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DINNER TABLE HUMAN CAPITAL AND ENTREPRENEURSHIP

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ABSTRACT

We document three new facts about entrepreneurship. First, a majority of male entrepreneurs start a firm in the same or a closely related industry as their fathers' industry of employment. Second, this tendency is correlated with intelligence: higher-IQ entrepreneurs are less likely to follow their fathers. Third, an entrepreneur that starts a firm in the same industry as where his father was employed tends to outperform entrepreneurs in the same industry whose fathers did not work in that industry. We consider various explanations for these facts and propose that "dinner table human capital", where children obtain industry knowledge through their parents, is an important factor behind them.

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1 Introduction

A considerable literature studies who becomes entrepreneurs, but comparatively less is know about who becomes successful entrepreneurs; the gap between self-employed and VC-backed entrepreneurs is so great that they almost seem like distinct experiences. Here we relate entrepreneurial choices and outcomes to "dinner table human capital": knowledge about an industry transmitted via parents that work in that industry. We hypothesize that being exposed to an industry via parents during upbringing provides valuable information (skills, connections, etc.) which leads them to become better entrepreneurs in that industry, which in turn can explain cross-sectional patterns of selection and performance for entrepreneurs.

To see why learning about an industry via the home environment could be important, consider the case of Larry Page, the co-founder of Google. Larry Page's father, Carl Page, was a pioneer in computer science and artificial intelligence, and his mother taught computer programming. Because of his parents' professions, his childhood home was full of computers and science magazines, which developed his fascination for technology at an early age.[1]

We build a Roy (1951)-type model that links dinner table human capital and aptitude (IQ) to entrepreneurial entry, sector choice, and startup performance. The underlying intuition of the model is simple: starting a business in the same industry as one's parents gives a head start through the acquired knowledge, but for high-IQ entrepreneurs the value of the opportunity may be greater in a sector that has higher returns to intelligence. The model has two main predictions: entrepreneurs have a tendency to start up a business in the same industry as where their parents were employed, and this tendency will be declining in IQ.

To study the role of industry knowledge transmitted from parents, we leverage several datasets from Norway. First, we employ a database that contains longitudinal accounting and employment information on the universe of incorporated firms established in Norway between 1999 and 2011. The data contain initial ownership shares; we define an entrepreneur as an individual with a substantial ownership share in the firm when it is established. Moreover, register data provides detailed information about all Norwegian workers, while also linking specific individuals to specific firms and industries, which provides us information about father's industry.

[1] In his own words, "I was really lucky to have an environment when I was growing up. My dad was a professor... of computer science and we had computers ... lying around the house from a really early age. I had kind of a unique environment." See https://www.achievement.org/achiever/larry-page/#interview.

The register data also provided information on year of death, if applicable, for parents. We limit the analysis to men who were 22-to-45 years old in 1996 and for whom we have information about their fathers' industries. Finally, in order to learn more about mechanisms, we design and analyze responses from a large survey directed at entrepreneurs.

Our first key empirical result is that a man is much more likely to start a business in his father's industry of employment than in other industries. Using the distributions of entrepreneur and father industries if fathers and entrepreneurs were randomly mixed, we would find that 0.5% of entrepreneurs choose the same narrowly-defined industry as their fathers. In reality, over 4% of entrepreneurs start businesses in the same narrow industry. More broadly, eleven percent of entrepreneurs start firms in the same 2-digit industry as the father's employment and a substantial majority start up a firm in an industry that is in the top decile of our measure of industry closeness. Thus, dinner table capital appears potentially important for most entrepreneurs.

Our second empirical result is that the tendency to follow one's father declines with IQ. For example, an entrepreneur with relatively low IQ is about twice as likely to become an entrepreneur in his father's industry as an entrepreneur at the top of the IQ scale. Following one's father is much more likely than random at the top of the IQ scale, but even more so at the bottom of the IQ scale.

Our third empirical result is the most important for understanding new venture success. We show that ventures founded by people who follow their fathers are more successful than other ventures. This need not be true as sons following their fathers could be due to greater awareness of that industry, parental pressure or expectations to enter it, or because of similarities in tastes. However, none of these alternative explanations would imply that such entrepreneurs create greater value. We show that ventures founded by those who follow their fathers are noticeably different from other ventures both at founding and after four years of operation: They invest substantially more initial capital, are much more likely to survive four years, have more employees, and are more profitable. They are also much more likely to be positive outliers in the sense of having a large number of employees or high assets. Ventures started by people whose father worked in the industries where they start ventures are 100% more likely to become a top 5% or top 1% startup in terms of size than other new companies.

By analyzing the population of Norwegian startups, we are less subject to selection biases commonly encountered in the literature that uses tip-of-the-iceberg datasets. Of course, most startups in the dataset are small. When we focus on larger ventures – those with at least five (or ten) employees during the first two years – our results are, if anything, stronger. Dinner table human capital appears relevant throughout the distribution of startups, including those at the top.

We highlight the role of dinner table human capital to explain why sons follow their fathers, and successfully so. An alternative explanation is that fathers actively help out, for example by providing cheap labor or by utilizing their network. To address this possibility, we analyze the subsample of entrepreneurs where the father had died before the founding date. Our estimates on selection into the same industry and on startup performance are just as strong on this subsample. This suggests that the effects of fathers helping out is less important than the skills and network from dinner table human capital provided during upbringing.

By the same argument as in Bell, Chetty, Jaravel, Petkova and Reenen (2019), under the assumption that differences in genetic ability do not generate differences in propensities to start up a firm across narrow industry categorizations, our results on entrepreneurial activity imply that exposure to an industry during upbringing has a causal effect on entrepreneurship. Intuitively, as long as genetics do not govern one's ability to start up a firm in, for example, the metals industry or in the construction industry, the close alignment between the industries where children start up a firm and the industry they were exposed to must be driven by causal exposure effects.[2]

We conducted an ex-post survey of entrepreneurs in order to learn more about entrepreneurs' views regarding the possible effects of parents on their venture formation. About 3,800 entrepreneurs responded to the survey. With the usual caveat for surveys given limited response rates, a large majority (84 percent) of same-industry entrepreneurs report that they acquired industry knowledge from their parents. Conversations at home and observing parents at work were the most frequent mechanisms for human capital transfer cited by survey respondents. Obtaining help from parents, through cheap labor or through access to networks, appears less common. The survey results reinforce the message from the register data analysis: dinner table human capital appears to be valuable for entrepreneurs.

In order to assess the possible broader importance of dinner table human capital, we analyze whether non-entrepreneurs (i.e,. wage workers) also tend to follow their parents. The patterns

[2]This argument is spelled out in Bell et al. (2019), Section IV.A.

are similar. For example, the fraction being employed in the same 2-digit industry as their father is much higher than random allocation would suggest, and being employed in the same 5-digit industry as one's father (but not at the same plant) yields about 4% higher wages, after controlling for industry fixed effects.

While it is well-known that entrepreneurship runs in families, partly due to genetics and partly due to social exposure effects (see e.g., Lindquist, Sol and van Praag (2015)), less is known about the nature of the exposure effects.[3] Our results suggest that knowledge transmission is a major force in determining what type of firm an entrepreneur starts up, and how well it performs. In a closely related study, Bell et al. (2019) show that children whose parents hold patents in a technology class are more likely to patent in exactly that patent class themselves. Similarly, we find a strong link between father's industry of work and the industry where a son starts a firm, even for narrowly defined industry categories. The evidence from the dead father subsample and from the survey suggest that the main driver is human capital transmission, and parents helping out less so. Combined, the findings of Bell et al. (2019) and our paper provide a compelling story of human capital transmission within the family being important for innovative activity later in life.

In emphasizing learning based on social interaction, our paper links to literature on peer effects in entrepreneurship (Giannetti and Simonov (2009), Nanda and Sorensen (2010)). While these papers focus on the entrepreneurial entry decision, consistent with imitation effects, we highlight the productivity-augmenting effects of learning from parents. Lerner and Malmendier (2013) show that learning from other entrepreneurs is important for MBAs. We complement their findings by demonstrating a different and broader source of entrepreneurial learning: from parents.[4]

Our paper also identifies a more positive side of family business skills than the work on family firms, which generally shows that passing control to heirs lowers performance (Benned-

[3]Numerous studies document a tight link between parents and children along broad socio-economic dimensions, including income (e.g., Becker and Tomes (1979) and Chetty, Friedman, Saez, Turner and Yagan (2016)), education (e.g., Black, Devereux and Salvanes (2005)), wealth (e.g., Charles and Hurst (2003) and Black et al. (2005)), and health (e.g., Bhalotra and Rawlings (2013)). Less is known in this literature about the underlying mechanisms. We demonstrate strong learning, or "nurture", effects in the entrepreneurship setting.

[4]We also provide insight into the heterogeneity of startups noted by Hurst and Pugsley (2011), Levine and Rubinstein (2016), Sedlacek and Sterk (2017), and others, by identifying a key source of variation in the type of business started up by entrepreneurs: father's industry. We find that a majority of entrepreneurs start out companies in an industry closely related to where their father worked, and, for narrowly defined industries, they perform better.

sen, Nielsen, Perez-Gonzalez and Wolfenzon (2007) and Perez-Gonzalez (2006)). While that line of work suggests an heir may not be the *best* option for running an existing venture, our results suggest that, on average, an heir who self-selects to stay in his fathers' industry is more productive than a typical entrepreneur in that industry.

The paper proceeds as follows. The next section outlines a simple model of entrepreneurial entry and performance. Section 3 presents the data and Section 4 contains the core empirical results. In Section 5 we interpret the results and discuss the likely mechanisms behind them. Section 6 concludes.

2 Model of entrepreneurial entry and content

To guide the empirical analysis, we construct a stylized model of entrepreneurial choice in the spirit of Evans and Jovanovic (1989).[5] The model considers two decisions; whether to become an entrepreneur or stay on as a wage worker and, if becoming an entrepreneur, in which sector to start a firm. We first outline the individual's decision problem, and then discuss the empirical implementation of the model.

The individual maximizes expected payoff. The payoff from being an employee is known and determined by,

$$w = a + h_0 * IQ \tag{1}$$

where w is log wages and $a > 0$ is an individual-specific term that captures match quality, random factors, and education level. We will refer to a as "job match". a captures factors that drive differences in productivity and happiness in the labor market relative to entrepreneurship, including risk aversion (as in the model in van Praag and Cramer (2001)). We abstract from other variables that affect wages such as age and gender.

The payoff from being an entrepreneur depends on the industry. If the firm is started in the same sector as a parent worked, which we denote sector 1, the payoff is

$$e_1 = K + h_1 * IQ + \epsilon_1 \tag{2}$$

where ϵ_1 is an iid random term unknown to the individual at the point of entry. $K > 0$ captures

[5] Unlike Evans and Jovanovic (1989), we do not focus on credit constraints.

"dinner table human capital". It is the value to an entrepreneur of the institutional industry knowledge transferred from parents.[6]

If the firm is started in an industry different from where the entrepreneur's parents worked, the payoff depends only on IQ. Denote by Sector 2 the industry in which the returns to IQ is highest. The payoff in Sector 2 equals,

$$e_2 = h_2 * IQ + \epsilon_2 \tag{3}$$

where ϵ_2 is an iid random term unknown to the individual at the point of entry.

If $h_1 > h_2$ then the individual will always prefer sector 1, so the interesting case is $h_1 < h_2$. There are at least a couple of natural reasons why we might expect h_1 to be less than h_2. First, if the payoff from IQ is linear in each industry 2, 3, 4, .., n, then the upper envelope of payoff will be convex in IQ. Second, we might expect that high intelligence people have a lower cost of general education and that general education has a higher return in Sector 2. We return to this issue below.

One simplification of the model is that we do not accommodate wage work in the parents' sector, in which case it is reasonable that there will also be some institutional knowledge that can enhance productivity (see Laband and Lentz (1983)). This can be accommodated in the empirical analysis.

As IQ is observable in our data, we are interested in the role played by IQ in the model. Due to the linearity of the model, the values of IQ where a particular career option (wage work, Sector 1 entrepreneurship, or Sector 2 entrepreneurship) is optimal will be a convex set. We denote by W the convex set where wage work is optimal, by S_1 the convex set where entrepreneurship in Sector 1 (following parents) is optimal, and by S_2 the convex set where entrepreneurship in Sector 2 is optimal. Let us denote by *full separation* a state where each of the career options are optimal for an interval of IQ, i.e., each of the three sets are non-empty. We then have the following.

Remark 1 ***Selection***.

(i) Full separation implies that the ordering, from lowest IQ to highest IQ, is either $\{W, S_1, S_2\}$ *or* $\{S_1, W, S_2\}$*. In any full separation,* $h_0 < h_2$.

[6] It is very possible that K depends on IQ. We assume that this relationship is weak.

(ii) If $a \geq K$ and $h_0 < h_1$ and there is full separation, then the ordering is $\{W,S_1,S_2\}$.

(iii) If $a < K$ and $h_0 \geq h_1$ and there is full separation, then the ordering is $\{S_1,W,S_2\}$.

Proof. First note that if $h_0 \geq h_2$ then W will dominate S_2 because $a \geq 0$. Likewise, if $h_1 \geq h_2$ then S_1 dominates S_2 because $K \geq 0$. Thus $h_2 \geq h_1, h_0$ in order for full separation to occur. There are two subcases, (a)$h_0 < h_1 < h_2$ and (b)$h_1 < h_0 < h_2$. In case (a), the payoff from Sector 1 must cross the payoff from wage work from below in order to have full separation. This implies that $a \geq K$ and $h_0 < h_1$. The ordering in this case becomes $\{W,S_1,S_2\}$. In case (b), the payoff from wage work must cross the payoff from Sector 1 from below in order to have full separation. This implies that $a < K$ and $h_0 \geq h_1$. The ordering in this case becomes $\{S_1, W,S_2\}$. ■

The model allows for two types of equilibria with entrepreneurship; the first where the distribution of IQ for entrepreneurs is bimodal; low IQ individuals follow their parents and become sector 1 entrepreneurs and high IQ entrepreneurs become Sector 2 entrepreneurs. The other type of equilibrium is one where Sector 1 and Sector 2 entrepreneurs are both selected on IQ, but Sector 1 entrepreneurs less so. Independently of whether the ordering is $\{W,S_1,S_2\}$ or $\{S_1,W,S_2\}$, we have the following comparative result with respect to IQ.

Remark 2 *Increased IQ leads to,*

*(i)**Entry**: Higher propensity to become Sector 2 entrepreneur.*

*(ii)**Startup type**: Higher fraction Sector 2 entrepreneur relative to Sector 1 entrepreneur*

*(iii)**Entrepreneur performance**: Increased venture performance*

Proof. Follows directly from Remark 1. ■

The model explains both whether a person becomes an entrepreneur and what type of firm that person sets up. IQ is the key underlying variable. Conditional on entry, low IQ people will follow their parents (taking advantage of the human capital gift they received). High IQ people will also be inclined to follow parents but less so. Figure 1 illustrates the separation of type $\{W,S_1,S_2\}$. Individuals who match the wage sector particularly well (high job match or a) do not choose entrepreneurship. For a lower job match, individuals with a low IQ will choose Sector 1 entrepreneurship and individuals with a high IQ will choose Sector 2 entrepreneurship. Note that an increase in K will shift the solid line above "Sector 1" upwards and hence shift

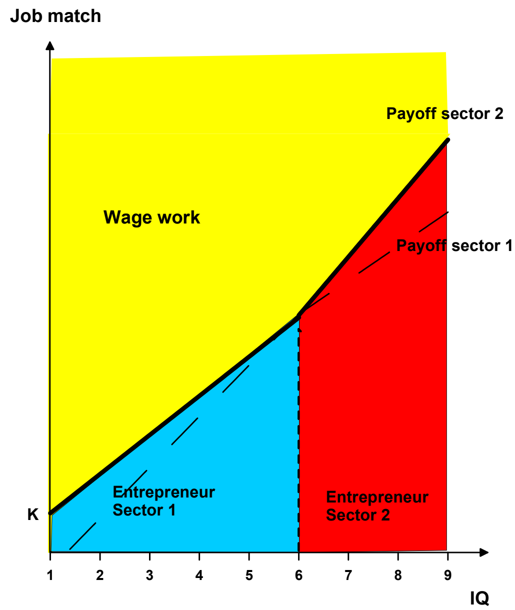

Figure 1: Sector Choice

IQ^* to the right. An increase in h_1 will rotate the same line counter-clockwise, and an increase in h_2 will rotate the solid line above "Sector 2" counter-clockwise. Finally, an increase in h_0 will rotate both solid lines clockwise.

We can extend the model by investigating the choice of education. In the appendix, we show that a version of the model that includes an educational choice preserves the qualitative properties of Remark 1.

While the model concerns an individual's decision, it is straightforward to generate testable implications for the cross-section as long as h_i is determined primarily by market opportunities and unrelated to individual characteristics. Specifically, the model implies that

1. Entrepreneurs are more likely to pick their parents' sector than random chance would imply.

2. Higher-IQ entrepreneurs are less likely to follow their parents than lower-IQ entrepreneurs.

3. All else equal, entrepreneurs in their parents' sector will have better performance than entrepreneurs outside their parents' sector.

3 Data

3.1 Norway

We start with a brief description of the Norwegian economy, the tax code, and the basis for the data collection.[7] Norway is an industrialized nation with a population of about 4.7 million. The GDP per capita in 2008 was about $58,717, well above the EU average. Norway is characterized by a large middle class and an unusually equal distribution of disposable income.

The maximum marginal tax rate (for incomes above $75,000) is about 50%, while capital gains are taxed at a flat 28% rate. There are tax benefits to setting up an incorporated company, including more beneficial write-offs for expenses such as home office, company car, and computer equipment, so incorporation is typically preferable beyond very small scale ventures. Norway also imposes a wealth tax every year. While wealth is only taxed at death in the U.S. and most other countries, Norwegians pay a 1% annual tax on any net wealth above $120,000. The government's statistical agency, Statistics Norway (also known by its Norwegian acronym SSB) collects yearly data on wealth and income at the individual level from the Norwegian Tax Agency, and we obtain our data from SSB. Earnings and wealth figures for individuals are public information in Norway. This transparency is generally believed to make tax evasion more difficult and hence data more reliable.

A considerable fraction of entrepreneurs have parents that are also entrepreneurs, so we need to consider the possibility that new firms are simply continuations or inheritance of parents' businesses. To our knowledge there are no tax advantages in starting up a new firm based on the parents' firm rather than just continue operations of the parents' firm. On the other hand, there are costs associated with transfer of assets from a parents' firm to a new firm, such as time spent on additional reporting to the tax authorities, cost of audits, lesser brand recognition, and losing

[7] The material is taken from the OECD Statistical Profile for Norway: 2010, available at OECD.org, and from Statistics Norway webpages.

the possibility to write off prior losses. So there appears to be only economic disadvantages of starting up a new firm based on the parents' firm rather than continue the parents' firm. Our survey, which we discuss in more detail in 5, confirms this impression; none of the respondents mentioned that their startup was inherited or in other ways a continuation of their parents' firm.

3.2 Data sources

The analysis draws on several Norwegian register databases. We consider all Norwegian men who were between the ages of 22 and 45 in 1996 and for whom we have a measure of intelligence from their armed forces entry test. We do not include women in our analysis because we do not have an IQ measure as women do not take the armed forces test.

For entrepreneurs, we use a database that consists of the universe of newly incorporated, limited liability firms in Norway between 1999 and 2007.[8] We only consider the first venture a person starts between 1999 and 2011 and we drop individuals where we cannot identify the industry of employment for his father. Covering the population of new firms means that the majority of firms in the database are small. The advantage of this approach is that it will not be subject to selection biases commonly encountered in the literature that uses ”tip-of-the-iceberg” datasets (e.g., Hall and Woodward (2010)).[9] While many of these firms are small, a substantial fraction are not, even in the first year: the 75th percentile for book value of assets and number of employees in the first year of operations is about $400,000 and four, respectively.

We use two different register datasets, both of which are drawn from the same source. The larger one, which we use for most of the analysis, includes all ventures started between 1999 and 2011 However, this dataset cannot be matched to the IQ data from the armed services test. So, for our analysis of the relationship between IQ and entrepreneurial entry, we use the other source of the same data. This includes all ventures started between 1999 and 2007. All analyses show consistent results between the two datasets and the exclusion of IQ from some analysis does not affect the impact of other factors, as we show below.

The data are compiled from four different registers:

[8]For 1999, the data contain only a sample of the firms started. Diagnostic tests do not suggest any selection bias.

[9]Relative to datasets covering the self-employed, as in Hamilton (2000), the advantage is that we can measure firm performance at a much more detailed level.

1. Accounting information from Dun & Bradstreet's database of accounting figures based on the annual financial statements submitted to the tax authorities. This data include variables such as 5-digit industry code, sales, assets, number of employees, and profits for the years 1999-2011. Note that the D&B data contain yearly information on *all* Norwegian incorporated limited liability companies, and not a sample as in the U.S. equivalent. Incorporated companies are required to have an external auditor certifying the accounting statements in the annual reports.

2. Data on individuals from 1993 to 2009 compiled by Statistics Norway, covers the Norwegian adult population and consists of yearly records of workplace ID in addition to education level, gender, income, wealth, marital status, and many other variables. The data also identifies family relationships.

3. The IQ data are from the Norwegian military records between 1984 and 2005. In the data period, military service was compulsory for every able young man. Before entering the service, his psychological suitability is assessed; this occurs for the great majority between their 18th and 20th birthday. The IQ measure is an unweighted mean of three subtests—arithmetic, word similarities, and figures. The arithmetic test is similar to the arithmetic test in the Wechsler Adult Intelligence Scale (WAIS), the word test similar to the vocabulary test in the WAIS, and the figures test similar to the Raven Progressive Matrix test (Black, Devereux and Salvanes (2010)). The IQ score in the data is reported in Standard Nine (stanine) units, a method of standardizing raw scores into a nine point standard scale with a normal distribution, a mean of five, and a standard deviation of two.

4. Founding documents submitted by new firms to the government agency 'Brønnøysund-registeret'. This register data include the start-up year, total capitalization, and the personal identification number and ownership share of all initial owners with at least 10 percent ownership stake.

For each new firm identified in 1), we create a list of owners identified through 4) and compile their associated socio-demographic information from 2) and IQ from 3). We define an entrepreneur as a person with more than 33% percent ownership of the total shares in a newly established limited liability firm. We interchangeably refer to this person as "the entrepreneur" or "the founder". For a small fraction of firms, the first year of financial reporting, defined through 1), is different than the year of incorporation defined by 4). For these firms, we define the first year as the first year of reporting. To avoid counting wealth management vehicles as start-ups, we omit finance and real estate firms (NACE 65-70).

3.3 Summary statistics

Table 1 displays summary statistics for our sample. Of the roughly 670,000 men who meet our criteria, 4.1% are entrepreneurs (that is, they start businesses of which they own more than 33% between 1999 and 2011).[10] Entrepreneurs are slightly more educated than the rest of the sample (an education level of four corresponds to a high school diploma).

For both groups, we looked at earnings (in thousands of Norwegian Kroner) in their highest earning year between 1996 and 1998 (that is, while the entrepreneurs are still working in the labor market). Earnings for the entrepreneurs were almost 70% higher than non-entrepreneurs, which reflects their slightly higher education and IQ. They also have higher asset levels, suggesting entrepreneurs come from wealthier backgrounds. Wages in Norway respond in expected ways to education and job market experience. We ran wage regressions (details are in Appendix Table A.1) on our combined entrepreneur/non-entrepreneur sample where the dependent variable is the log of pay in the person's highest earning year between 1996 and 1998. Both for those who become entrepreneurs and those who do not, wages in Norway are related to age, education, and IQ in a predictable and typical manner.

Entrepreneurs are relatively likely to have entrepreneur parents, as is well established (see (Lindquist et al. 2015)). Note that we use a broader proxy for entrepreneurship of parents (self-employed) than we use for sons/founders (incorporated businesses) because we do not have incorporation data from when fathers would have founded their businesses.

We ran regressions (details in Appendix Table A.2) where the dependent variable is an indicator variable that equals one if the person starts a business between 1999 and 2007 (that is, the person is in the first column of Panel A of Table 1). These regressions confirm that the background characteristics in the table all contribute to the decision to become an entrepreneur as they are each statistically and economically significant predictors of entrepreneurial entry.

[10] This share is somewhat of an underestimate of the population given we limit the entrepreneur sample to those people for whom we know what industry employed their fathers.

Higher IQ and being younger predict entrepreneurial entry. Holding these variables fixed, lower education predicts entrepreneurial entry. Education leads to higher pay before starting a venture and higher pay in the non-entrepreneurial sector predicts a higher propensity to leave that sector and become an entrepreneur. Overall, greater earning power leads to higher entrepreneurship propensity, possibly because those who earn more have more resources to put towards a new venture and because they have a higher market value that they want to capture rather than split with an employer.

Our main proxies for "dinner table human capital" are indicator variables that take the value of one if the son's entrepreneurial venture is in the same industry (defined at various levels of specificity) as the industry where his father worked. Over four percent of entrepreneurs start up a firm in the same 5-digit industry as their father and over 11% in the same 2-digit industry. Five-digit industry codes are very narrow including such industries as "Manufacture of other electronic and electric wires and cables", "Freight ocean transport", and "Tax consultancy activity".

The entrepreneurs own, on average, 68% of the companies they start. A male is much more likely to start a business in an industry in which his father worked and in which he worked before starting the business than in other industries. For example, about ten percent of entrepreneurs start up a firm in the same 5-digit industry where they worked before starting the firm.

Panel B shows the basic features and performance metrics for the ventures founded by the entrepreneur sample. There are 27,311 such ventures started, though the sample is smaller after four years due to businesses failing or becoming part of another company. The average new venture in our sample starts with 163,000 Norwegian Kroner (approximately $18,000 at the current exchange rate) in invested equity. However, there is a great deal of variation in the size of these ventures, as evidenced by the standard deviation in the table. The median equity at founding is 97,000 Kroner and the 90th percentile is about 254,000 Kroner. 8.6% of new companies are technology-related.

Four years after founding, 61% of ventures are still operating. Size and profitability are highly variable at this stage. For example, while the average firm has 2.5 employees, a large share have none beyond the founders while 6% of firms have at least ten employees. Figure 2 graphs the distribution of initial employment (not counting the founder) by decile. The bottom five deciles are together in the graph because about half the firms are sole proprietors. Total employment at the firms in our sample is about 67,000 people, which represents between two and three percent of the Norwegian labor force.

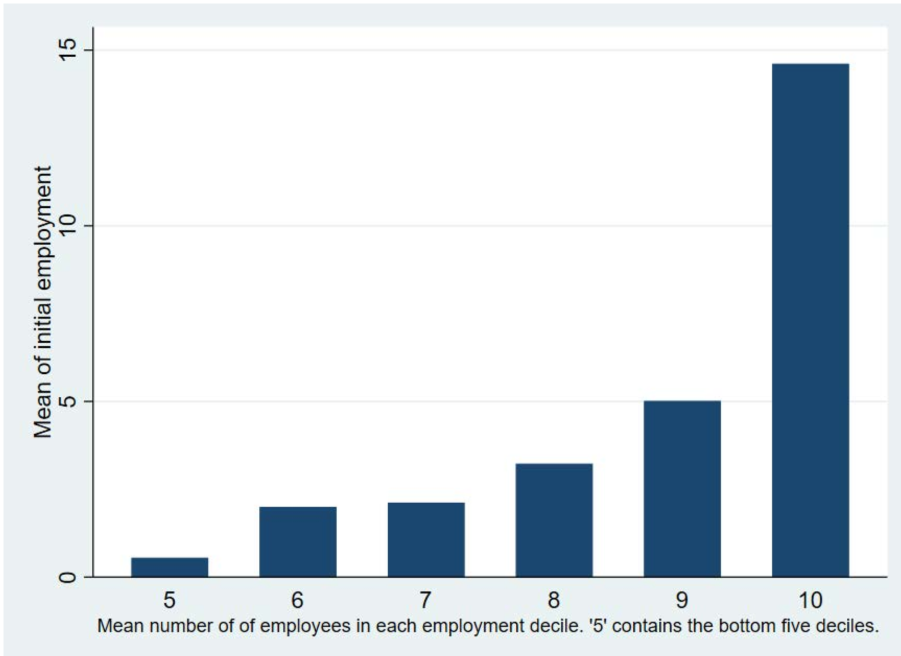

Figure 2: Distribution of Initial Employment

4 Results

4.1 Following Fathers

As we noted when discussing Table 1, over 4% of entrepreneurs start ventures in the narrowly defined industry in which their fathers worked. Using the distributions of entrepreneur and father industries if fathers and entrepreneurs were randomly mixed, we would find that 0.5% of entrepreneurs choose the same industry as their fathers.[11] Some industries are concentrated geographically, so we might expect that following one's father would be common simply because, for example, both fathers and sons in coastal areas are likely to work in fishing. However, when we randomly mix entrepreneur and father industries within cities, we find the probability of

[11]The 0.5% estimate is based on simulations where we randomly assigned the same overall distribution of industries to fathers as we see in the data and then see how many sons, using their actual industry codes, match these random father industries.

randomly working in one's father's industry increases only slightly to 0.58%. Following one's father happens much more often (about nine times as often, to be precise) as we would expect if it occurred strictly by chance.

Many entrepreneurs go into industries that are not the same as where their fathers worked but that are still more closely related than a random industry. For example, the son of a fisherman might learn about the fish industry from his father but choose a less taxing way to use that knowledge such as fish wholesaling. To get at such related, but not identical, father/son industry pairs, we created a "relatedness" index of industries. Specifically, for each two-digit industry, we divide the other industries into ten deciles of increasing "relatedness" based on the frequency of job changes into that other industry (details in Appendix A.4). 60% of entrepreneurs do not start a firm in the same two-digit industry as their fathers, but start a firm in an industry that is in the tenth (highest) relatedness decile. Thus, about 72% of male entrepreneurs start firms in the same or closely related industry as their fathers and, as a result, potentially have some dinner table human capital that we can observe.

This is our first finding – sons open new ventures in the same industry (or closely related industry) as their fathers worked at very high rates relative to what we would expect if fathers did not influence their son's skills. While other explanations can account for this fact, it is consistent with the first empirical prediction of our model.

4.2 What Predicts Following One's Father?

In Table 2, we analyze the role of dinner table human capital in entrepreneurial entry. The table shows results of linear probability models (results are insensitive to the choice of specification) where the sample is entrepreneurs who start a business between 1999 and 2007 and the dependent variable equals one if the entrepreneur's father worked in the same industry.[12] Note that, in this table, we are using the smaller dataset (18,028 entrepreneurs instead of the 27,311 in the larger sample) so that we can analyze the relationship between entrepreneurial choices and

[12] All our results are qualitatively similar if we define dinner table human capital as following the industry of either parent. We focus on fathers given our entrepreneur data is limited to men and that, when our sample was growing up, fathers were more likely to be attached to the labor force and to be the primary breadwinner in a household.

IQ.[13]

Columns 1 and 2 show regressions that do not control for industry fixed effects and we find evidence very much in line with what we would expect from our model. The IQ coefficient suggests that each additional IQ point (or each additional eight IQ points using a standard IQ scale) lowers the probability of following one's father by about one fifth (0.008 compared to 0.04 unconditional probability) with no controls (column 1). With controls added in column 2, the IQ coefficient remains highly significant and indicates more than a 10% increase for each IQ point.

This relationship between following one's father and IQ can be seen graphically in Figure 3. We drop IQ levels of 1 and 2 as they contain very few people. The steady downward relationship shows that the most intelligent entrepreneurs (while still much more likely to follow their fathers than random chance would suggest, as in the Larry Page anecdote), are about half as likely as the least intelligent entrepreneurs to follow their fathers.

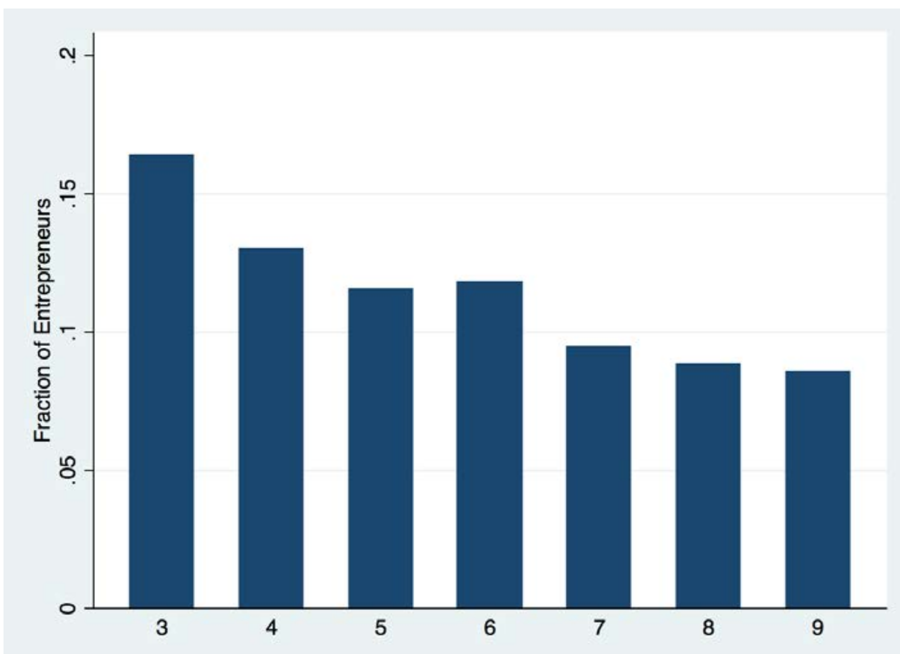

Figure 3: Entrepreneurial Entry into Father's 2-Digit Industry by IQ

[13]Throughout the analysis, we use linear specifications for education, age, IQ, and other explanatory variables. This makes interpretation of the results quite simple. If we used more flexible formats, the interpretation of all our key results is unchanged.

The table and graph confirm the second prediction of our model: specifically, that dinner table human capital is more important in determining sector for entrepreneurs with less natural intelligence. These results are consistent with the idea that the gifts people get, in terms of industry knowledge from their fathers' labor market experience, are relatively more valuable for those who have less natural intellectual skill.

Returning to Table 2, the education result is similar to IQ – those with more general human capital gained from the education system are less likely to follow their fathers. A one unit increase in our education measure (for example, changing from a high school graduate to someone with a bachelor's degree) decreases the likelihood of an entrepreneur's venture being in his father's industry by a bit less than half of one percentage point (about 10%).

Overall, we interpret the results in columns 1-2 as a reflection of the match between the entrepreneur's ability and the sector his father worked in. If the budding entrepreneur got a human capital gift from his father in an industry where his stellar intelligence would not be rewarded, it is in his best interests to forsake the gift and seek his fortune in an industry where his talents will be better compensated. But if the industry is relatively simple, so that his dinner table human capital makes him likely to succeed and his natural talents are not great, then he follows his father.

This "difference-in-industry" idea is supported by the fact that, when we include industry fixed effects in column 3 of Table 2, the IQ effect is much smaller (though still statistically significant). That is, different industries have different likelihoods of attracting entrepreneurs with dinner table human capital but, within an industry, aptitude as measured by IQ has a smaller effect on the decision of whether or not to employ dinner table human capital in a new business.

Column 4 of the table shows that the greater tendency of less intelligent entrepreneurs to follow their fathers holds within families. That is, even limiting ourselves to the variation that comes from pairs of sons of the same father who both become entrepreneurs and who have different IQ scores, we find a strong and significant relationship between intelligence and choosing an industry where an entrepreneur can use his dinner table human capital.

Table 2 also shows that entrepreneurs with more assets before they start their venture are more likely to start businesses in industries where their parents worked. One possible explanation for this is that those whose parents were more successful (and, as a result, gave their sons more money directly or more opportunities to earn money in their fields) also gave their sons larger dinner table human capital gifts. The table also shows that sons of entrepreneurs are more likely to follow their parents than sons of non-entrepreneurs. Combining our results with the fact that children of entrepreneurs are more likely to be entrepreneurs themselves (e.g., Lindquist et al. (2015)), it appears parents pass along general entrepreneurial skill and industry-specific entrepreneurial skill.

From our model, we expect to find that entrepreneurs with higher aptitude will attract (or make) larger investments in those firms. This is true in terms of number of employees as we find that the tendency to follow ones father increases in deciles of initial employment. For example, in the highest decile in terms of initial employment, almost 15% of entrepreneurs follow their fathers. Below median-sized firms are founded by entrepreneurs who follow their fathers in 9% of ventures.

Table 3 examines the scale of initial investment and returns to the larger dataset as our focus is now on how following one's father explains features and success of new ventures.[14] The dependent variable is the log of the amount invested at founding.

The coefficient on the "Same" variable shows a very strong relationship between the founder following his father in terms of industry and the initial equity investment. An entrepreneur son who enters an industry where a father preceded him invests about 12% more equity than an entrepreneur who does not follow a father in that same industry. An interpretation of this that follows from the model is that dinner table human capital makes expected returns greater because they have contacts within the industry or, due to their backgrounds, they are expected to be more successful. Similarly, their industry knowledge could reduce the risk to investors who are therefore willing to put up more money.

In addition, we find (not surprisingly) that entrepreneurs with more assets start larger ventures and that entrepreneurial children of entrepreneurs start larger ventures.

4.3 Startup performance

We look at longer-term performance in Table 4. Column 1 of both panels shows linear probability models where the dependent variable equals one if the business is still operating four years after founding. Consistent with our model's prediction that dinner table human capital

[14]Examining the smaller dataset that included IQ, we find that higher IQ leads to larger initial investments, though the relationship is not economically large.

enhances firm productivity, survival is noticeably higher for those with dinner table human capital. Survival is six percentage points, or about 10%, higher for those who follow their parents. Also, entrepreneurs with more assets before they start their venture and those who invest more in their ventures initially are more likely to survive.[15]

The next three columns of the table shows results for continuous measures of scale – Log of sales, number of employees, and log of assets. Some of these regressions are on smaller samples because we cannot include businesses that are no longer operating or that have zero or negative assets. We set employees to zero if the venture is no longer operating four years after founding.

The relationship between these performance measures and having a parent who worked in the founder's industry again has a strong and consistently positive association with performance. Dinner table human capital increases log sales and log assets by a third or more. The relationship between following one's father and number of employees is statistically more consistent and quite large economically. When a venture is four years old, it is likely to have one-to-two more employees if the business is in the same industry as that in which the founder's father worked. This is a very large effect given the average surviving four-year-old firm has 2.5 employees.

The final column focuses on EBITDA (operating profits) and leads to similar conclusions. We use the actual level of operating profit because many values are negative. The "Same" coefficient indicates that sons who follow their fathers make 200-250 thousand kroners more per year which is almost equal to the mean of operating profits.

In Table 5, we look at extreme outcomes rather than means. The dependent variables in the regressions in this table equal one if the firm is in the top five percent of all firms in the firm's two-digit industry in the relevant category. Firms that do not survive are included, so there is no depletion of the sample (and, naturally, the dependent variable can only equal one for surviving firms).

The regressions (which are linear probability models) support the conclusion that dinner table human capital is valuable. Founding a business in the same industry as a father predicts

[15] In order to use the larger dataset, we do not control for IQ in any of our performance analysis. This does not present bias, however. In the more limited dataset, we found that entrepreneur IQ is positively related to startup performance but the relationship is not economically large. More importantly, the relationship between "same" (or other explanatory variables) and performance is not affected by whether or not IQ is included in the regression.

50 to 100% higher probability of being a positive outlier for total assets, sales, employees, and operating profit. We found very similar results when looking at the relationship between ”Same” and a startup being in the top 1% or 2% in its industry on these same dimensions.

The effects of the other explanatory variables are not as consistent but education predicts a slightly greater probability of being a positive outlier. As we might expect, entrepreneurs who have more assets before starting their venture or who invest more equity at the start of their ventures are more likely to be positive outliers. For example, a 10% increase in the amount of equity invested initially is associated with 0.9% and 1.2% higher probability of being in the top five percent of ventures (within a given industry) as measured by employees or assets, respectively.

We have shown that firms started up in the same industry as where the entrepreneurs father worked have a higher chance of ending up in the top 5% (and top 1%) of startups in terms of sales or job creation. We also saw that initially larger firms are more likely to be founded by followers of their fathers. We now analyze whether the relationship between starting up in the same business as ones father is stronger or weaker across the initial size distribution. Figure 4 plots the following one’s father “excess performance” in terms of log of sales relative to other startups in an industry, across different firm sizes.

The strongest performance results are for the largest startups. For example, in the largest decile, the coefficient on excess log sales is about 0.3 (as opposed to a little below 0.2 for the broader sample). This indicates that, for the firms that are the largest initially, the scale in terms of sales at year four are about 30% higher for firms where the founder followed his father. So following one’s father is closely related to higher initial scale and, even controlling for initial scale, greater scale after four years.

In Table 6 we repeat the survival and employee analyses from Tables 4 and 5 but we add two other measures of starting a business in the entrepreneur’s father’s industry. “Same – 2-digit” is an indicator variable for the start-up being in the same two-digit industry as the father worked and “Related” is an indicator for the startup being in an industry in the top decile of industries in terms of turnover from the father’s industry to the industry of the startup (see discussion above and details in Appendix A.4). These definitions expand the number of entrepreneurs in industries related to their fathers substantially. While four percent of entrepreneurs are classified as “Same”, over eleven percent are “Same2” and 72% are in related industries (11.4% are in the

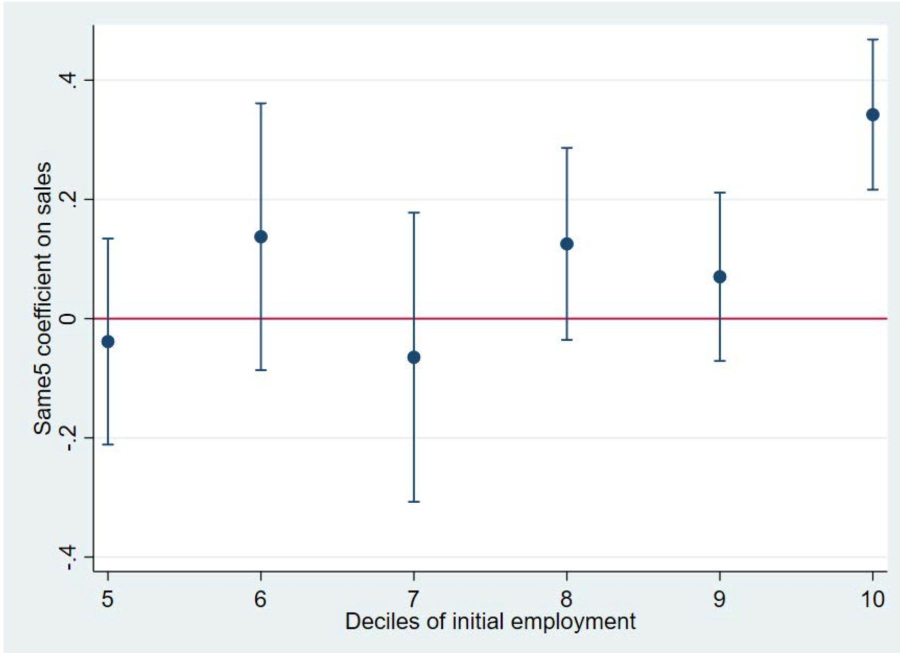

Figure 4: Effect of Following Father by Initial Size

same 2-digit industry and the rest are in a related industry).

As the table shows, the performance relationship of starting a business in one's father's five-digit industry is much stronger than two-digit and related industries. While sons have a high propensity to start businesses in the same two-digit industries as their fathers worked and in related industries, these startups outperform other startups marginally. This is consistent with dinner table human capital making future entrepreneurs *aware* of a range of businesses related to their fathers' industry but conveying skills that are particularly valuable in their fathers' area of expertise defined quite narrowly.

The conclusion from Tables 4 and 5 is clear – businesses started by sons that are in the same industry that employs (or employed) their fathers are more successful, on average, than those that do not. This relationship is much stronger and more consistent than the relationship between performance and other features of the founder including age, education, and financial background.

While dinner table human capital appears to be important to individual entrepreneurs, we now consider the aggregate implications for the economy. Our data is unique in that we follow all startups (for men between the ages of 22 and 45) from 1999 to 2011 and allow us to perform some simple calculations that address this issue.

About 4% of startups are in the same five-digit industry as the father was employed. For these startups, Table 4 Panel B, column 3, suggests that the year four employment effect is about 40%. This suggests that startups, as a whole, create approximately 1.6% more jobs than they would in the absence of dinner table human capital. These calculations suggest that human capital obtained at the dinner table have effects on aggregate job creation.

5 Mechanisms and Discussion

About four percent of entrepreneurs start a firm in the same very narrowly defined industry as their fathers worked and over half start a venture in a closely related industry. Entrepreneurs may follow their parents because they obtained dinner table human capital through their upbringing. But they may also follow their parents because the parents can provide direct assistance in starting the company through working for the company or providing contacts.

In this section, we look for the mechanisms behind the results we have presented so far and for evidence consistent with a more causal connection between dinner table capital and both entrepreneurial decisions and outcomes. We examine mechanisms for our earlier results in two ways. First, we can look at a subsample of entrepreneurs whose fathers died before they started their companies. Second, by analyzing the findings of our survey, we can better understand how dinner table human capital is obtained.

5.1 Dead Father Subsample

We now consider the subsample of entrepreneurs whose fathers died before they started their companies.[16] The propensity to follow one's father is still very strong even for entrepreneurs whose fathers died before the son's venture was launched. The share of entrepreneurs who start companies in the same 2-digit industry as their fathers is 10.0% for sons whose fathers are dead when they start the company versus 11.7% for those whose fathers are still alive. For 5-digit

[16] If the entrepreneur's father died before 1986, then we do not know what industry the father worked in and, as a result, the entrepreneur was dropped from all our analysis.

industries, the shares are 3.4% and 4.3%, respectively.[17]

These numbers indicate that the propensity to open a business in an entrepreneur's father's industry is almost as high for those whose fathers are dead when the venture is started, strongly suggesting that these entrepreneurs are not choosing to open a business where their fathers can directly help them. The high rate at which sons follow their fathers even if the father has died indicates that dinner table human capital, rather than direct help, likely drives the high rate at which entrepreneurs follow their fathers when they start ventures.[18]

Though our focus in this section is on the larger dataset, we did look at the relationship between following one's father and IQ using the smaller dataset for which we have the entrepreneur's IQ. Appendix Figure 5 shows that the relationship between intelligence and following one's father in an entrepreneurial venture holds when the father dies before the business was started.

Panel A of Table 7 extends the dead father analysis to the performance regressions in Panel B of Table 4. We add two new explanatory variables. First, "Father died" is a dummy variable that equals one if the entrepreneur's father died between 1986 and when the new business was started. These fathers were not available to help with the business. The second new explanatory variable is an interaction between the father's death and the entrepreneur's business being in the same industry as his father. If the reason entrepreneurs who follow their fathers are successful is because their fathers directly contribute to the success of the new business, then we should find that the value of following one's father is limited to entrepreneurs whose fathers are alive when they start the business.

The number of dead fathers is small so that the interaction term is noisy in some of these specifications. But the estimates are precise enough to suggest that there is no reason to think the relationship between following one's father and entrepreneurial performance is limited to sons whose fathers are available to help with the new venture. In fact, the point estimates indicate that, if anything, the performance effects are higher for those whose fathers die before they start their ventures. In Panel B, we run the performance regressions limiting the sample to en-

[17]Both the 2-digit and 5-digit differences across the two groups are significant and all groups are significantly higher than the level that would be produced by random sorting of industries.

[18](Kalil, Mogstad, Rege and Votruba 2016) show that the presence of Norwegian fathers is also important in determining children's educational attainment. They also use death of fathers to separate children who live with their fathers from those who do not.

trepreneurs whose fathers died before they started their companies. The coefficient on following one's father are similar in magnitude to the broader sample and statistically significant.

We also ran regressions where we ensure that the value of following one's father is not simply a matter of passing down entrepreneurial skills (as would be suggested by Lindquist et al. (2015)) by looking at the relationship of following one's father for entrepreneurs who did not have a parent who was an entrepreneur. That is, we limited the sample to entrepreneurs who, as far as we can tell, had parents that worked in the labor market and never started their own business. The results for the performance of these entrepreneurs is very similar to that for the sample as a whole shown in Panel B of Table 4. It appears that our measure of following a father by industry is not simply a proxy for following a parent into entrepreneurship.

5.2 Entrepreneur Survey

To help inform how dinner table human capital is transferred from parents to children, we deployed a survey of Norwegian entrepreneurs. Appendix A.3 details the survey questions and methodology and Appendix Table A.4 provides summary statistics of the responses. The survey was sent to all Norwegian companies with an initial accounting year between 2008 and 2014 that we were able to collect contact information from, about 50% of the total number of startups, and, to be consistent with our empirical register data sample, where one person owned at least one-third of the company and the venture was not an investment vehicle.[19] We obtained a response rate of approximately 15% (3,800 firms). The respondents are not necessarily representative, so we do not want to make strong claims based on the survey results. But the responses are quite suggestive of the value of dinner table human capital for entrepreneurs.

Of the survey respondents, about 15% said yes (for one or both parents) when asked, "Did your parents have work experience from the same or a closely related industry before your started up the firm?" Of this same-industry group, 84 percent report that they acquired at least some industry knowledge from their parents and almost half report that they have obtained "much" industry knowledge. Direct exposure to parents, through observing them at work (75%) and conversations at home (58%) are the most common ways of obtaining knowledge. More

[19]We focused our empirical analysis above on men because we do not have IQ data for women. However, we did not limit our survey to male entrepreneurs and we asked about mothers' influence as well as fathers'. The conclusions of our survey responses are similar if we focus on men.

indirect ways such as providing access to parents' network in the industry (30%) or to industry literature (21%) were cited less often.

Among those with parental work experience from the same or a closely related industry, a majority (60%) have not received any help from parents. Among the minority that do receive direct parental support, obtaining advice (51%) and parents working for the firm (37%) are the most common channels of assistance. Parents providing financial help (26%), helping out with obtaining access to customers (22%), with suppliers (15%), or sitting on the board (19%) are also important. Among those with parents *without* industry experience, the responses are markedly different. Here, a large majority, about 85%, received no help from parents, and the remaining 15% received mainly financial help (54% in this group) and advice (42% in this group). More direct operational help such as providing access to customers or to suppliers was very uncommon (4% and 1% in this group). About 51% of the entrepreneurs with parental work experience from the industry report that the parents indirectly or directly had affected startup performance in a positive way, while for those without such parental work experience the fraction is considerably smaller (about 18%). Consistent with the findings from the register data (Table 3), a much higher fraction of same-industry entrepreneurs had parents that also were entrepreneurs (48% vs 23%).

The answers to the survey question "Please comment on what role your parents played in providing industry knowledge prior to starting up the firm" provide anecdotal evidence of intergenerational transfer of knowledge and the value of dinner table human capital:[20]

- "My parents worked in medicine and pharmacy, as well as having an extra job with pharmacy at home. The part of the work that was done at home was fascinating. Other than that, it was summer jobs in pharmacies and the Norwegian Medicine Depot."

- "My father and his parents have always run a clothing shop. My mother was a decorator. I now create my own clothing brand that I sell through my own store and online. From the age of 13, I worked in the shop and learned a lot from both parents. This background made it easy for me to start my own, and I have always received a lot of moral support from home. Financial support has come when special needs via private loans."

[20] This open-ended question was asked at the end of the survey after the respondent had already answered more objective multiple choice questions about parental involvement. Translations below are from Norwegian using Google Translate, with some minor edits for syntax by the authors.

- "Through conversations, visiting relationships, working with father in adolescence."
- "Through my parents' networks, I gained work experience from the industry through summer jobs before I graduated."
- "I went up on a passenger ship where my father was a machine driver and thus gained maritime experience. This led to the choice of career direction which again revealed innovation needs in the market segment."
- "My father was CFO in an engineering company, so I got some exposure to a similar industry through him. But he died before I started up the company."
- "My father worked from home for a while when I was young. He also worked in the industry when I started up. I got some jobs directly from his employer. Certainly never straight from him, but there was probably some help from his side."
- "Via customer contacts and metrics."
- "Started working in my father's business at the age of 16. I picked out what he did well and implemented this in my own business. I also learned from his mistakes and so did not make the same mistakes myself."

With the obvious caveat of limited response and sample selection issues, the responses to our survey support our dinner table human capital hypothesis. A large majority of same-industry entrepreneurs have obtained industry knowledge from their parents, typically through conversations at home or observing parents working. Parental help appears to play a role, but less so than the transmission of dinner table human capital.

5.3 Comparison to Wage Workers

Our model and our analysis to this point limit the value of dinner table human capital to entrepreneurs. However, children that do not become entrepreneurs (i.e., wage workers) also often work in jobs similar to those of their parents.[21]

[21]Laband and Lentz (1983) show that U.S. sons are much more likely to follow their fathers in terms of occupation than random chance would suggest. Using much more recent data, Li (2017) shows the same for U.S.

Using a sample similar to our analysis of entrepreneurship, we analyzed the value of dinner table human capital for Norwegian wage workers. We found that dinner table human capital is important for this broader sample, though marginally less important than for entrepreneurs. Because wage workers are not our focus, the details of these analyses are in the Appendix. Our findings are:

- Wage workers follow their fathers into industries in a manner similar to entrepreneurs, though the relationship is somewhat weaker.
- Following one's father is associated with lower IQ though the relationship between IQ and following one's father is smaller economically for wage workers than for entrepreneurs.
- Wage workers who follow their fathers earn 4% higher wages which, while non-trivial, is smaller than the performance relationship of entrepreneurs following their fathers in terms of size and survival of new ventures.

Overall, our analysis of wage workers reinforces the idea that dinner table human capital is important for both workers and entrepreneurs but that the value to entrepreneurs is generally higher than to wage workers.

6 Conclusion

A majority of entrepreneurs start a firm in the same or a closely related industry as their fathers' industry of employment. This tendency is correlated with intelligence: higher-IQ entrepreneurs are less likely to follow their fathers. We also showed that businesses started by people who follow the industry in which their fathers worked are noticeably more successful after four years of operation by several different measures. We interpret this as suggesting that dinner table human capital is quite valuable and that many parents give their children a gift of industry knowledge. This conclusion is supported by analysis of the subset of entrepreneurs where the father is dead upon starting up the firm, by our survey evidence, and by the analysis of data for all workers in Norway.

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workers and their parents, regardless of gender. Kramarz and Skans (2014) show that Swedish children join the establishment where a parent works (and, as a result, work in the same industry as the parent) at a high rate. Unlike these papers, we focus on following parents in terms of industry rather than occupation because occupation is less relevant for entrepreneurs.

Our findings shed some light on what happens in the entrepreneurial process and identifies a source of heterogeneity in entrepreneurship. At a broader level, our work suggests that interaction within the family is an important mechanism for the transmission of human capital that is valuable to innovative activity.

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Table 1: Summary Statistics

Panel A: Individuals		
	Entrepreneurs	Non-Entrepreneurs
Education "Level"	4.43	4.19
	(1.54)	(1.35)
Highest Earnings (000), 1996-1998	508.34	300.10
	(552.02)	(299.30)
Age in that year	35.03	34.95
	(7.58)	(7.18)
Assets in that year (000)	943.85	361.45
	(5,052.61)	(309.01)
IQ (1-9 scale)	5.68	5.45
	(1.74)	(1.85)
Father was Self-Employed	28.09%	N/A
Entrepreneur in Father's 5-digit Industry	4.13%	N/A
Entrepreneur in Father's 2-digit Industry	11.42%	N/A
Entrepreneur in "Related" Industry	60.51%	N/A
Share of Venture Owned	68.16%	N/A
	(25.08%)	
Number of Observations	27,311	643,740
Panel B: Entrepreneurial Ventures		
Equity at Founding (000s)	163.12	
	(989.26)	
Assets in Fourth Year (000s)	2.72	
	(8.55)	
Sales in Fourth Year (000s)	5.97	
	(11.93)	
Employees in Fourth Year	2.47	
	(7.77)	
EBITDA in Fourth Year	423.81	
	(1301.62)	
=1 *if Technology-based*	8.60%	
=1 if Survived at least 4 Years	60.95%	
Number of Observations	27,311	

Notes: Standard deviations in parentheses. Panel A sample is all Norwegian men between the ages of 22 and 45 in 1996. "Entrepreneurs" include any man who started a non-financial business between *1999 and 2007* of which he owned at least one-third and for whom we know the industry that employed his father. Samples for IQ in Panel A and Fourth Year variables in Panel B are smaller than for other variables.

Table 2: Entrepreneurial Following Parents

	(1)	(2)	(3)	(4)
IQ	-0.0079	-0.0061	-0.0024	-0.0092
	(0.0009)	(0.0010)	(0.0011)	(0.0040)
Education		-0.0049	0.0002	0.0008
		(0.0013)	(0.0014)	(0.0049)
Age		-0.0004	-0.0004	0.0000
		(0.0003)	(0.0003)	(0.0013)
Ln(Assets pre-Entrepreneurship)		0.0064	0.0053	0.0014
		(0.0009)	(0.0009)	(0.0034)
Father Self-Employed		0.0656	0.0627	
		(0.0037)	(0.0037)	
5-Digit Industry Fixed Effects	No	No	Yes	Yes
Father Fixed Effects	No	No	No	Yes
R-square	0.0044	0.0259	0.0856	0.9807
Observations	18,028	18,028	18,028	18,028

Notes: Linear Probability Regressions, Dependent Variable = 1 if entrepreneur founds a business in 5-digit industry in which his father worked. Sample limited to entrepreneurs. Standard errors in parentheses.

Table 3: Initial Scale

	(1)	(2)
Same	0.0700	0.1202
	(0.0161)	(0.1162)
Education	-0.0024	-0.0277
	(0.0024)	(0.0138)
Age	0.0003	0.0019
	(0.0005)	(0.0042)
Ln(Assets pre-Entrepreneurship)	0.0465	0.0241
	(0.0024)	(0.0129)
Father Entrepreneur	0.0104	
	(0.0073)	
Industry Fixed Effects	No	Yes
Family Fixed Effects	No	No
R-square	0.1477	0.9770
Observations	27,311	27,311

Notes: Dependent variable = natural log of the equity invested in the business when it was founded (mean is approximately 163 thousand Norwegian Kroner). All specifications include Year Dummies. Standard errors in parentheses.

Table 4: Year Four Performance

Panel A: Without 5-digit industry controls

Dependent Variable:	4-Year Survival	Year 4 Log Sales	Year 4 Employees	Year 4 Log Assets	Year 4 EBITDA
Same	0.0596	0.4219	1.6727	0.2543	253.9590
	(0.0149)	(0.0507)	(0.2341)	(0.0452)	(48.0873)
Education	-0.0003	-0.1246	-0.1480	-0.0070	39.5764
	(0.0019)	(0.0070)	(0.0307)	(0.0063)	(6.6747)
Age	-0.0005	-0.0170	-0.0284	-0.0112	-4.0031
	(0.0004)	(0.0015)	(0.0067)	(0.0014)	(1.4619)
Ln(Assets pre-Entrepreneurship)	0.0117	0.0371	0.0955	0.1519	71.6481
	(0.0023)	(0.0085)	(0.0355)	(0.0076)	(8.0513)
Ln(Startup Equity)	-0.0024	0.6215	1.4701	0.6050	217.5185
	(0.0055)	(0.0199)	(0.0861)	(0.0177)	(18.8874)
Father Entrepreneur	0.0091	(0.0519)	(0.0540)	0.0487	3.5698
	(0.0066)	(0.0236)	(0.1044)	(0.0211)	(22.4028)
R-square	0.0077	0.1024	0.0312	0.1075	0.0233
Observations	27,311	16,645	27,311	16,643	16,645

Panel B: With 5-digit industry controls

Dependent Variable:	4-Year Survival	Year 4 Log Sales	Year 4 Employees	Year 4 Log Assets	Year 4 EBITDA
Same	0.0241	0.1874	1.0175	0.1831	221.2305
	(0.0150)	(0.0477)	(0.2319)	(0.0450)	(47.1285)
Education	0.0071	-0.0202	0.0517	0.0267	45.3874
	(0.0022)	(0.0077)	(0.0344)	(0.0072)	(7.5614)
Age	0.0000	-0.0096	-0.0137	-0.0114	-4.4016
	(0.0004)	(0.0015)	(0.0067)	(0.0014)	(1.4520)
Ln(Assets pre-Entrepreneurship)	0.0141	0.0409	0.1459	0.1384	63.3104
	(0.0022)	(0.0079)	(0.0348)	(0.0075)	(7.8315)
Ln(Startup Equity)	0.0034	0.4364	1.2917	0.5395	207.4935
	(0.0057)	(0.0197)	(0.0878)	(0.0185)	(19.4233)
Father Entrepreneur	0.0079	-0.0197	0.0397	0.0266	1.7524
	(0.0066)	(0.0219)	(0.1020)	(0.0207)	(21.6599)
R-square	0.0665	0.2755	0.1182	0.1927	0.1449
Observations	27,311	16,645	27,311	16,643	16,645

Notes: Dependent variables are performance measures four years after ventures are incorporated. All specifications include Year Dummies. Sample sizes are reduced when sales or assets are missing (due to operation closing), missing, or negative (Log Sales and Log Assets), or when assets are zero or missing (ROA). Standard errors in parentheses.

Table 5: Year Four Extreme Performance

Dependent Variable:	Sales	Employees	Assets	EBITDA
Same	0.0307	0.0449	0.0289	0.0399
	(0.0066)	(0.0066)	(0.0066)	(0.0067)
Education	0.0011	-0.0010	0.0028	0.0053
	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Age	-0.0006	-0.0006	-0.0006	-0.0007
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Ln(Assets pre-Entrepreneurship)	0.0051	0.0039	0.0113	0.0099
	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Ln(Startup Equity)	0.0559	0.0467	0.0635	0.0347
	(0.0024)	(0.0024)	(0.0024)	(0.0025)
Father Entrepreneur	-0.0004	-0.0028	0.0036	0.0003
	(0.0030)	(0.0030)	(0.0029)	(0.0030)
R-squared	0.0273	0.0285	0.0387	0.0199
Observations	27,210	27,210	27,210	27,210

Notes: Linear probability models where dependent variable = 1 if company is in top 5%, within its 2-digit industry, of the relevant category in Year 4 after founding. All specifications include Year Dummies. Sample is reduced because companies in 2-digit industries with fewer than 20 companies are dropped.

Table 6: Performance by Industry Aggregation

Dependent Variable:	4-Year Survival	Year 4 Survival	Year 4 Survival	Year 4 Employees	Year 4 Employees	Year 4 Employees
Same			0.0095			0.8942
			(0.0182)			(0.2826)
Same – 2-digit	0.0177		0.0262	0.4528		0.1727
	(0.0094)		(0.0129)	(0.1452)		(0.2003)
Related		0.0057	0.0182		-0.1388	0.0557
		(0.0076)	(0.0090)		(0.1182)	(0.1393)
R-square	0.0655	0.0653	0.0656	0.1166	0.1163	0.1169
Observations	27,210	27,210	27,210	27,210	27,210	27,210

Note: These regressions are identical to the regressions in Table 5, Panel B, except these regressions include two additional measures of entrepreneurs following their fathers. “Same – 2-digit” equals one if the entrepreneur’s business is in the same 2-digit industry as where his father worked and “Related” equals one if the entrepreneur’s business is in an industry closely related to the one in which his father worked.

Table 7: Dead Fathers

Panel A: Dead Father Variables					
Variables	4-Year Survival	Year 4 Log Sales	Year 4 Employees	Year 4 Log Assets	Year 4 EBITDA
Same	0.0126	0.1597	0.7173	0.1506	166.0731
	(0.0160)	(0.0514)	(0.2487)	(0.0485)	(33.4465)
Father died	-0.0080	-0.0478	-0.1045	-0.0750	-34.2045
	(0.0085)	(0.0286)	(0.1318)	(0.0270)	(17.7221)
Same* (Father died)	0.0841	0.2059	2.3033	0.2362	51.5265
	(0.0431)	(0.1323)	(0.6680)	(0.1249)	(89.8437)
Observations	27,210	16,595	27,210	16,593	27,210
R-squared	0.0656	0.2750	0.1173	0.1920	0.1028

Panel B: Dead Father Subsample					
Variables	4-Year Survival	Year 4 Log Sales	Year 4 Employees	Year 4 Log Assets	Year 4 EBITDA
Same	0.0872	0.3511	2.8183	0.4069	207.7801
	(0.0426)	(0.1296)	(0.5412)	(0.1232)	(74.9690)
Observations	4,430	2,679	4,430	2,679	4,430
R-squared	0.1302	0.3718	0.2549	0.2944	0.1661

Notes: These regressions are identical to the regressions in Table 4, Panel B, except they add an indicator for the founder's father dying before the venture is started (Panel A) or are limited to the subsample with dead fathers.

A Appendix

A.1 Appendix Tables and Graphs

Table A.1: Pay Regressions

	(1)	(2)	(3)
IQ	0.0691	0.0189	0.0260
	(0.0005)	(0.0005)	(0.0011)
Education		0.0919	0.0832
		(0.0007)	(0.0014)
Age		0.0243	0.0250
		(0.0001)	(0.0003)
Father Fixed Effects	No	No	Yes
R-square	0.0344	0.1098	0.7879
Observations	661,768	661,768	661,768

Notes: Sample is all Norwegian men who were 22-45 years old in 1996, for whom we have information on IQ, and who are employed. Regressions are cross-sectional with dependent variable = ln(pay) in year between 1996 and 1998 with highest pay.

Table A.2: Entrepreneurial Entry

	(1)	(2)	(3)
IQ	0.0018	0.0016	0.0013
	(0.0001)	(0.0001)	(0.0003)
Education		-0.0006	-0.0022
		(0.0002)	(0.0004)
Age		-0.0019	-0.0009
		(0.00003)	(0.0001)
Ln(Highest Pay, 1996-1998)		0.0120	0.0117
		(0.0003)	(0.0007)
Ln(Assets in same year)		0.0041	0.0040
		(0.0001)	(0.0002)
Father Fixed Effects	No	No	Yes
R-square	0.0004	0.0095	0.7245
Observations	661,768	661,768	661,768

Notes: Linear Probability Regressions, Dependent Variable = 1 if person becomes an entrepreneur between 1999 and 2007. Sample is all entrepreneurs and non-entrepreneurs. Standard errors in parentheses.

Table A.3: Labor Market Outcomes

Panel A: Labor Market Following Fathers				
	(1)	(2)	(3)	(4)
IQ	-0.0059	-0.0038	-0.0007	-0.0043
	(0.0002)	(0.0002)	(0.0002)	(0.0007)
Education		-0.0047	-0.0012	-0.0034
		(0.0003)	(0.0003)	(0.0008)
Age		0.0005	0.0003	0.0007
		(0.0001)	(0.0001)	(0.0002)
5-Digit Industry Fixed Effects	No	No	Yes	Yes
Father Fixed Effects	No	No	No	Yes
R-square	0.0021	0.0029	0.0461	0.8922
Observations	417,270	417,270	417,270	417,270

Panel B: Pay Regressions						
	(1)	(2)	(3)	(4)	(5)	(6)
IQ	0.0126	0.0268	0.0128	0.0268	0.0128	0.0136
	(0.0005)	(0.0011)	(0.0005)	(0.0011)	(0.0005)	(0.0005)
Education	0.0520	0.0463	0.0522	0.0463	0.0522	0.0522
	(0.0006)	(0.0013)	(0.0006)	(0.0013)	(0.0006)	(0.0006)
Age	0.0322	0.0320	0.0322	0.0320	0.0322	0.0322
	(0.0001)	(0.0004)	(0.0001)	(0.0004)	(0.0001)	(0.0001)
Same			0.0417	0.0032	0.0314	0.1153
			(0.0034)	(0.0071)	(0.0050)	(0.0102)
Same – 2 digit					-0.0028	
					(0.0033)	
Related					0.0082	
					(0.0018)	
Same Plant					0.0157	
					(0.0054)	
IQ*Same						-0.0150
						(0.0020)
Father Fixed Effects	No	Yes	No	Yes	No	No
R-square	0.1859	0.8598	0.1862	0.8598	0.1863	0.1863
Observations	417,270	417,270	417,270	417,270	417,270	417,270

Notes: Sample is all Norwegian men who were 22-45 years old in 2008, for whom we have information on IQ and the industry that employed their fathers, and who are employed. Regressions in both panels are cross-sections in 2008. Panel A: Linear Probability Regressions where dependent variable = 1 worker is employed a business in 5-digit industry in which his father worked. Panel B: Dependent variable is log of 2008 pay. “Same”, “Same - 2 digit”, and “Same plant” equal one if person works in same 5-digit industry, 2-digit industry, or establishment, respectively, as his father.

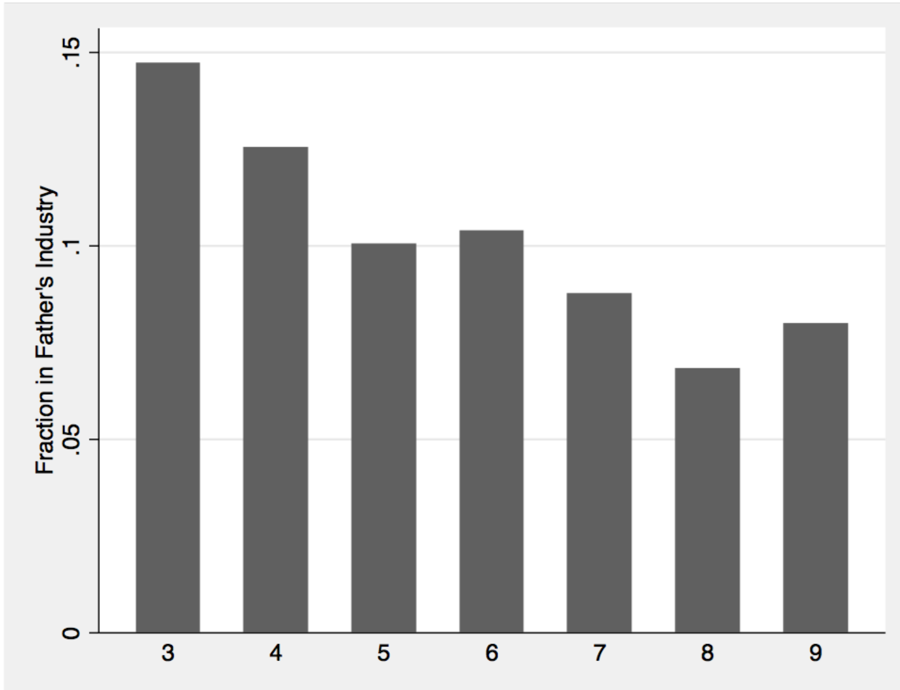

Figure 5: Entrepreneurial Entry into Father's Industry by IQ, if Father Dead When Business Started

A.2 Education

We can extend the model by investigating the choice of education. We think of education as something that gives general human capital, so that productivity as wage worker becomes

$$w = a + k_0 s + h_0 * IQ \tag{4}$$

where s is years of education. The productivity as Sector 1 entrepreneur becomes,

$$e_1 = K + k_1 s + h_1 * IQ + \epsilon_1 \tag{5}$$

and as Sector 2 entrepreneur becomes,

$$e_2 = k_2 s + h_2 * IQ + \epsilon_2. \tag{6}$$

Moreover, in line with much of the education literature we assume that education is cheaper to acquire for high-IQ individuals. We assume that the cost of education is convex and decreasing in IQ,

$$c(s) = \frac{s^2}{IQ} \tag{7}$$

The convexity in educational cost ensures interior solutions.

From these assumptions we see immediately that higher-IQ individuals will obtain higher schooling levels and be more productive both as workers and as entrepreneurs. Schooling acts as a shifter of productivity but does not alter the qualitative properties of Remark 1 and 2. As we have made no assumptions on the relative magnitudes of k_0, k_1 and k_2, the model does not provide predictions on in which industry education is more valuable. Finally note that we can also imagine versions of the model where schooling interacts with IQ. If, for example, education leads to a large shift upwards in h_0 then the sorting properties of Remark 1 can be altered. We summarize,

Remark 3 *In addition to (i)-(iii) from Remark 1, increased IQ leads to,*

(iv)Higher education level

Proof. Follows directly. ■

A.3 Entrepreneur survey

We conducted an ex-post survey of entrepreneurs, with two purposes. First, we wished to explore how industry knowledge is transferred from parents to children. Second, parents provide input not only through human capital transmission but also by helping out in their child's entrepreneurial activity, and we wished to explore the importance of this complementary channel.

A.3.1 Survey outline

The web-based survey was conducted in August 2017. The fifteen survey questions are reproduced below. Through register data we identified all new incorporated companies that had (a) their first accounting year between 2008 and 2014, (b) at least one personal owner with more than 1/3 ownership initially, and (c) were not financial or holding companies. (a) was chosen because in recently started firms it would be easier to track down the entrepreneur, and (b) and (c) ensured a similar sampling to the main analysis. This constituted 56,161 firms. We next obtained email address or cell phone number (or both) from the Brønnøysund register for 26,760 firms (about 48 percent).[22] Below we discuss the main findings.

A.3.2 Survey results

Parental background from industry

About 15 percent of entrepreneurs have parents with work experience from the same or a closely related industry. This is higher than our matching based on exact (2-sector) industry codes in the register data, which had about 10 percent of males starting up a firm in the same industry as their father worked in. Almost 80 percent of the entrepreneurs in the survey are male, and the fraction of male entrepreneurs that follow their parents is substantially higher than for female entrepreneurs (16 versus 11 percent).

Transmission of industry knowledge

[22] Reporting email address or cell phone number to Brønnøysund is voluntary for firms, which in addition to attrition explains the limited coverage. Diagnostic tests suggest that the sample of firms with contact details are not very different from the ones without. The response rate of the survey was about 15 percent. Startups of respondents and non-respondents, the latter group including those without contact information and those with contact information but non-response to survey, appear fairly balanced on observables. These and other details of the survey are available from the authors.

Among those with parental work experience from the same industry, a large majority (84%) state that they have obtained at least some industry knowledge from parents (Q7). About 40% of these report that they have obtained "much" such knowledge. Direct exposure to parents, through observing them at work (75%) and conversations at home (58%) are the most common ways of obtaining knowledge (Q8). More indirect ways such as providing access to parents' network in the industry or to industry literature, are less common. About two thirds (65%) of subjects who had parents with work experience from the same industry report that they were more likely to start up a firm in that industry (rather than to start up a firm in a different industry) because of their parents work experience. The answers to the qualitative question (Q12) provide stories of intergenerational transfer of knowledge. Many respondents say that they obtained industry knowledge through "shop talk" at home, or through following their parents to work, quite frequently through summer jobs.

Parental help

Among those with parental work experience from the same or a closely related industry, a majority (60%) has not received any help from parents. Of those that received help, about a quarter received much help. Obtaining advice (51%) and parents working for the firm (37%) are the most common channels of assistance. Parents providing financial help (26%), helping out with obtaining access to customers (22%), with suppliers (15%), or sitting on the board (19%) are less common. Among those with parents *without* industry experience, the responses are markedly different. Here, a large majority, about 85%, received no help from parents, and the remaining 15% received mainly financial help (54% in this group) and advice (42% in this group). More direct operational help such as providing access to customers or to suppliers was very uncommon (4% and 1% in this group).

Parents affecting performance

Q11 asks whether parents directly or indirectly have affected the performance (growth, profitability, survival) of the startup. About 51% of the entrepreneurs with parental work experience from the industry report that the parents had affected startup performance in a positive way, while for those without such parental work experience the fraction is considerably smaller, (about 18%).

Other findings

A much higher fraction of same-industry entrepreneurs had parents that also were entrepreneurs (48% vs 23%), and more than half of the 48% were entrepreneurs in the same industry. It is well-known that entrepreneurship runs in families, but not previously known that this appears to be especially so for same-industry entrepreneurs. One concern is that the new firms are continuations of their parents firm. However, the written comments from entrepreneurs (Q14 and Q15) does not suggest a continuation/inheritance channel – none of the stories told by entrepreneurs indicate that their firm is a direct continuation of their parents' firm.

Summary

With the obvious caveat of limited response and sample selection issues, it appears that a large majority of same-industry entrepreneurs have obtained industry knowledge from their parents. The learning typically occurred through conversations at home or observing parents working. Parental help appears to play a not unimportant, but lesser, role.

A.3.3 Survey questions

Q1. Are you one of the entrepreneurs of name_firm? As entrepreneur we count a person with more than a third (33%) of the ownership stake when the firm was started (tick one box)

a. Yes

b. No –> end. Display message: "Please forward the email to one of the entrepreneurs. Thank you!"

Q2. What is your highest level of education? (tick one box)

a. Primary education

b. High School or similar

c. Bachelor/engineer/nurse or similar

d. Master/hovedfag/MD/siv.ing/siv.øk or similar

e. Doctoral degree

Q3. What is your gender? (tick one box)

a. Female

b. Male

Q4. What is your age? (tick one box)

a. 18-25

b. 26-30

c. 31-35

d. 36-40

e. 41-45

f. 46-50

g. 51-55

h. 56-60

i. 61 or more

The following questions are about prior to starting up a firm.

Q5. Did you have work experience from the same industry (as an employee) prior to starting up the firm? (tick one box)

a. Yes

b. No

Q6. Did your parents have work experience from the same or a closely related industry before your started up the firm? (tick one box)

a. No –> drop Q7, Q8, Q11, Q14. Drop Q13 unless b on Q12

b. Father

c. Mother

d. Both

e. Unknown –> drop Q7, Q8, Q11, Q14. Drop Q13 unless b on Q12

Q7. Did you obtain industry knowledge from your parents through your upbringing? Examples can be conversations at home, observe parents at work, access to parental network, reading of books or journals available in your home etc. (tick one box)

a. None –> drop Q8

b. Some

c. Much

Q8. How did you obtain knowledge about the industry via your parents?

a. Informal conversations at home (over the dinner table, on family trips etc)

b. Observing my parents at work

c. Through my parents' network (colleagues or friends)

d. Through books or periodicals available at home

e. Other

The following questions are about your experiences in connection with and after the firm was started up.

Q9. Has your parents helped you out with the startup? Such help can be guidance, work hours, financial help, connections, referrals etc (tick one box)

a. None –> drop Q10 (go to Q11 or Q12 depending on answer to Q6)

b. Slight

c. Substantial

Q10. How has your parents helped out? (tick all boxes that apply)

a. Financial support

b. Worked in the startup

c. Access to custom network

d. Access to supplier network

e. Board membership

f. Advice and guidance

g. Other

Q11. Do you think your parents directly or indirectly have affected the performance of the startup (growth, profitability, or survival)? (tick one box)

a. No

b. Yes, in a slightly negative way

c. Yes, in a slightly positive way

d. Yes, in a very negative way

e. Yes, in a very positive way

Q12. Has any of your parents experience as an entrepreneur (more than 1/3 ownership in a new inc)? (tick one box)

a. No –> drop Q13 unless b, c or d on Q6

b. Yes, in the same industry as my startup

b. Yes, but in a different industry than my startup

c. Unknown –> drop Q13 unless b, c or d on Q6

Q13. Do you think you were more likely to choose to start up a firm in this industry (rather than in a different industry) because of your parents' background from the industry? (tick one box)

a. No

b. Some

c. Much

Q14. Please comment on what role your parents played in providing industry knowledge prior to starting up the firm (text box)

Q15. Please comment on what role your parents have played in helping you out in connection with and after the firm was started up (text box)

Thanks for your participation!

Table A.4: Survey Summary Statistics

VARIABLES	Parental same-industry work experience: yes mean	N	Parental same-industry work experience: no mean	N
Q2. Primary education	0.078	3,263	0.14	559
Q2. High school	0.25	3,263	0.35	559
Q2. Bachelor	0.36	3,263	0.31	559
Q2. Master	0.29	3,263	0.21	559
Q2. Ph.D	0.019	3,263	0.0036	559
Q3. Male	0.77	3,252	0.83	561
Q4. Age 18-25	0.0052	3,269	0.011	562
Q4. Age 26-30	0.035	3,269	0.059	562
Q4. Age 31-35	0.083	3,269	0.084	562
Q4. Age 36-40	0.13	3,269	0.11	562
Q4. Age 41-45	0.15	3,269	0.18	562
Q4. Age 46-50	0.16	3,269	0.17	562
Q4. Age 51-55	0.15	3,269	0.14	562
Q4. Age 56-60	0.12	3,269	0.12	562
Q4. Age 61 or more	0.16	3,269	0.13	562
Q5. Work experience from same industry	0.54	3,267	0.68	562
Q5. Work experience from close industry	0.23	3,267	0.24	562
Q5. No work experience from same or close industry	0.22	3,267	0.085	562
Q7. Learning from parents: none			0.16	560
Q7. Learning from parents: some			0.5	560
Q7. Learning from parents: much			0.34	560
Q8. Learning from conversations with parents at home			0.58	473
Q8. Learning from observing parents			0.75	473
Q8. Learning from parents' network			0.3	473
Q8. Learning from literature (books, journals, magazines)			0.21	473
Q8. Learning from parents, other			0.23	473
Q9. Help from parents: none	0.85	3,259	0.6	555
Q9. Help from parents: some	0.12	3,259	0.28	555
Q9. Help from parents: much	0.027	3,259	0.12	555
Q10. Financial help, fraction	0.54	503	0.32	228
Q10. Worked for startup, fraction	0.25	503	0.46	228
Q10. Access to customer network, fraction	0.042	503	0.28	228
Q10. Access to supplier network, fraction	0.012	503	0.18	228
Q10. Board membership, fraction	0.2	503	0.23	228
Q10. Advice and guidance, fraction	0.42	503	0.63	228
Q10. Other, fraction	0.13	503	0.092	228

Q11. Parents effect on performance: none	0.81	3,247	0.45	555
Q11. Parents effect on performance: slightly negative	0.008	3,247	0.022	555
Q11. Parents effect on performance: slightly positive	0.14	3,247	0.36	555
Q11. Parents effect on performance: very negative	0.0025	3,247	0.0072	555
Q11. Parents effect on performance: very positive	0.04	3,247	0.15	555
Q12. Parents entrepreneur: no	0.78	3,216	0.53	549
Q12. Parents entrepreneur: yes, same industry	0.0037	3,216	0.26	549
Q12. Parents entrepreneur: yes, different industry	0.22	3,216	0.21	549
Q13. Not more likely to choose that industry			0.34	551
Q13. More likely to choose that industry			0.4	551
Q13. Much more likely to choose that industry			0.25	551
Response rate overall	0.15	3,270	0.15	562

This table compares those whose parents had industry work experience versus those that did not. The survey did not require respondents to answer each question; the number of respondents for each question is given in columns 2 and 4. The fraction of respondent with parent work experience from same industry is 0.15. Response rate overall of the survey is 0.15.

A.4 Relatedness

More than 4 percent of entrepreneurs start a firm in the same 5-digit industry as their fathers' work experience, and more than 11 percent in the same 2-digit industry. Of the remaining 89 percent of entrepreneurs, about 52 percent start a firm in a closely related industry. Here we outline the methodology behind this finding.

A.4.1 Definitions

We base our measures of industry relatedness on the frequency of labor market transitions between pairs of industries. First define,

$$f_{AB}^{(1)} = n_{AB}/n_A \tag{8}$$

where n_{AB} is the total number of workers that move from industry A to industry B in a given year, and n_A is the number of workers leaving industry A. $f_{AB}^{(1)}$ is the fraction of workers leaving industry A that move to industry B, and measures the extent to which labor transitions from industry A tends to flow in the direction of industry B. $f_{AB}^{(1)}$ is intended to capture the extent to which industry-specific human capital is "portable" from industry A to industry B. It is conceivable that labor flows between two industries are predominantly one-directional; we therefore do not require $f_{AB}^{(1)} = f_{BA}^{(1)}$. Clearly $\sum_{\forall B} f_{AB}^{(1)} = 1$ because $\sum_{\forall B} n_{AB} = n_A$. The first measure of relatedness, r_1, is simply $f_{AB}^{(1)}$ converted to deciles based on rank. For given A, the 10% B industries with the smallest $f_{AB}^{(1)}$ obtains $r_1 = 1$, the 10% B industries with the largest $f_{AB}^{(1)}$ obtains $r_1 = 10$, and so on.

The measure r_1 has the inconvenience that large industries B will tend to have a high n_{AB}, so that r_1 tends to be high for any large industry B. To account for size, we construct two alternative relatedness measures. The first subtracts the size of industry B in the first step, i.e.,

$$f_{AB}^{(2)} = f_{AB}^{(1)} - N_B/N \tag{9}$$

where N_B is the number of workers employed in industry B in a given year, and N is the number of workers in the economy. The second relatedness measure, r_2, is $f_{AB}^{(2)}$ converted to deciles based on rank, so that the 10% B industries with the smallest $f_{AB}^{(2)}$ obtains $r_1 = 1$, the

10% B industries with the largest $f^{(2)}_{AB}$ obtains $r_1 = 10$, and so on. Industry B being large does not necessarily translate into a large labor flow into B (think about downsizing industries). Our third (and main) measure of relatedness, r_3, uses the size of the flow into B, rather than the size of B as in r_2,

$$f^{(3)}_{AB} = f^{(1)}_{AB} - M_B/M \tag{10}$$

where M_B is the total number of workers that move to industry B in a given year, and M is the total number of workers that switch industries. As M_B/M is the probability that a randomly chosen worker moves to industry B, we can interpret $f^{(3)}_{AB}$ as the excess probability, over and above a random switch, of a worker from sector A choosing sector B. Note that $f^{(3)}_{AB}$ can be negative, if the switch from A to B is less likely to occur than for a random worker. The third relatedness measure, r_3, is $f^{(3)}_{AB}$ converted to decile format based on rank, so that the 10% B industries with the smallest $f^{(3)}_{AB}$ obtains $r_1 = 1$, the 10% B industries with the largest $f^{(3)}_{AB}$ obtains $r_1 = 10$, and so on.

A.4.2 Estimated relatedness

We estimate $f^{(i)}_{AB}$ using yearly transitions in industry code for Norwegian workers in the period 1996-2006. We first sample the population of workers that are full-time employed in all years 1996-2006. This balanced sample constitutes about 490.000 individuals. For each year and industry, we calculate the number of workers that change industry, and which industry they move to. On average, about 23.000 individuals (5%) change 2-digit industry from one year to the next. Such changes are typically due to a worker moving to a different firm, but can also be the firm changing industry code. We include both type of changes as both are presumably informative about the relatedness of two industries. Our results are robust to including only changes of the first kind.

There are 59 industries at the 2-digit level. We drop two industries where only a handful of workers were employed,[23] so that we calculate 3192 (57*56) $f^{(i)}_{AB}$ for each year. We then compute an average $f^{(i)}_{AB}$ across years before converting to deciles and obtain r_i. Tables of summary statistics and top industry pairs are available from the authors. Figure 6 plots the

[23] These two industries were "Activities of households as employers of domestic staff" (nace2 95) and "Extra-territorial organizations and bodies" (nace2 99).

mean $f_{AB}^{(3)}$ within the ten deciles of relatedness:

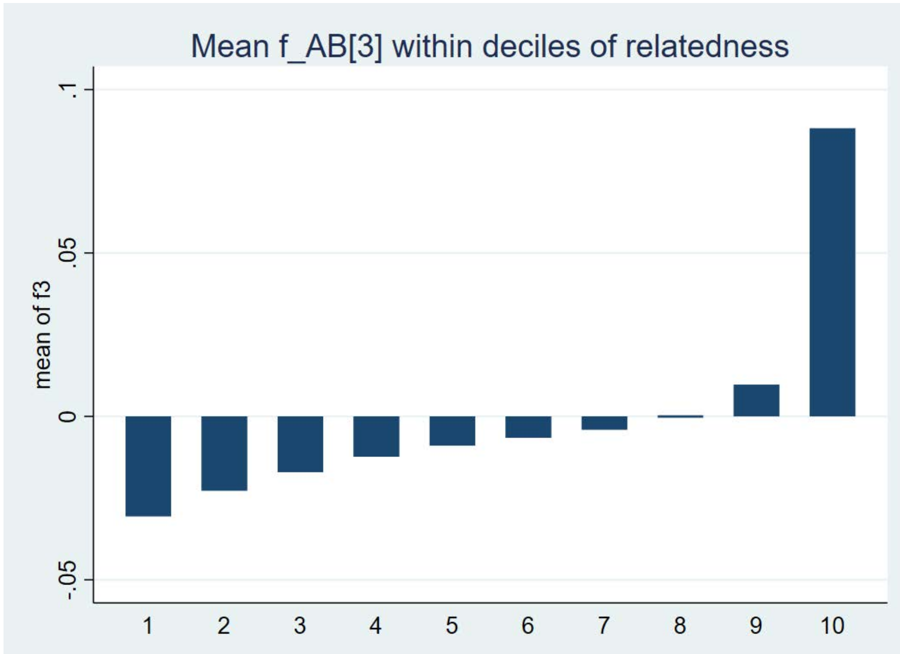

Figure 6: Distribution of Primary Relatedness Measure

For deciles 1-7, we see that the excess probability is negative, meaning that transition to these industries are less likely than for a randomly chosen worker. If industry B is in Decile ten in terms of relatedness from industry A, then $f_{AB}^{(3)}$ (i.e., excess probability of moving into B from A) is about eight percent. For Decile nine, the excess probability is much lower, about two percent.

A.4.3 Entrepreneurs relatedness to father's industry

We now investigate how close the industry relation is between father's industry of work and the startup industry, for entrepreneurs that do not start in the same 2-digit industry as their father's work experience. We focus on $f_{AB}^{(3)}$ and r_3. If entrepreneurs started firms in random industries, the mean $f_{AB}^{(3)}$ and r_3 would be 0 and 5.5, respectively. The mean r_i for entrepreneurs is almost eight, i.e., in the eighth relatedness decile. About 55 percent of entrepreneurs start up a firm in Decile ten. This is an extremely large number. The mean $f_{AB}^{(3)}$ is more modest, about five percent. Denoting the father's industry by A and the son's startup industry as B, this means that the excess probability of labor mobility from industry A to industry B is about five percent. Figure 7 shows the distribution of r_3.

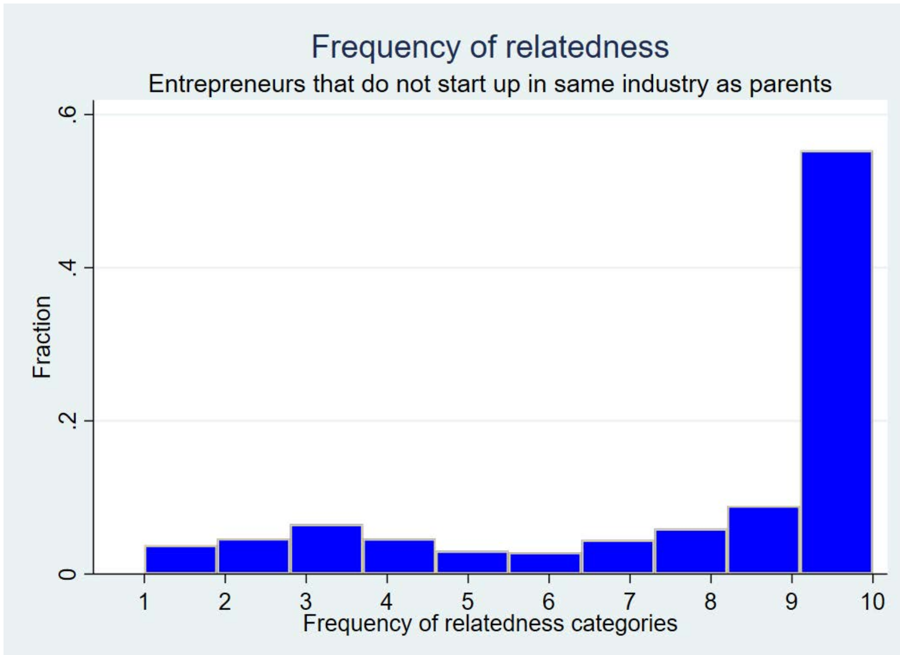

Figure 7: Distribution of Entrepreneurs' Relatedness to Father's Industry

A.4.4 Wage workers relatedness to father's industry

We now investigate how close the industry relation is between father's industry of work and the industry choice for wage workers, for wage workers that do not work in the exact same industry as their father's work experience. Again we focus on $f_{AB}^{(3)}$ and r_3. If wage workers were employed in industries at random, the mean $f_{AB}^{(3)}$ and r_3 would be 0 and 5.5, respectively. The mean r_i for wage workers is about 6.7, i.e., close to the seventh relatedness decile. About 34 percent of wage workers are employed in an industry in Decile ten. The mean $f_{AB}^{(3)}$ is about 3 percent. Denoting the father's industry by A and the son's startup industry as B, this means that the excess probability of labor mobility from industry A to industry B is about three percent. Figure 8 shows the distribution of r_3 for wage workers.

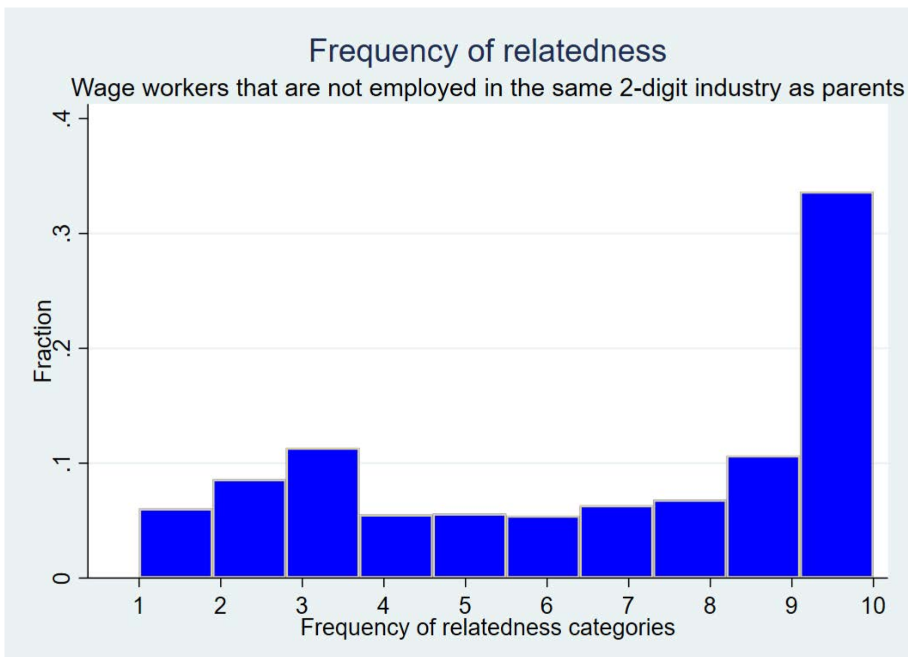

Figure 8: Distribution of Wage Workers' Relatedness to Father's Industry