)
R-squared	0.008	0.009	0.010	0.008	0.009	0.091
Observations	564,788	195,852	226,469	103,574	38,893	564,788

Notes: The sample is restricted to men in families with at least two males born 1952-82 with valid draft records. Non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Each column in each panel represents a separate regression. All regressions control for dummy variables for child's year of birth, dummy variables for mother's year of birth, dummy variables for mother's age at first birth and dummy variables for mother's educational attainment. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Table 3. Effects of birth order on children's different types of non-cognitive abilities

	Non-Cognitive Ability				
	Overall Ability	Social Maturity	Intensity	Psychological Energy	Emotional Stability
Second child	-0.115***	-0.101***	-0.077***	-0.109***	-0.092***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Third child	-0.199***	-0.162***	-0.161***	-0.184***	-0.153***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Fourth child	-0.247***	-0.197***	-0.196***	-0.224***	-0.197***
	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)
Fifth child	-0.302***	-0.226***	-0.245***	-0.276***	-0.232***
	(0.019)	(0.020)	(0.020)	(0.020)	(0.020)
R-squared	0.008	0.005	0.005	0.006	0.005
Observations	564,788	564,788	564,788	564,788	564,788

Notes: The sample is restricted to men in families with at least two males born 1952-82 with valid draft records. Non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Each column in each panel represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Table 4. Effects of birth order on children's employment and occupational sorting

	Employed	Self-employed	Top Managers	Managers	Creative Occupations
Second child	-0.010***	0.006***	-0.0017***	-0.010***	-0.0002
	(0.002)	(0.001)	(0.0005)	(0.002)	(0.0005)
Third child	-0.017***	0.008***	-0.0020**	-0.015***	-0.0001
	(0.003)	(0.002)	(0.0008)	(0.003)	(0.0008)
Fourth child	-0.020***	0.007***	-0.0018	-0.016***	-0.0003
	(0.004)	(0.003)	(0.0011)	(0.004)	(0.0012)
Fifth child	-0.022***	0.006	-0.0026*	-0.021***	-0.0006
	(0.007)	(0.004)	(0.0015)	(0.007)	(0.0018)
R-squared	0.005	0.001	0.001	0.006	0.001
Observations	727,111	727,111	521,779	521,779	521,779

Notes: The sample is restricted to men in families with at least two males born 1941-74. Columns (3) – (5) are based on occupational data for the 1996-2009 period. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Table 5. Effects of birth order on sorting into jobs with different skill requirements

	Social Ability	Leadership Ability	Conscien-tiousness	Agreeableness	Emotional Stability	Extraversion	Openness
Second child	-0.064***	-0.048***	-0.071***	-0.048***	-0.050***	-0.064***	-0.075***
	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.009)	(0.008)
Third child	-0.101***	-0.084***	-0.116***	-0.080***	-0.085***	-0.102***	-0.122***
	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Fourth child	-0.141***	-0.111***	-0.155***	-0.102***	-0.105***	-0.142***	-0.161***
	(0.022)	(0.025)	(0.023)	(0.023)	(0.024)	(0.023)	(0.023)
Fifth child	-0.141***	-0.086**	-0.145***	-0.095***	-0.090**	-0.137***	-0.155***
	(0.034)	(0.038)	(0.035)	(0.034)	(0.036)	(0.035)	(0.036)
R-squared	0.007	0.008	0.006	0.004	0.003	0.008	0.009
Observations	375,540	375,540	375,540	375,540	375,540	375,540	375,540

Notes: The sample is restricted to men in families with at least two males born 1941-74. The occupational information covers the 1996-2009 period, and have been matched to the O*NET database to obtain job requirements. All measures are standardized in the full sample of workers. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Table 6. Effects of birth order and siblings' gender composition on children's employment and occupational sorting

	Non-Cognitive Skills	Employed	Self-employed	Top Managers	Managers	Creative Occupations
Birth order:						
Second child	-0.052***	-0.001	0.003*	-0.0020**	-0.009***	-0.0025***
	(0.009)	(0.003)	(0.002)	(0.0009)	(0.003)	(0.0009)
Third child	-0.101***	-0.001	0.005	-0.0020	-0.014**	-0.0031**
	(0.014)	(0.005)	(0.003)	(0.0014)	(0.005)	(0.0015)
Fourth child	-0.121***	0.001	0.001	-0.0018	-0.014*	-0.0040*
	(0.020)	(0.007)	(0.004)	(0.0019)	(0.007)	(0.0020)
Fifth child	-0.141***	0.002	-0.002	-0.0026	-0.017*	-0.0049*
	(0.027)	(0.010)	(0.006)	(0.0024)	(0.010)	(0.0026)
Birth order among boys:						
Second boy	-0.071***	-0.010***	0.003	0.0003	-0.001	0.0026***
	(0.009)	(0.003)	(0.002)	(0.0009)	(0.003)	(0.0009)
Third boy	-0.109***	-0.020***	0.004	-0.0005	-0.002	0.0028*
	(0.014)	(0.005)	(0.003)	(0.0015)	(0.006)	(0.0015)
Fourth boy	-0.147***	-0.030***	0.014***	0.0006	-0.004	0.0043*
	(0.023)	(0.008)	(0.005)	(0.0021)	(0.008)	(0.0023)
Fifth boy	-0.257***	-0.009	-0.001	-0.0011	-0.012	0.0058
	(0.052)	(0.019)	(0.011)	(0.0033)	(0.017)	(0.0060)
R-squared	0.009	0.005	0.001	0.001	0.006	0.001
Observations	564,788	727,111	727,111	521,779	521,779	521,779

Notes: The sample in column (1) is restricted to men in families with at least two males born 1952-82 with valid draft records, while the remaining columns are restricted to men in families with at least two males born 1941-74. Columns (3) – (5) are based on occupational data for the 1996-2009 period. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Table 7. Effects of birth order and siblings' gender composition on sorting into jobs with different skill requirements

	Social ability	Leadership ability	Conscien-tiousness	Agreeableness	Emotional Stability	Extraversion	Openness
Birth order:							
Second child	-0.058***	-0.031	-0.056***	-0.046***	-0.050***	-0.054***	-0.053***
	(0.017)	(0.019)	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)
Third child	-0.089***	-0.055*	-0.091***	-0.073***	-0.084***	-0.084***	-0.088***
	(0.028)	(0.031)	(0.029)	(0.028)	(0.029)	(0.029)	(0.029)
Fourth child	-0.127***	-0.078*	-0.128***	-0.098**	-0.112***	-0.122***	-0.123***
	(0.038)	(0.043)	(0.039)	(0.038)	(0.040)	(0.039)	(0.040)
Fifth child	-0.119**	-0.045	-0.109**	-0.086*	-0.096*	-0.107**	-0.104*
	(0.051)	(0.057)	(0.053)	(0.051)	(0.054)	(0.052)	(0.053)
Birth order among boys:							
Second boy	-0.006	-0.020	-0.017	-0.003	-0.001	-0.011	-0.025
	(0.017)	(0.019)	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)
Third boy	-0.018	-0.034	-0.031	-0.011	-0.002	-0.024	-0.037
	(0.028)	(0.032)	(0.029)	(0.029)	(0.030)	(0.029)	(0.029)
Fourth boy	-0.007	-0.022	-0.014	0.012	0.032	-0.012	-0.032
	(0.042)	(0.047)	(0.044)	(0.042)	(0.044)	(0.043)	(0.044)
Fifth boy	-0.073	-0.085	-0.091	-0.064	-0.042	-0.086	-0.118
	(0.084)	(0.093)	(0.088)	(0.084)	(0.091)	(0.086)	(0.090)
R-squared	0.007	0.008	0.006	0.004	0.003	0.008	0.010
Observations	375,540	375,540	375,540	375,540	375,540	375,540	375,540

Notes: The sample is restricted to men in families with at least two males born 1941-74. The occupational information covers the 1996-2009 period, and have been matched to the O*NET database to obtain job requirements. All measures are standardized in the full sample of workers. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Table 8. Effects of biological and social birth order on children's non-cognitive abilities, exploiting older siblings' vital and adoption status

	Non-cognitive ability	
Biological birth order		
Second child	-0.103***	0.065*
	(0.004)	(0.036)
Third child	-0.202***	0.122**
	(0.007)	(0.060)
Fourth child	-0.258***	0.179**
	(0.011)	(0.082)
Fifth child	-0.303***	0.176*
	(0.017)	(0.105)
Social birth order		
Second child		-0.170***
		(0.037)
Third child		-0.327***
		(0.060)
Fourth child		-0.441***
		(0.082)
Fifth child		-0.481***
		(0.106)
R-squared	0.008	0.009
Observations	442,244	442,244

Notes: The analysis is restricted to families with at least two males born 1952-82 with valid draft records, and with a family size of 3-6 children. Non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Social birth order is the birth order of the child excluding older siblings who have been put up for adoption, who were still born or who died within two months from birth. Each column represents a separate regression. Omitted category is first child. The regressions control for family fixed effects, dummy variables for year of birth and a dummy variable for the sixth biological birth order. All families are weighted to match families where at least one child has died or been put up for adoption, with respect to family size, sibling's gender composition, mother's year of birth, mother's age at first birth and mother's highest educational level. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Table 9. Effects of birth order on pupil effort and parental investments

	Homework (hours/week)	Read books (std)	Watch TV or play computer (hours/week)	Parents help with homework (incidence)	Parents talk about school (std)	Parents' Expectations (std)
Second child	-0.132	-0.353***	0.193**	0.011	-0.178**	-0.082
	(0.085)	(0.069)	(0.085)	(0.022)	(0.083)	(0.170)
Third child	-0.282**	-0.500***	0.418***	0.013	-0.326**	0.076
	(0.133)	(0.111)	(0.133)	(0.036)	(0.136)	(0.279)
Fourth child	-0.482**	-0.513***	0.287	0.015	-0.509**	-0.033
	(0.205)	(0.172)	(0.213)	(0.054)	(0.205)	(0.432)
Fifth child	-0.996***	-0.769***	1.025***	-0.077	-0.689**	-0.300
	(0.318)	(0.285)	(0.353)	(0.091)	(0.290)	(0.618)
R-squared	0.048	0.147	0.095	0.024	0.027	0.029
p-value of F-test	0.033	0.000	0.003	0.660	0.121	0.395
Observations	31,908	26,145	30,799	32,636	23,034	11,829

Notes: The sample is restricted to individuals born 1967, 1972, 1977, 1982, 1987 or 1992 in the ETF-data. Each column represents a separate regression. Omitted category is first child. All regressions control for the full interaction between all siblings' year of birth, and dummy variables for child's year of birth and gender. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix A. Supplementary results

Appendix Table 1. Average non-cognitive and cognitive abilities, by occupational status

	Non-cognitive ability	Cognitive ability
Employed	0.077	0.090
[n=823,466]	(0.962)	(0.964)
whereof:		
- Top managers	0.815	0.752
[n=5,296]	(0.854)	(0.733)
- Managers	0.545	0.527
[n=83,297]	(0.875)	(0.799)
- Creative occupations	0.120	0.624
[n=8,903]	(1.007)	(0.779)
Self-employed	0.011	-0.038
[n=52,775]	(0.944)	(0.922)
Not employed	-0.425	-0.301
[n=105,624]	(1.104)	(1.078)
Observations	981,865	981,865

Notes: The table shows mean (standard deviation) non-cognitive and cognitive abilities for men with different occupational status. The sample is restricted to men born 1952-74 with valid draft records. The occupational data covers the 1996-2009 period. We have taken the observation closest to age 45 (but within ages 35-55) for each individual, weighted by the inverse of the sampling probability. The number of observations (sum of weights) for each occupational status is given in squared parentheses. Cognitive and non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees.

Appendix Table 2. Descriptive statistics in full sample and analysis sample

	Full sample	Analysis sample
Outcome variables:		
Overall non-cognitive ability	0.040	0.032
	(0.985)	(0.989)
Social maturity	0.026	0.016
	(0.985)	(0.989)
Intensity	0.038	0.034
	(0.992)	(0.994)
Psychological energy	0.028	0.020
	(0.99)	(0.993)
Emotional stability	0.031	0.024
	(0.984)	(0.987)
Employed	0.829	0.825
	(0.377)	(0.380)
Self-employed	0.056	0.057
	(0.230)	(0.233)
Top managers	0.006	0.006
	(0.069)	(0.069)
Managers	0.070	0.069
	(0.238)	(0.236)
Creative Occupations	0.006	0.006
	(0.074)	(0.070)
Background variables:		
Family size	2.759	2.974
	(0.859)	(0.897)
Age, 2010	43.204	43.387
	(8.440)	(7.853)
Mother's age at first birth	23.410	23.180
	(3.936)	(3.898)
Mother's years of schooling	10.103	10.064
	(2.726)	(2.720)
Observations	1,102,497	564,788

Notes: The full sample consists of all males born 1941-82 with valid draft records, while the analysis sample is restricted to families with at least two males born 1941-82 with valid draft records. Non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. The occupational information covers the 1996-2009 period, and we have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual. Family size is the number of children to which the mother has given birth. Mother's years of schooling are measured at age 45.

Appendix Table 3. Wage premiums for individual abilities and job requirements

	(1)	(2)	(3)	(4)	(5)	(6)
Individual abilities:						
Overall cognitive ability	0.124***				0.063***	
	(0.000)				(0.000)	
Logical ability		0.064***				0.033***
		(0.001)				(0.001)
Verbal ability		0.041***				0.018***
		(0.001)				(0.001)
Spatial ability		0.016***				0.007***
		(0.001)				(0.000)
Technical ability		0.029***				0.010***
		(0.001)				(0.000)
Overall non-cognitive ability	0.083***				0.050***	
	(0.000)				(0.000)	
Social maturity		0.030***				0.016***
		(0.001)				(0.001)
Intensity		0.014***				0.006***
		(0.001)				(0.000)
Psychological energy		0.022***				0.012***
		(0.001)				(0.001)
Emotional stability		0.024***				0.017***
		(0.001)				(0.001)
Job requirements:						
Cognitive ability			0.183***	0.116***	0.140***	0.082***
			(0.001)	(0.001)	(0.001)	(0.001)
Social ability			0.053***		0.044***	
			(0.001)		(0.001)	
Conscientiousness				0.177***		0.154***
				(0.002)		(0.002)
Agreeableness				-0.268***		-0.268***
				(0.002)		(0.002)
Emotional Stability				-0.010***		0.001
				(0.001)		(0.001)
Extraversion				0.225***		0.223***
				(0.001)		(0.001)
Openness to experience				-0.046***		-0.046***
				(0.001)		(0.001)
R^2	0.266	0.264	0.360	0.427	0.410	0.469
Observations	518,159	518,159	518,159	518,159	518,159	518,159

Notes: The table shows estimates of the association between log-wages and different individual abilities and job requirements. The sample is restricted to men born 1952-74 with valid draft records. Cognitive and non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. The wage and occupational data covers the 1996-2009 period, and have been matched to the O*NET database to obtain job requirements. The job requirements are standardized in the full sample of workers. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix Table 4a. Correlation matrix for different skill measures obtained from the military draft

	Overall non-cognitive ability	Social Maturity	Intensity	Psychological Energy	Emotional Stability	Overall cognitive ability
Overall non-cognitive ability	1.0000					
Social Maturity	0.7834	1.0000				
Intensity	0.8137	0.5359	1.0000			
Psychological Energy	0.7568	0.7347	0.5986	1.0000		
Emotional Stability	0.8072	0.7242	0.5526	0.6853	1.0000	
Overall cognitive ability	0.3756	0.3559	0.2238	0.3114	0.3175	1.0000

Notes: The sample is restricted to men in families with at least two males born 1952-82 with valid draft records (n=564,788). Non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees.

Appendix Table 4b. Correlation matrix for different skill measures obtained from occupational sorting

	Social Ability	Leadership Ability	Conscien-tiousness	Agreeableness	Emotional Stability	Extraversion	Openness	Cognitive ability
Social Ability	1.0000							
Leadership Ability	0.8054	1.0000						
Conscientiousness	0.8978	0.8556	1.0000					
Agreeableness	0.9381	0.7921	0.8910	1.0000				
Emotional stability	0.8612	0.7773	0.8914	0.9470	1.0000			
Extraversion	0.9819	0.8853	0.9208	0.9183	0.8519	1.0000		
Openness	0.7899	0.8760	0.9195	0.7319	0.7345	0.8538	1.0000	
Cognitive ability	0.6877	0.7112	0.7614	0.6019	0.6309	0.7140	0.8155	1.0000

Notes: The sample is restricted to men in families with at least two males born 1941-74 (n=). The occupational information covers the 1996-2009 period, and have been matched to the O*NET database to obtain job requirements. All measures are standardized in the full sample of workers. We have taken the observation closest to age 45 (but within ages 35-55) for each individual, weighted by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix Table 5. Descriptive statistics – ETF-survey

	Full Sample	First child	Second child	Third child	Fourth child	Fifth child
Outcome variables:						
Homework (hours/week)	2.352	2.410	2.349	2.269	2.21	2.001
	(1.473)	(1.492)	(1.465)	(1.464)	(1.42)	(1.216)
Read books (std)	-0.009	0.112	-0.085	-0.083	-0.081	-0.172
	(0.999)	(1.002)	(0.985)	(0.995)	(1.017)	(1.044)
Watch TV or play computer (hours/week)	2.559	2.481	2.582	2.645	2.700	2.862
	(1.477)	(1.454)	(1.465)	(1.503)	(1.617)	(1.757)
Parents help with homework (incidence)	0.823	0.833	0.824	0.808	0.777	0.755
	(0.382)	(0.373)	(0.381)	(0.394)	(0.416)	(0.431)
Parents talk about school (std)	-0.006	0.033	-0.018	-0.064	-0.052	-0.107
	(0.993)	(0.984)	(0.995)	(1.002)	(1.014)	(1.040)
Parents' expectations (std)	-0.032	-0.023	-0.033	-0.033	-0.100	-0.112
	(0.986)	(0.992)	(0.985)	(0.986)	(0.949)	(0.950)
Observations	36,796	14,332	14,988	5,782	1,387	307

Notes: The sample is restricted to individuals born 1967, 1972, 1977, 1982, 1987 or 1992 in the ETF-data. The number of observations varies for different outcome variables.

Appendix Table 6. Effects of birth order on children's abilities, simulating missing children

		Simulating missing second-born children under the assumption of no birth order effects	
	Observed data	Simulating all missing children	Simulating children likely to be missing
	Panel A: Non-cognitive skills		
Second child	-0.109***	-0.076***	-0.084***
	(0.006)	(0.005)	(0.005)
	Panel B: Cognitive skills		
Second child	-0.167***	-0.123***	-0.133***
	(0.005)	(0.005)	(0.005)
Observations	349,922	436,382	424,908

Notes: The table shows the effects of being second-born when filling in potentially missing second-born children in single-child families. The sample is restricted to first-born and second-born children in all families, irrespectively of family size. In the last two columns, missing second-born children have been randomly drawn from the skill distribution of first-born children, within a given strata defined by the interaction between mother's year of birth (10 classes), mother's age at first birth (30 classes), mother's highest educational level (7 classes) and father's income (20 classes). In the second column all missing second-born children have been simulated, while in the third column missing second-born children have been restricted by the probability of fertility for mothers at different ages. The table shows the average point estimates and standard errors from 1,000 repetitions. Cognitive and non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Each column in each panel represents a separate regression. Omitted category is first child. All regressions control for family fixed effects and dummy variables for year of birth. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix Table 7. Effects of birth order on children's cognitive ability

	All families	Two-child families	Three-child families	Four-child families	Five-child families
Second child	-0.181***	-0.194***	-0.172***	-0.145***	-0.163***
	(0.003)	(0.007)	(0.005)	(0.008)	(0.015)
Third child	-0.299***		-0.328***	-0.278***	-0.283***
	(0.007)		(0.010)	(0.013)	(0.020)
Fourth child	-0.372***			-0.390***	-0.383***
	(0.010)			(0.019)	(0.027)
Fifth child	-0.422***				-0.469***
	(0.017)				(0.038)
Observations	564,788	195,852	226,469	103,574	38,893

Notes: The sample is restricted to men in families with at least two males born 1952-82 with valid draft records. Cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Each column in each panel represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix Table 8. Effects of birth order and siblings' gender composition on children's skills

	Non-Cognitive Skills		Cognitive Skills	
Birth order:				
Second child	-0.115***	-0.052***	-0.181***	-0.126***
	(0.004)	(0.009)	(0.003)	(0.007)
Third child	-0.199***	-0.101***	-0.299***	-0.207***
	(0.007)	(0.014)	(0.007)	(0.012)
Fourth child	-0.247***	-0.121***	-0.372***	-0.250***
	(0.012)	(0.020)	(0.010)	(0.017)
Fifth child	-0.302***	-0.141***	-0.422***	-0.277***
	(0.019)	(0.027)	(0.017)	(0.024)
Birth order among boys:				
Second boy		-0.071***		-0.063***
		(0.009)		(0.007)
Third boy		-0.109***		-0.107***
		(0.014)		(0.013)
Fourth boy		-0.147***		-0.149***
		(0.023)		(0.020)
Fifth boy		-0.257***		-0.142***
		(0.052)		(0.044)
R-squared	0.009	0.009	0.017	0.017
Observations	564,788	564,788	564,788	564,788

Notes: The sample is restricted to men in families with at least two males born 1952-82 with valid draft records. Non-cognitive and cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Each column in each panel represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix Table 9. Effects of biological and social birth order on children's non-cognitive abilities and cognitive, exploiting older siblings' vital and adoption status

	Non-Cognitive Skills		Cognitive Skills	
Biological birth order				
Second child	-0.103***	0.065*	-0.160***	0.061*
	(0.004)	(0.036)	(0.004)	(0.032)
Third child	-0.202***	0.122**	-0.299***	0.077
	(0.007)	(0.060)	(0.006)	(0.053)
Fourth child	-0.258***	0.179**	-0.375***	0.118*
	(0.011)	(0.082)	(0.010)	(0.072)
Fifth child	-0.303***	0.176*	-0.421***	0.168*
	(0.017)	(0.105)	(0.015)	(0.093)
Social birth order				
Second child		-0.170***		-0.224***
		(0.037)		(0.032)
Third child		-0.327***		-0.379***
		(0.060)		(0.053)
Fourth child		-0.441***		-0.497***
		(0.082)		(0.072)
Fifth child		-0.481***		-0.594***
		(0.106)		(0.094)
R-squared	0.008	0.009	0.017	0.017
Observations	442,244	442,244	442,244	442,244

Notes: The analysis is restricted to families with at least two males born 1952-82 with valid draft records, and with a family size of 3-6 children. Cognitive and non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Social birth order is the birth order of the child excluding older siblings who have been put up for adoption, who were still born or who died within two months from birth. Each column represents a separate regression. Omitted category is first child. The regressions control for family fixed effects, dummy variables for year of birth and a dummy variable for the sixth biological birth order. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix Table 10. Effects of birth order on children's non-cognitive ability

	All families	Two-child families	Three-child families	Four-child families	Five-child families
			Panel A: Family FE		
Second child	-0.115***	-0.111***	-0.114***	-0.093***	-0.126***
	(0.005)	(0.009)	(0.007)	(0.011)	(0.019)
Third child	-0.199***		-0.224***	-0.194***	-0.193***
	(0.008)		(0.013)	(0.016)	(0.024)
Fourth child	-0.247***			-0.290***	-0.248***
	(0.013)			(0.024)	(0.032)
Fifth child	-0.302***				-0.334***
	(0.019)				(0.045)
			Panel B: Family type FE		
Second child	-0.115***	-0.111***	-0.114***	-0.093***	-0.126***
	(0.004)	(0.008)	(0.006)	(0.010)	(0.018)
Third child	-0.199***		-0.224***	-0.194***	-0.193***
	(0.007)		(0.011)	(0.014)	(0.022)
Fourth child	-0.247***			-0.290***	-0.248***
	(0.012)			(0.022)	(0.031)
Fifth child	-0.302***				-0.334***
	(0.019)				(0.043)
Observations	564,788	195,852	226,469	103,574	38,893

Notes: The sample is restricted to men in families with at least two males born 1952-82 with valid draft records. Non-cognitive abilities are measured at approximately age 18 and standardized by year of draft in the full sample of draftees. Each column in each panel represents a separate regression. All regressions control for dummy variables for year of birth. Family type FE is dummy variables for the full interaction between all siblings' year of birth. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix B. Results with occupational outcomes for women

Appendix B Table 1. Descriptive statistics, females

	Full Sample	First child	Second child	Third child	Fourth child	Fifth child
Employment and occupation:						
Employed	0.833	0.844	0.834	0.821	0.810	0.794
	(0.373)	(0.363)	(0.372)	(0.383)	(0.392)	(0.404)
Self-employed	0.030	0.031	0.030	0.029	0.029	0.029
	(0.171)	(0.173)	(0.171)	(0.169)	(0.168)	(0.169)
Top managers	0.001	0.001	0.001	0.001	0.001	0.001
	(0.027)	(0.030)	(0.027)	(0.025)	(0.025)	(0.023)
Managers	0.036	0.039	0.035	0.033	0.029	0.023
	(0.165)	(0.173)	(0.164)	(0.158)	(0.148)	(0.131)
Creative Occupations	0.009	0.008	0.009	0.010	0.008	0.007
	(0.086)	(0.081)	(0.090)	(0.091)	(0.083)	(0.077)
Job Requirements:						
Social ability	0.151	0.207	0.153	0.094	0.012	-0.061
	(0.963)	(0.973)	(0.959)	(0.952)	(0.943)	(0.930)
Leadership ability	-0.004	0.053	-0.001	-0.064	-0.140	-0.210
	(0.919)	(0.931)	(0.915)	(0.909)	(0.879)	(0.863)
Conscientiousness	0.132	0.199	0.136	0.061	-0.031	-0.117
	(0.940)	(0.946)	(0.936)	(0.935)	(0.917)	(0.910)
Agreeableness	0.343	0.392	0.342	0.293	0.232	0.168
	(0.905)	(0.907)	(0.902)	(0.902)	(0.895)	(0.891)
Emotional Stability	0.343	0.388	0.344	0.297	0.239	0.181
	(0.865)	(0.855)	(0.863)	(0.875)	(0.879)	(0.888)
Extraversion	0.094	0.152	0.098	0.035	-0.049	-0.122
	(0.952)	(0.964)	(0.948)	(0.937)	(0.917)	(0.898)
Openness to experience	-0.004	0.058	0.002	-0.073	-0.165	-0.249
	(0.949)	(0.955)	(0.945)	(0.941)	(0.923)	(0.906)
Observations	663,749	243,432	246,801	121,712	41,245	10,559

Notes: The sample is restricted to women in families with at least two females born 1941-74. The occupational information covers the 1996-2009 period, and we have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual. The information on job requirements is derived from the O*NET occupational descriptions and all measures are standardized in the full sample of workers. The data on employment and occupations covers to the full sample (employed and non-employed), while the job requirements are restricted to employed individuals.

Appendix B Table 2. Effects of birth order on children's employment and occupational sorting, females

	Employed	Self-Employed	Top Managers	Managers	Creative Occupations
Second child	-0.009***	0.003***	-0.0004**	-0.005***	0.0009**
	(0.002)	(0.001)	(0.0002)	(0.001)	(0.0004)
Third child	-0.018***	0.004***	-0.0006**	-0.008***	0.0018**
	(0.003)	(0.001)	(0.0003)	(0.002)	(0.0008)
Fourth child	-0.021***	0.007***	-0.0006	-0.009***	0.0017
	(0.004)	(0.002)	(0.0004)	(0.002)	(0.0011)
Fifth child	-0.032***	0.008**	-0.0003	-0.012***	0.0010
	(0.007)	(0.003)	(0.0006)	(0.003)	(0.0015)
R-squared	0.005	0.001	0.001	0.006	0.001
Observations	663,749	663,749	566,521	566,521	566,521

Notes: The sample is restricted to women in families with at least two females born 1941-74. Columns (3) – (5) are based on occupational data for the 1996-2009 period. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix B Table 3. Effects of birth order on sorting into jobs with different skill requirements, females

	Social Ability	Leadership Ability	Conscien-tiousness	Agree-ableness	Emotional Stability	Extraversion	Openness
Second child	-0.092***	-0.086***	-0.094***	-0.079***	-0.070***	-0.091***	-0.093***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Third child	-0.167***	-0.157***	-0.168***	-0.148***	-0.130***	-0.166***	-0.168***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Fourth child	-0.233***	-0.200***	-0.215***	-0.204***	-0.182***	-0.228***	-0.213***
	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Fifth child	-0.273***	-0.229***	-0.249***	-0.239***	-0.212***	-0.264***	-0.255***
	(0.026)	(0.024)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
R-squared	0.007	0.008	0.006	0.004	0.003	0.008	0.009
Observations	459,846	459,846	459,846	459,846	459,846	459,846	459,846

Notes: The sample is restricted to women in families with at least two females born 1941-74. The occupational information covers the 1996-2009 period, and have been matched to the O*NET database to obtain job requirements. All measures are standardized in the full sample of workers. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix B Table 4. Effects of birth order and siblings' gender composition on employment and occupational sorting, females

	Employment	Self-employed	Top managers	Managers	Creative Occupations
Birth order:					
Second child	-0.006**	0.001	-0.0005*	-0.005***	0.0004
	(0.003)	(0.001)	(0.0003)	(0.002)	(0.0009)
Third child	-0.013**	0.001	-0.0007	-0.008***	0.0007
	(0.005)	(0.002)	(0.0005)	(0.003)	(0.0014)
Fourth child	-0.015**	0.002	-0.0006	-0.008**	0.0004
	(0.007)	(0.003)	(0.0006)	(0.004)	(0.0018)
Fifth child	-0.024**	0.003	-0.0003	-0.011**	-0.0003
	(0.010)	(0.004)	(0.0008)	(0.005)	(0.0023)
Birth order among girls:					
Second girl	-0.004	0.002	0.0001	-0.000	0.0006
	(0.003)	(0.001)	(0.0003)	(0.002)	(0.0009)
Third girl	-0.005	0.003	-0.0001	-0.001	0.0018
	(0.005)	(0.002)	(0.0005)	(0.003)	(0.0014)
Fourth girl	-0.008	0.008**	0.0000	-0.003	0.0005
	(0.008)	(0.004)	(0.0008)	(0.004)	(0.0021)
Fifth girl	-0.016	0.005	-0.0007	0.001	0.0010
	(0.021)	(0.010)	(0.0009)	(0.010)	(0.0038)
	(0.019)	(0.010)	(0.0010)	(0.010)	(0.0041)
R-squared	0.009	0.001	0.001	0.006	0.001
Observations	663,749	663,749	566,521	566,521	566,521

Notes: The sample is restricted to women in families with at least two females born 1941-74. Columns (3) – (5) are based on occupational data for the 1996-2009 period. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.

Appendix B Table 5. Effects of birth order and siblings' gender composition on sorting into jobs with different skill requirements, females

	Social ability	Leadership ability	Conscien-tiousness	Agree-ableness	Emotional Stability	Extraversion	Openness
Birth order:							
Second child	-0.064***	-0.062***	-0.067***	-0.051***	-0.042***	-0.064***	-0.070***
	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Third child	-0.126***	-0.117***	-0.125***	-0.107***	-0.088***	-0.124***	-0.129***
	(0.021)	(0.019)	(0.020)	(0.020)	(0.019)	(0.020)	(0.020)
Fourth child	-0.180***	-0.145***	-0.154***	-0.152***	-0.126***	-0.173***	-0.159***
	(0.028)	(0.026)	(0.027)	(0.027)	(0.026)	(0.027)	(0.027)
Fifth child	-0.220***	-0.166***	-0.178***	-0.186***	-0.152***	-0.207***	-0.192***
	(0.038)	(0.036)	(0.036)	(0.036)	(0.036)	(0.037)	(0.036)
Birth order Among girls:							
Second girl	-0.032**	-0.028**	-0.031**	-0.032***	-0.032***	-0.031**	-0.027**
	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Third girl	-0.044**	-0.047**	-0.050**	-0.045**	-0.046**	-0.046**	-0.046**
	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Fourth girl	-0.066**	-0.080***	-0.091***	-0.063**	-0.076**	-0.072**	-0.079**
	(0.032)	(0.030)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
Fifth girl	0.021	-0.027	-0.045	0.018	-0.005	0.006	-0.035
	(0.072)	(0.068)	(0.070)	(0.070)	(0.071)	(0.070)	(0.070)
R-squared	0.007	0.008	0.006	0.004	0.003	0.008	0.010
Observations	459,846	459,846	459,846	459,846	459,846	459,846	459,846

Notes: The sample is restricted to women in families with at least two females born 1941-74. The occupational information covers the 1996-2009 period, and have been matched to the O*NET database to obtain job requirements. All measures are standardized in the full sample of workers. We have calculated the weighted average of the five observations closest to age 45 (but within ages 35-55) for each individual, and weighted the regressions by the inverse of the sampling probability. Each column represents a separate regression. All regressions control for family fixed effects and dummy variables for child's year of birth. Omitted category is first child. Robust standard errors are in parentheses. ***/**/*=the estimates are significantly different from zero at the 1/5/10 per cent level of confidence, respectively.