

The relationship between education and entrepreneurship

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Contents

1. Introduction.....	3
2. Literature Review	5
2A. The Importance of Entrepreneurship.....	5
Defining Entrepreneurship.....	5
The Value of Entrepreneurship.....	6
2B. Entrepreneurial Engagement and Education	8
2C. Entrepreneurial Performance and Education	10
3. Data & Methods.....	13
3A. Data Overview	13
3B. Variable Overview	13
Outcome Variables	13
Main Explanatory Variables	14
Instrumental Variable	15
Control Variables.....	15
3C. Methodology	15
Justifying the Instrument.....	15
Testing the Hypotheses	17
Robustness Considerations	17
4. Results	19
4A. Summary Statistics	19
4B. Hypothesis 1	23
4C. Hypothesis 2	25
4D. Hypothesis 3A.....	27
4E. Hypothesis 3B	29
4F. Robustness Check.....	31
5. Discussion & Conclusion.....	34
5A. Discussion	34
5B. Conclusion	36
5C. Limitations and Directions for Future Research.....	37
Bibliography.....	39

1. Introduction

Entrepreneurship is often seen as the backbone of strong market-based economies. Geroski (1989) finds that business entry impacts broad economic productivity through innovation and other competitive pressures. In addition, Schumpeter (1968) envisions entrepreneurship as a force for dynamic and disruptive innovation, allowing for broad economic growth and efficiency. Hence, he views business entry as a fundamental and transformative function in propelling long-term living standards forward. In addition, entrepreneurship maintains relevance through its impact on more specific individual life outcomes. For instance, Quadrini (2000) show that entrepreneurs have a greater probability of moving into higher income brackets than individuals in other forms of employment.

Therefore, it is important to consider the drivers of entrepreneurship, with one such driver potentially being education. Education is often regarded as an important mechanism for discrepancies in individual life outcomes. For instance, the literature indicates a substantial effect of education on earnings (Card, 1999). This broadly falls in line with human capital theory, which suggests that the accumulation of relevant skills allows for enhanced productivity and earnings (Becker, 1962). In addition, signalling theory suggests that individuals benefit in the labour market from education also as a result of their enhanced ability to signal such aspects as their intelligence (Swinkels, 1999; Weiss, 1995). Hence, education can act as a means of economic mobility when it is accessible to low-income individuals. More relevant to this paper, Van der Sluis et al. (2008) conduct a literature review and find a significant impact of education on entrepreneurial performance. This may follow from human capital theory, as better-educated (and hence better-skilled) entrepreneurs seem to be more likely to create successful businesses.

In exploring education in relation to entrepreneurship outcomes, I attempt to answer the following research question:

Does education relate to entrepreneurial occupational choice and success?

Note that in this paper, I focus on general educational attainment. This means that the number of years of full-time education or the general advancement of qualifications is considered, in contrast to specific qualifications and their relevance. In addition, entrepreneurship is treated here as equivalent to self-employment.

This paper derives its social relevance based on the importance of entrepreneurship in generating broad socio-economic progress. More specifically, this research better informs social and macroeconomic policymakers on the need to enhance opportunities for higher educational attainment. In addition, individuals may be more equipped to make sound decisions regarding their educational paths while factoring in how education impacts their future occupational outcomes.

The scientific relevance of this study lies in its attempt to adequately deal with endogeneity in the relationship between education and entrepreneurship. Initially, I conduct a series of individual-level regressions of entrepreneurship-related outcomes on educational attainment, while controlling for several important confounders. However, this is arguably insufficient in providing evidence for a causal relationship. For instance, given limited data or other limitations, it may be difficult to account for all potential covariates. Moreover, simultaneous causality may present an issue, where occupation-related outcomes may even influence levels of educational attainment. For example, a failed entrepreneur may pursue further education in order to increase employment prospects. Hence, I also employ instrumental variable analysis to further isolate a causal relationship. This paper's scientific relevance derives from a nascent instrumental variable approach. Hoogerheide et al. (2012) consider regressions with an income-related output variable and an education-related explanatory variable. They find that father's education can be utilized as an effective instrument in such regressions. As a result, I employ the same instrument in my regression analyses. Hence, I may be able to estimate a more causal relationship between education and entrepreneurship-related outcomes than has been estimated in other research. Another source of scientific relevance is my utilization of nascent 2018 data, which allows for a timely analysis. Moreover, I conduct my analysis while utilizing two measures for educational attainment: education years and education level (e.g., bachelor's degree level). This allows for more holistic insights regarding the relationship between education and entrepreneurship outcomes.

The data used in this analysis derives from the European Social Survey (ESS). It is individual-level European data collected in 2018 pertaining to 29 countries. Findings indicate that educational attainment associates positively with entrepreneurial engagement. In addition, a higher level of education among entrepreneurs associates with them having higher incomes. However, educational attainment has no association with the number of employees employed by entrepreneurs, and hence with their organizational size.

In the following section, I conduct a broad literature review. In it, I first outline entrepreneurship and its importance for society and individuals. Afterward, I introduce my hypotheses based on a review of how education impacts different entrepreneurship-related outcomes. I then describe the data and methods and present the results. Finally, I end my paper by discussing the results and providing concluding remarks.

2. Literature Review

2A. The Importance of Entrepreneurship

Defining Entrepreneurship

Broadly, numerous perspectives on the role of the entrepreneur exist in complementarity and sometimes contention. For instance, Schumpeter (1968) considers entrepreneurs as disrupters who bring about dynamic economic change. Such disruption can be dramatically innovative, challenging successful incumbent industry leaders or even creating entirely new industries. In support of this conception, Drucker (1985) suggests that the entrepreneur is fundamentally defined by innovation and risk. Under similar reasoning, Kirzner (1973) indicates that the entrepreneur is a decision-maker who is necessarily alert to unnoticed opportunities. The underlying thematic commonality in these views entails a focus on dynamism, opportunity, risk, and alertness. Disequilibrium is fundamental in such theories, indicating a divergence from static efficient market-clearing equilibria through innovative disruption.

Hawley (1907) focuses on the risk element of entrepreneurship, suggesting that the essence of the entrepreneur is defined by high risk-inclination. He suggests that an entrepreneur's earnings are a reward for risk-taking, rather than a reflection of successful organizational management and coordination. Meanwhile, Hartman (1959) defines the entrepreneur as an individual who is able to independently justify her authority within the organization, accountable to no one except possible shareholders. Essentially, entrepreneurship is defined here as the ultimate source of decision and risk, not innovation. Providing a more straightforward definition, Brockhaus (1980) defines entrepreneurship in terms of ownership. In his point of view, the business owner is thus the entrepreneur.

Gartner (1988) instead argues that entrepreneurship should be defined as the creation of organizations. As a result, once an individual completes the organization-creation stage, she is no longer an entrepreneur. In contrast, Litzinger (1965) distinguishes the entrepreneur from the manager on the basis of the former's action and goal orientation. Meanwhile, McClelland (1961) suggests that entrepreneurial activity is inherently multidimensional. He suggests six dimensions of entrepreneurial activity, including such areas as risk-taking, responsibility, organizational skills, and anticipating potential opportunities. Hébert and Link (1989) also notice the complexities involved in defining an entrepreneur and consider economic history in order to provide a set of key roles. For instance, their definition considers uncertainty, ownership, innovation, resource allocation, arbitrage, decision-making, and more.

In further ensuring a straight forward and holistic analysis of broad entrepreneurial activity, this paper approaches entrepreneurship as self-employment. Intuitively and simply, self-employment can be perceived as the general employment status of anyone who works for herself. This is precisely the approach to self-employment explored in this paper. The ESS provides no explicit and formal definition

of self-employment. Instead, they ask respondents to define themselves as self-employed, employees, or individuals working in family businesses. This can allow for some vagueness as to what exactly is measured by self-employment as it seems largely up to the subjective interpretation of the respondent. However, the implication is that self-employment broadly entails autonomous own-account work. This may include individuals who are opportunity-driven and entrepreneurial in spirit, as well as those working in the gig economy out of necessity. This conception of entrepreneurship arguably encompasses the array of the aforementioned definitions. For instance, post-creation, business owners nonetheless face risks and pursue new opportunities. In addition, even those individuals working in the gig economy may retain substantial autonomy and authority in the direction of their labour.

The Value of Entrepreneurship

Hitt et al. (2011) explore the concept of strategic entrepreneurship, which they define as opportunity-driven and value-sustaining through time. They suggest that three primary dimensions should be explored when considering the value of strategic entrepreneurship: the individual, the organization, and society. This view is also arguably applicable to a broader concept of entrepreneurship, concerning self-employment. Broadly, on the individual level, some entrepreneurs are driven by opportunity, meaning that they are truly entrepreneurial in the Schumpeterian spirit (Schumpeter, 1942). Through their identification of opportunities in the market, they provide effective solutions and attain a competitive position. Other entrepreneurs are instead driven by necessity, meaning that they are fundamentally driven by a lack of other opportunities. Hence, according to Fairlie and Fossen (2018), necessity-driven entrepreneurship is counter-cyclical, while opportunity-driven entrepreneurship is pro-cyclical. This makes sense as more individuals are in desperate financial situations during recessions, and vice versa. Fundamentally, This indicates that there exists a multiplicity of motives that may impact the (potential) entrepreneur.

Hamilton (2000) investigates the pecuniary returns of self-employment relative to paid employment, finding that paid employees start with higher earnings and maintain a higher earnings growth rate over time as well. Nonetheless, many individuals pursue the path of self-employment. The author suggests that this is explained through non-pecuniary benefits, indicating a relation to autonomy. Shir et al. (2019) more explicitly explore such non-pecuniary benefits by considering self-determination theory, which posits the importance of autonomy, competence, and relatedness as key to human wellbeing. Their findings indicate that active entrepreneurial work is more likely to satisfy self-determination theory relative to other forms of work, given that work in that context is more self-motivated. In addition, Hundley (2001) observes lower earnings for women in self-employment, attributing this to childrearing and housework. This is somewhat explained by Clain (2000), showing that women in self-employment are less skilled than their female paid-employee counterparts. She also shows the opposite holding for men. The implication is potentially higher non-pecuniary benefits deriving from self-

employment holding for women. For instance, Heilman and Chen (2003) show that discrimination against minorities and women drive them out of conventional paid employment and toward self-employment.

Wennekers and Thurik (1999) envision a mechanism connecting entrepreneurship to economic growth. They connect the drivers of entrepreneurship to entrepreneurial activity, and then to intermediate variables which influence economic growth. In consideration of these intermediate variables, it is imperative to consider the industrial and organizational levels. Schumpeter's (1942) conception of entrepreneurial disruptive innovation entails temporary disequilibrium and organizational advantage. As new businesses cultivate radically transformative innovation, they benefit from an early entry into a newly created market and replace inefficient and non-innovative businesses (Schumpeter, 1942). However, this advantage, as implied by Schumpeter (1942), is constantly under threat by new entrants given no entry constraints. Over time, the position of the previously disruptive innovator dissipates as the threat of new entry is realized. Therefore, incumbents must further differentiate, in a seemingly perpetual cycle of attempts in maintaining market power. In doing so, they may form innovation networks with a series of partners (Hughes et al., 2014). Given the presence of innovative newly-created firms, incumbents would benefit from including them in such partnerships. Katila and Shane (2005) indeed find that a lack of organizational resources propels firm innovation, implying the high innovative capacity of new firms. Intentionally orchestrated networks can be designed for the mutual gain of all participants (Dhanaraj and Parkhe, 2006), with imminent value-creation through knowledge-mobility. Another way in which firm entry may propel incumbent innovation is through geographic clustering. For instance, Baptista and Swann (1998) find that the geographic clustering of similar firms propels general industry-level innovation. Hence, as small and innovative firms enter geographically concentrated industries, they may contribute to the innovation of other firms through knowledge spillovers. More specifically, Henderson (1997) finds that such geographic firm-concentration is useful if the firms operate within the same industry, as opposed to operating in a diversity of industries. Moreover, aside from geographic clustering and network orchestration, Woolley (2010) finds that radically disruptive innovation allows for cross-industry opportunities for business generation, and hence that new technologies can be developed to benefit the needs of very different firms. Hence, innovative business entry may actually spur further business entry. This can also indicate the cumulative nature of innovation, as shown by Galasso and Schankerman (2015).

Through the displacement of non-innovative firms and products from leading market roles, the market undergoes a dynamic process of efficiency-optimization. Beyond this, new business generation can serve as a broader means to promote industrial efficiency from a more static perspective. This would entail the incremental development of presently sold products within an existing industry in the economy. Nickell (1996) finds that business entry in to an existing industry propels increases in the rate of total factor productivity growth. On a level more pertinent to necessity-driven entrepreneurship,

Burtch et al. (2018) find that the gig economy has been an effective tool in the broad enhancement of static economic efficiency. According to the authors, prior to the gig economy, more necessity-driven individuals unsuccessfully launched innovative start-up ventures. After the gig economy's advent, these individuals instead more effectively redeployed their skills in a more useful and wealth-generating way as self-employed gig workers.

This brings us to the final stage of socio-economic benefits arising from entrepreneurship, as implied by Hitt et al. (2011). This stage is the societal stage, concerning such aspects as broad economic growth and development, as well as broad social progress. As indicated by the reviewed literature, new business generation and self-employment propels gains in both dynamic (i.e., innovative) and static (i.e., incrementally developmental) efficiency. Hence, it is almost implied that this translates into broad gains for economic growth. However, Van Stel et al. (2005) demonstrate that the economic gains of entrepreneurship are dependent on a country's existing per capita incomes, with richer countries attaining positive economic gains and vice versa for poorer countries. The authors discuss that this may be due to poor countries experiencing a lack of human capital as well as large companies having economies of scale. They suggest that poorer countries can still benefit from entrepreneurship, though through targeting these deficiencies. In addition, social goals are often directly targeted by entrepreneurs. For example, Sine and Lee (2009) have found that the emergence of pressure groups in the area of clean energy has led to increased entrepreneurial activity in this area. This arguably may fall in line with Porter and Kramer's (2019) vision of shared value – namely, that businesses are capable of targeting social change through utilizing the infinite scalability arising from profit. For instance, a government bureaucrat may be limited in her resource capacity when subsidizing clean energy. However, the entrepreneur may find means to profitably pursue the same ends, generating returns for herself that may even be redeployed for further development and innovation.

I have provided a definition of entrepreneurship and discussed its importance on multiple levels. As indicated, different drivers of entrepreneurship generate different outcomes. For instance, opportunity-driven innovation can be economically positively transformative, while necessity-driven gig employment can be more incrementally beneficial. This forms the bedrock underlying the importance of deeply exploring how certain drivers impact entrepreneurial activity.

2B. Entrepreneurial Engagement and Education

Contemporary literature often indicates a broadly positive association between education and entrepreneurship on the individual level (Marvel et al., 2016). Education aids in the development of human capital (i.e., productive skills), which allows for enhanced occupational opportunities (Becker, 1962). However, this does not need to translate to an inclination for entrepreneurship, as opportunities may also be heightened in paid employment. For instance, Van der Sluis et al. (2008) find that educational attainment has an effect on the performance of entrepreneurs, but not on their selection into

entrepreneurship. Hence, the picture becomes complicated. Van Praag et al. (2013) find that the returns of human capital on entrepreneurship are higher than the returns of human capital on paid employment. The authors suggest that this may be due to the fewer work constraints entrepreneurs face, allowing for greater flexibility in their skill utilization. In addition, education can theoretically impact occupational opportunities through ways traditionally unaccounted for by human capital. Caplan (2019) builds a case against education subsidization by arguing that most individual-level occupational benefits accrued from higher education are due to the signalling mechanism. Under such a view, it is perceived that an individual's level of education can signal such aspects as her intelligence, endurance, and analytical skills. This can serve to, for instance, increase credibility to VC investors or to derive better-paying jobs.

In considering the very first stages of entrepreneurship, Gaglio and Taub (1992) suggest that successful entrepreneurship partially rests on the capacity to identify new opportunities. This capacity may result from enhanced cognitive and reasoning abilities, for instance. As for the next step of the process, Dimov (2010) finds that opportunity confidence (as impacted by human capital) affects venture emergence. Meanwhile, Dimov and Shepherd (2005) find that venture capital (VC) firms with top management team members that have high levels of general human capital (i.e., humanities and science education) were more likely to have companies in their portfolio reaching an initial public offering. In addition, those with higher specific human capital (i.e., MBAs, certain types of experience) maintained lower numbers of bankruptcies in their portfolio. Since VC management teams play an active role in portfolio firm management, these results may apply to entrepreneurs themselves. Moreover, Colombo and Grilli (2010) find that founders' human capital significantly enhances the likelihood of being funded by a VC, which then impacts broad firm success. In addition, they find that founders' human capital maintains another direct effect on firm growth.

Thus far, I have essentially focused on opportunity-driven entrepreneurship. Block and Koellinger (2009) find that many nascent entrepreneurs report little job satisfaction as they feel that they were "forced" to choose the path they were in. Hence, there is a lack of opportunity, which theoretically could derive from a lack of human capital. In fact, Card (1999) suggests that there is very robust evidence for the notion that education substantially influences earnings. Thus, given low education, low job earnings are the norm. As a result, individuals in this category may be more likely to engage in necessity entrepreneurship out of desperation. This aligns with the findings of Amit et al. (1995), suggesting that those individuals who turn from paid employment to self-employment typically earned less in paid employment relative to individuals who did not make the switch. Hence, it could very well be the case that there is a U-shaped relationship between educational attainment and entrepreneurship engagement (with the former on the x-axis and the latter on the y-axis). Individuals with low levels of education enter entrepreneurship out of necessity, while individuals with high levels of education do so out of opportunity.

However, Gimeno et al. (1997) find that founders' human capital is highly predictive of a firm's long-term survival. Hence, necessity entrepreneurship is more likely to be a highly temporary phenomenon assuming that it is driven by low levels of human capital. As a result, the aforementioned U-shaped relationship is unlikely. This could be the case due to the notion that venture survival (and hence an individual's continued engagement in entrepreneurship) is dependent on the founder's capacity to employ (or signal) human capital, as indicated by the reviewed literature. Meanwhile, entrepreneurs with surviving and profitable businesses may also leave entrepreneurship for paid employment. They are likely to exit given an array of potentially desirable opportunities, including acquisitions (Wennberg & DeTienne, 2014), though it must be considered that these entrepreneurs leave given high opportunity costs (rather than being forced out). Hence, education can be seen as a contributing but on its own insufficient factor toward persistent entrepreneurial engagement.

These notions combinedly give way to the first hypothesis.

Hypothesis 1: Educational attainment is positively associated with engagement in entrepreneurship.

2C. Entrepreneurial Performance and Education

As indicated in the prior section, highly educated entrepreneurs are resultantly more equipped to create businesses and sustain their survival. Corporate growth is often measured through evaluating employment figures (Delmar, 2006). Using this approach, Rauch and Rijdsdijk (2013) find that general human capital leads to greater growth and resultantly less failure. This makes intuitive sense, as the effective deployment of skills by high human capital entrepreneurs must provide them with a long-standing advantage in business growth. Jiménez-Jiménez and Sanz-Valle (2011) find that organizational learning positively impacts performance. According to the authors, organizational learning is where organizations cultivate insights and knowledge over time from operational experience. Meanwhile, Hsu and Fang (2009) suggest that organizational learning is positively impacted by organizational human capital. This indicates the long-term importance of human capital development to foster growth.

Generally, these insights follow from those explored in the prior section. Namely, individuals require human capital to decipher new opportunities. From there, they require human capital to garner investments and establish the venture. Finally, they require human capital to attain organizational growth through organizational learning. However, the picture may indeed be more complicated than as indicated. The aforementioned findings by Van Praag et al. (2013) indicate that such factors as organizational flexibility and decision-making autonomy allow for high gains to entrepreneurship success from human capital. These factors allow entrepreneurs to fully appropriate all potential benefits from their human capital because entrepreneurs are more likely to retain the flexibility to focus on their strengths. This degree of control could theoretically diminish given an enlarged organizational size. For instance, Hessels et al. (2019) find that entrepreneurs have higher returns to education relative to

employees, with those returns primarily applying in situations where entrepreneurs do not have any employees of their own. Hence, entrepreneurs in this context may be incentivized to limit the growth of their organization. Or, for example, their growth may inherently be limited by the fact that they are unable to fully utilize their abilities in driving their business forward. However, this may not be a significant factor as such mechanisms as delegation may even enable the entrepreneur to focus on the particular facets of business operations in which they may excel. In addition, through organizational learning, a constant re-optimization to new conditions is possible, and performance could be persistently targeted successfully (Jiménez-Jiménez & Sanz-Valle, 2011). Regardless, an entrepreneur's level of human capital may be considered as a necessary but on its own insufficient condition for long-term organizational growth.

As mentioned, employment growth is typically seen as reflective of organizational growth (Delmar, 2006). Hence, the outlined ideas give way to the second hypothesis.

Hypothesis 2: Educational attainment is positively associated with an entrepreneur's number of employees.

The first hypothesis concerns the link between education and engagement in entrepreneurship. This relationship can provide an indication of how important it is to develop general human capital in order to find and exploit opportunities. However, this is not an indication of whether or not educated entrepreneurs are able to truly grow their businesses. In contrast, the second hypothesis pertains to the relationship between education and entrepreneurial performance. Here, education can be treated as a contributing but on its own insufficient factor in explaining entrepreneurial performance, as previously discussed. However, this does not directly reflect the relationship between education and opportunity-driven entrepreneurship. This is because entrepreneurs may have idiosyncratic objectives and may want to purposely stay small. For instance, Cassar (2006) finds that an entrepreneur's stated preference for growth influences corporate performance directly, and in a way that is complementary with the entrepreneur's opportunity costs. Kolvereid and Bullvag (1996) also find that as these intentions change, so does the organizational growth path. Moreover, as aforementioned, findings by Hessels et al. (2019) suggest that entrepreneurs can best reap the rewards of their education under the autonomy and flexibility which is associated with smallness. Hence, entrepreneurs may be less capable to fully utilize the breadth of their skills, which would lead them to pursue growth constraints. In addition, this also follows from Shir et al. (2019) in their exploration of entrepreneurship's non-pecuniary benefits in light of self-determination theory. As autonomy is highly valued, entrepreneurs could hypothetically reject expansion to maintain it.

In order to best measure the opportunity basis for entrepreneurship, it is useful to consider financial security. If entrepreneurs who maintain relatively high educational attainment levels tend to be more financially secure than entrepreneurs with lower levels of educational attainment, this would be more

conclusive evidence toward the notion that education increases opportunity-based entrepreneurship. In this paper, financial security will be analysed using two dimensions: objective and subjective. The objective dimension concerns a measure of actual income, while the subjective dimension concerns satisfaction with income. Here, income pertains to the family level rather than the individual level. There are two primary mechanisms underlying the notion that financially secure entrepreneurs are more likely to be opportunity motivated. Firstly, if educated entrepreneurs have spouses who earn a lot of money as reflected by household income, it indicates that they did not need to pursue entrepreneurship. This would hold similarly for entrepreneurs who run their businesses while maintaining well-paying jobs. Hence there would likely be an opportunity basis rather than a necessity basis for motivation. Secondly, if educated entrepreneurs earn a lot of money for themselves through entrepreneurship as reflected by household income, it indicates that they maintain high performance (irrespective of the number of individuals they employ).

The following are the pertinent hypotheses.

Hypothesis 3A: Educational attainment is positively associated with an entrepreneur's income.

Hypothesis 3B: Educational attainment is positively associated with an entrepreneur's level of comfort with income.

3. Data & Methods

3A. Data Overview

Data used derive from the 9th edition of the ESS. The survey comprises an overall observation count of 49,519, with respondents residing across 29 countries in Europe. This dataset was chosen given the rigorous and academically-driven nature of the data-collection processes involved. In addition, the data pertains to a range of concepts of relevance to my analysis, such as socio-demographics.

The sampling procedure is representative of the population comprising those aged 15 and above in the participating countries. Individuals are chosen for the survey based on random sampling, with at least 800 respondents surveyed depending on the respective country's population. In further reducing bias, the non-response rate is effectively minimized through various incentive programs targeted toward interviewers and interviewees. There are other checks against biases, such as quality controls and interviewer briefings.

3B. Variable Overview

Outcome Variables

For Hypothesis 1, I consider the relationships between educational attainment and entrepreneurial engagement. In order to investigate this, I use a categorical variable which defines the employment status of respondents. There are three relevant categories to the response scheme – “employee”; “self-employed”; and “working for own family business”. In order to simplify the analysis, this three-category variable is then transformed into a binary variable indicating self-employment. Hence, observations indicating that an individual is self-employed take a value of 1, while employees and those otherwise working for family businesses take a value of 0. On the other hand, Hypothesis 2 entails an analysis of the relationship between educational attainment and the number of employees. The variable reflecting the latter is a discrete measure of the number of employees an entrepreneur has, which is treated as a continuous variable.

Finally, the last two hypotheses concern the relationship between an entrepreneur's level of financial security and their level of educational attainment. More specifically, Hypothesis 3A concerns a respondent's net income level as a measure of financial security. This refers to the calculated decile standing of an entrepreneur's household income, subtracting for any compulsory deductions and tax payments. In order to simplify the analysis, the variable is transformed into one which reflects high income. This will reflect whether an individual is in the ninth or tenth decile, which follows from existing literature, as used by Ahluwalia (1976). However, it is important to note that transforming this variable into a binary variables does indeed lead to a loss of information. For instance, education could have marginally differing relationships with an entrepreneur's income level depending on the concerned

income level. Nonetheless, this transformation is done in order to make the results of this paper more broadly communicable, aiding in its social relevance. In addition, simplifying the analysis and its interpretation allows for more robustly clear conclusions vis-à-vis the hypothesis.

Additionally, Hypothesis 3B pertains specifically to the respondents' financial comfort as a measure of financial security. Financial comfort relates to the degree to which respondents feel comfortable with their household income. The variable entails four categories and is made binary in order to simplify the analysis. These four categories reflect high comfort, ability to cope, difficulty to cope, and high difficulty to cope. Resultantly, high income comfort is considered, which binarily reflects a high degree of comfort with household income. The same issues concerning the binary transformation of the decile income ranking variable apply in this context as well. A loss of information ensues from this transformation. However, the analysis is resultantly made more generally communicable, and clearer conclusions vis-à-vis the pertinent hypothesis result.

Main Explanatory Variables

For all analyses, variables reflecting educational attainment are utilized. These variables are education years and education level. Education years reflects the aggregate number of years spent by a respondent in full-time or full-time equivalent education. It is measured as a discrete variable, as only integer values are considered. Nonetheless, it is treated continuously in the regression analyses.

However, education years does not reflect whether, for instance, individuals invest more or less time than typical when in the pursuit of certain academic levels of attainment. To illustrate, spending more time than necessary on a single qualification could provide an indication of poor cognitive ability. On the other hand, education level reflects the highest education level obtained by a survey respondent. The coding frame pertaining to seven levels of education is influenced by the International Standard Classification of Education (ISCED). In order to more easily analyse the effect of higher education on our output variables, I re-categorize education level to create a variable which binarily reflects high education. High education, in this context, reflects the completion of a bachelor's or bachelor's-equivalent education, or higher (e.g., a master's degree). On the other hand, low education reflects educational attainment levels ranging from less than lower secondary education to advanced vocational sub-degree education.

When conducting this binary transformation, some information is lost; for instance, there could be education category-specific factors and effects that are not accounted for. However, this is less important as a more marginal analysis is derived when using education years instead. Nonetheless consider that education level and education years measure different things. Hence, these indicators are not direct substitutes. In addition, there may be significant endogeneity among the various education level categories. For instance, the effects of bachelor-level and master-level education on

entrepreneurship may be highly similar. Hence, this may bring down the individual significance of the various categories of education. The analysis conducted in this paper is in order to derive a broad conclusion on the effects of attaining higher levels of education. Deriving this may indeed lead us to pay attention to the broader picture and disregard other information.

Instrumental Variable

I use father's education as the instrument for the instrumental variable analyses. Similar to the aforementioned respondent's education level variable, this variable is also defined in terms of identical levels of education. In order to similarly simplify the analysis, the variable is redefined from 7 categories of educational attainment to two. The new binary variable will take a value of 1 for a high level of educational attainment obtained by the respondent's father. Here, high education is defined equivalently to the main independent variable reflecting as such for the respondents themselves. To reiterate, high education here is defined as entailing completion of a bachelor's or bachelor's equivalent degree, or higher. Meanwhile, low education reflects educational attainment levels ranging from less than lower secondary education to advanced vocational sub-degree education.

Control Variables

In selecting control variables for the analysis, I consider the study by Van der Sluis et al. (2008) and its compilation of commonly used controls in the context of regressing entrepreneurship outcomes on education indicators. These variables typically relate to socio-demographics and social exclusion. Namely, I include binary variables concerning the respondent's gender and whether they are married, and a continuous variable representing their age (in years). The age variable is reconstructed in order to range from 18 to 65, to solely focus on members of the labour force. In addition, I incorporate a binary variable representing whether respondents consider themselves to be members of an ethnic minority in their country of residence.

I also consider a categorical variable for substantial longstanding mental or physical health problems which impact daily activities (referred to in this paper more generally as disabilities). This variable comprises three categories, reflecting a high extent, some extent, and no extent to which such issues have been prevalent for the respondent. Finally, I incorporate a variable binarily reflecting the occupational status of the respondent's father when she respondent was 14. The variable comprises four categories, reflecting if the respondent's father was an employee, self-employed, not working, or dead at that time.

3C. Methodology

Justifying the Instrument

For each hypothesis, I use a binary measure for high father's education when instrumenting a binary measure for high respondent's education. This instrument's validity is not immediately clear, and hence it is important to ensure that the fundamental conditions of instrumental analysis are fulfilled in this context. For instance, research by Dickson et al. (2016) demonstrates clearly that parental education positively affects childhood educational attainment. This is also intuitively seen as parental education might, for instance, motivate parental involvement in their children's education. Furthermore, the instrument must not relate to the error term of employed regressions. This condition is (imperfectly) fulfilled through the employment of pertinent covariates.

In addition, the instrument must fulfil the exclusion restriction, meaning that it may not directly affect the outcome variable in any way other than through the main independent variable. The satisfaction of this condition in the context of this analysis is not immediately clear. For instance, it is intuitively plausible that parental education may impact their children's occupational direction other than through influencing their children's level of education. Parental education likely influences parental occupation, which then likely motivates their children's direction of employment. This is difficult to rule out. Hoogerheide et al. (2012) analyse the validity of parental background variables as instruments with respect to income regressions on education. More specifically, they concern themselves with father's education as the instrument. The authors indeed find significant violations of the exclusion restriction. Meaning, father's education maintains a significant relationship with an individual's income level aside from through the individual's level of education. However, they incorporate a Bayesian analysis to investigate the magnitude of this violation. Given the lack of substantial magnitude, they conclude that this does not lead to a substantial biasing of results when conducting the instrumental variable analysis. However, one should nonetheless proceed with caution in precisely interpreting education coefficients, as father's education remains an imperfect instrument.

The justification provided by Hoogerheide et al. (2012) for the use of father's education as an instrument is made with respect to income regressions on education. However, the authors do not suggest the fulfilment of the exclusion restriction with other non-income occupation-related regressions. Given the thematic similarity of such variables, it seems intuitively valid that father's education would maintain a similar mechanistic relationship among them. Despite this, there is no concrete and decisive evidence in this regard. Hence, it is only fully empirically justified to use this instrument in the case of Hypothesis 3A and Hypothesis 3B – which directly entail income-dependent variables. This then presents a limitation when applying the instrument for the first two hypotheses, which concern the choice to become an entrepreneur and the number of employees under an entrepreneur.

The directionality of the possible bias for both hypotheses is likely to be positive. For instance, it may be that high paternal education propels paternal self-employment, as indicated by the first hypothesis. Paternal self-employment is known to positively influence the decision of individuals to become self-

employed, and their financial drive (Pablo-Lerchundi et al., 2015). Hence, analyses concerning both initial hypotheses may entail an upward bias. For the second hypothesis, there may be bias as the drive for growth partially determines organizational growth (Cassar, 2006). This is largely corrected for in utilizing pertinent control variables. However, it can provide an indication of this instrument's imperfection.

Testing the Hypotheses

All four hypotheses pertain to the effect of educational attainment on an entrepreneurship-related dependent variable. For all hypotheses, dependent variables are regressed on educational attainment (and a range of control variables) using ordinary least squares (OLS) regressions. These regressions are conducted twice for each hypothesis, in order to account for each measure of educational attainment (education years and high education). In addition, for all four hypotheses, instrumental variable analysis is also implemented, instrumenting educational attainment variables with father's education.

Hence, when concerning binary dependent variables (as is the case when evaluating Hypothesis 1, 3A, and 3B), linear probability models are constructed. Although logit models would be more appropriate here, there is no routine for IV logit regression. Therefore, for consistency across models, I am using OLS throughout. This is broadly justified given that the means of the dependent variables are not extremely low or high. Moreover, using OLS facilitates a more straightforward interpretation of the regression coefficients compared to logit regression.

Robustness Considerations

The utilization of household income in the latter two hypotheses could represent an issue. In the literature review, two dimensions of analysis were noted for these hypotheses. The first dimension is that if educated entrepreneurs earn more money from entrepreneurship as reflected by household income, it could indicate that there were underlying opportunities. The issue here is that household income could be wholly unrepresentative of the respondent's income. In order to isolate this dimension of the analysis, the analysis will be re-applied to households where the respondent has no partner, or where the partner is not working. This analysis serves as a robustness check on the main results for Hypotheses 3A and 3B.

In ensuring a robust and valid analysis, it is important to consider possible outliers. In doing so, I consider the interquartile rule, using the interquartile range (IQR) to find possible outliers. An outlier can be identified as any observation value extending beyond $1.5 \times IQR + Q3$, with Q3 being the third quartile. In addition, outliers in the opposite direction can be identified as any observation value below $Q1 - 1.5IQR$, with Q1 being the first quartile. The interquartile rule is applied to find and eliminate perceived measurement errors in education years and the number of employees under an entrepreneur (as there are extreme values in the distribution of these variables). As a result, observations for both

variables are excluded. In addition, consider that for each variable, other answers by respondents regarding refusal to respond and uncertainty about response is ignored and considered invalid. This could allow for bias; however, it should not be very significant given the high rate of valid responses.

4. Results

4A. Summary Statistics

Table 1

Summary statistics for the analysis sample

Variable	Obs.	Mean	Std. Dev.	Minimum	Maximum
<i>Outcome variables</i>					
Self-employment	28,384	0.112	0.316	0	1
Number of employees	2,155	0.791	1.255	0	5
High income	2,155	0.243	0.480	0	1
Financial comfort	2,155	0.388	0.487	0	1
<i>Explanatory variables</i>					
Education years	28,384	13.821	3.423	4	23
High education	28,384	0.295	0.456	0	1
<i>Instrumental variable</i>					
High father's education	28,384	0.142	0.349	0	1
<i>Control variables</i>					
Male	28,384	0.484	0.500	0	1
Age	28,384	44.621	12.917	18	65
Marriage	28,384	0.512	0.500	0	1
Ethnic minority	28,384	0.062	0.241	0	1
Disabilities	28,384	0.039	0.195	0	1
Father self-employment	28,384	0.176	0.381	0	1

Note: Mean and standard deviation values are rounded to the third nearest decimal place.

Summary statistics are displayed in Table 1. In total, for variables only pertinent to entrepreneurs (i.e., number of employees, high income, and financial comfort), there are 2,155 observations from 29 countries. Meanwhile, for all other variables, there are 28,384 observations from 29 countries.

Approximately 11% of respondents are self-employed, with those respondents averaging less than 1 employee. Moreover, approximately 24% of respondents have a high income. The high income binary indicator is such that it represents the number of observations where a respondent suggested their income to be in the top 30%. The discrepancy may be due to the changes made to the data. In addition, approximately 39% of respondents report as being financially comfortable. Furthermore, respondents are educated for an average of almost 14 years, and almost 30% are highly educated (i.e., holding a bachelor's degree equivalent or higher). In contrast, respondents' fathers are about half as likely to be highly educated.

In addition, Table 1 depicts summary statistics for the control variables used in the analysis. The pertinent data shows a mean age of 44.6 years, indicating a relatively elderly sample. Moreover, the male-female split of the sample skews slightly toward female (as 48.4% of the sample is male). A substantial over 50% of the sample is married, which intuitively resonates with the fact that the mean age is almost 45. Meanwhile, approximately 6% of the sample comprises ethnic minorities, with almost 4% holding for disabled individuals. These proportions are substantial enough to justify the incorporation of the latter two covariates. Moreover, almost 18% of respondents had self-employed fathers – a figure higher than the number of respondents who are self-employed. This is contrary to educational attainment, where respondents' fathers lag behind respondents by almost half.

Table 2*Correlation matrix for the analysis sample*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Self-employment	1.000						
(2) Number of employees	.	1.000					
(3) High income	.	0.076***	1.000				
(4) Financial comfort	.	0.075***	0.355***	1.000			
(5) Education years	0.023***	-0.037*	0.213***	0.187***	1.000		
(6) High education	0.012**	-0.025**	0.218***	0.193***	0.647***	1.000	
(7) High father's education	0.025***	-0.010***	0.143***	0.115***	0.284***	0.307***	1.000
(8) Male	0.101***	0.102**	0.052*	0.045**	-0.054***	-0.068***	-0.001
(9) Age	0.078***	0.059***	-0.041*	-0.026	-0.133***	-0.064***	-0.145***
(10) Marriage	0.031***	0.088***	0.121***	0.064***	-0.024***	0.021***	-0.063***
(11) Ethnic minority	-0.007	0.028	-0.059*	-0.082***	-0.053***	-0.013**	0.018***
(12) Disabilities	-0.009	0.028	-0.050*	-0.090***	-0.064***	-0.065***	-0.030***
(13) Father self-employment	0.121***	0.019	-0.030	0.014	0.040***	0.028***	-0.024***
	(8)	(9)	(10)	(11)	(12)	(13)	
(8) Male	1.000						
(9) Age	-0.010*	1.000					
(10) Marriage	-0.003	0.328***	1.000				
(11) Ethnic minority	0.013**	-0.043***	0.000	1.000			
(12) Disabilities	0.001	0.109***	-0.013**	0.013**	1.000		

(13) Father self-employment	0.018***	0.000	0.009	-0.008	-0.001	1.000
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Note: Correlations are pairwise Pearson correlations. All correlation values are rounded to the third nearest decimal place. For all correlations, “***” indicates a *p*-value at or below 0.01; “**” indicates a *p*-value at or below 0.05; and “*” indicates a *p*-value at or below 0.10. In this matrix, all variables but the number of employees, high income, and financial comfort maintain an observation count of 28,384. Meanwhile, the number of employees, high income, and financial comfort maintain an observation count of 2,155 and are observed within the sub-sample of entrepreneurs. Hence, there is no correlation coefficient among them with respect to self-employment. Consider that correlations involving those three variables were conducted within their specific sub-sample, while all other correlations pertained to the full sample.

Table 2 entails a pairwise correlation matrix concerning the analysis sample, with the majority of correlations being significant at a 10% level. All correlations pertaining only to outcome variables, main explanatory variables, and the instrumental variable are significant at the 10% significance level, with the majority significant at the 1% level. These correlations highlight significant (non-causal) associations among the respective variables and are largely in the expected direction. For instance, education years correlates positively with self-employment. However, all education-related variables correlate negatively with the number of employees employed by an entrepreneur. This contradicts with the notion that higher educational attainment of entrepreneurs associates with organizational growth.

4B. Hypothesis 1

Table 3

Regression results concerning the relationship between an individual's entrepreneurial engagement and their education

	(1) OLS		(2) OLS		(3) IV		(4) IV	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
<i>Education years</i>	0.003***	0.001	.	.	0.014***	0.002	.	.
<i>High education</i>	.	.	0.013***	0.004	.	.	0.092***	0.014
<i>Male</i>	0.064***	0.004	0.064***	0.004	0.068***	0.004	0.069***	0.004
<i>Age</i>	0.002***	0.000	0.002***	0.000	0.002***	0.000	0.002***	0.000
<i>Marriage</i>	0.002	0.004	0.002	0.004	0.000	0.004	-0.001	0.004
<i>Ethnic minority</i>	-0.003	0.007	-0.005	0.007	0.006	0.008	-0.003	0.007
<i>Disabilities</i>	-0.025***	0.009	-0.026***	0.009	-0.016*	0.009	-0.015*	0.009
<i>Father self-employment</i>	0.098***	0.006	0.098***	0.006	0.094***	0.006	0.096***	0.006
Constant	-0.070***	0.011	-0.027***	0.006	-0.236***	0.034	-0.060***	0.009
<i>R</i> ²	0.032		0.031		.		.	
<i>F</i> -statistic	107.85***		104.62***		105.75***		105.60***	
Observations	28,384		28,384		28,384		28,384	

Note: This table depicts regression results for four different regressions. For all four regressions, the dependent variable is self-employment. Column “(1)” concerns an ordinary least squares (OLS) regression of self-employment on education years and a range of control variables. Meanwhile, column “(2)” concerns an identical OLS regression, except that education years is replaced with high education. In addition, column “(3)” concerns an OLS instrumental variable regression, instrumenting education years with high father’s education and utilizing the same control variables. Finally, column “(4)” concerns an identical OLS instrumental variable regression, except that high education is the instrumented variable. For all coefficients and *F*-statistics, “***” indicates a *p*-value at or below 0.01; “**” indicates a *p*-value at or below 0.05; and “*” indicates a *p*-value at or below 0.10. “*B*” represents regression coefficients, while “*SE*” represents robust standard errors. All coefficient values are rounded to the third nearest decimal place.

The first hypothesis is such that higher educational attainment positively associates with entrepreneurial engagement. Table 2 concerns regression results pertinent to this hypothesis. In column 1, the results

from an OLS regression are recorded, with self-employment regressed on education years and a set of control variables. Education years reflects the number of years spent by an individual in full-time education. The education years coefficient is positive and statistically significant at the 1% significance level. Hence, given the inclusion of various control variables, education years positively associates with self-employment. As a result, holding all other variables constant at their regression sample average level, a unitary increase in education years relates to a 0.3% increase in the probability with which an individual is self-employed. Column (2) concerns an additional OLS regression, though conducted on high education rather than education years. High education binarily reflects an individual's attainment of a bachelor's-level degree or higher. The pertinent coefficient is positive and statistically significant at the 1% significance level. This indicates that, given control variables, going from no high education to high education positively associates with self-employment. More specifically, this change is associated with an increase in the probability of becoming self-employed by approximately 1.3%.

Column (3) concerns an OLS instrumental variable regression, regarding the relationship between education years and self-employment. Education years is instrumented with father's high education, which binarily reflects if a respondent's father maintains a level of educational completion at or exceeding the bachelor's degree level (or equivalent). Education years exhibits a positive and statistically significant coefficient, with significance at the 1% level. The coefficient indicates that the probability of engaging in self-employment increases by 1.4% with an additional year of education. Finally, column (4) concerns an identical instrumental variable regression, except that a respondent's high education is now instrumented with their father's high education. The latter variable is found to be positive and statistically significant at the 1% level. The coefficient indicates that moving from no high education to high education is associated with a 9.2% increase in the probability of being self-employed. The *F*-statistics of the instrumental variable models are statistically significant at the 1% level with a value greater than 10, indicating their relevance.

The first hypothesis is hence accepted. More explicitly, educational attainment is positively associated with engagement in entrepreneurship. This is given the fact that in all four models, variables reflecting educational attainment have positive coefficients that are statistically significant at the 1% level.

4C. Hypothesis 2

Table 4

Regression results concerning the relationship between an entrepreneur's number of employees and their education

	(1) OLS		(2) OLS		(3) IV		(4) IV	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
<i>Education years</i>	-0.006	0.008	.	.	0.003	0.028	.	.
<i>High education</i>	.	.	-0.024	0.058	.	.	0.016	0.169
<i>Male</i>	0.250***	0.054	0.251***	0.054	0.254***	0.055	0.254***	0.055
<i>Age</i>	0.003	0.002	0.004	0.002	0.004	0.003	0.004	0.002
<i>Marriage</i>	0.198***	0.055	0.199***	0.055	0.200***	0.055	0.200***	0.055
<i>Ethnic minority</i>	0.144	0.123	0.147	0.124	0.149	0.124	0.148	0.123
<i>Disabilities</i>	0.197	0.162	0.203	0.162	0.21	0.166	0.209	0.163
<i>Father self-employment</i>	0.021	0.061	0.021	0.061	0.024	0.061	0.024	0.062
Constant	0.437***	0.168	0.346***	0.115	0.288	0.473	0.324**	0.142
<i>R</i> ²	0.021		0.021		.		.	
<i>F</i> -statistic	6.83***		6.77***		6.73***		6.73***	
Observations	2,155		2,155		2,155		2,155	

Note: This table depicts regression results for four different regressions. For all four regressions, the dependent variable is the number of employees. Column “(1)” concerns an ordinary least squares (OLS) regression of the number of employees on education years and a range of control variables. Meanwhile, column “(2)” concerns an identical OLS regression, except that education years is replaced with high education. In addition, column “(3)” concerns an OLS instrumental variable regression, instrumenting education years with high father’s education and utilizing the same control variables. Finally, column “(4)” concerns an identical instrumental variable regression, except that high education is the instrumented variable. For all coefficients and *F*-statistics, “****” indicates a *p*-value at or below 0.01; “***” indicates a *p*-value at or below 0.05; and “**” indicates a *p*-value at or below 0.10. “*B*” represents regression coefficients, while “*SE*” represents robust standard errors. All coefficient values are rounded to the third nearest decimal place.

The second hypothesis is such that educational attainment positively associates with the number of employees under an entrepreneur. Table 4 contains regression results concerning this hypothesis.

Column (1) pertains to an OLS regression of the number of employees on education years and a variety of control variables. The education years variable was found to be negative and statistically insignificant at the 10% level, hence indicating the lack of association in this model. On the other hand, column (2) entails an identical analysis except with high education as a measure of educational attainment (rather than education years). Similar to the first regression, high education maintains a positive coefficient. However, this coefficient is also statistically insignificant at the 10% level. Hence, this regression also indicates a lack of association between educational attainment and the number of employees.

In order to further isolate any possible association, instrumental variable regressions are conducted with their results recorded in columns (3) and (4). The regression results represented in column (3) are such that education years is instrumented with father's high education. Findings indicate that the coefficient is positive but statistically insignificant at the 10% level. In addition, an almost identical regression is conducted with its results depicted in column (4). Here, the only difference is that high education (instead of education years) is instrumented with father's high education. The coefficient is positive, though also statistically insignificant at the 10% level. For both instrumental variable models, the *F*-statistics are high such that associated *p*-values are all less than 1%. Hence, the models are relevant in the context of the analysis. The *F*-statistics of the instrumental variable models are statistically significant at the 1% level though with a value less than 10, indicating their lack of relevance.

As a result, the second hypothesis is not accepted. More explicitly, there is no significant association between educational attainment and the number of employees under an entrepreneur. This is given the fact that, in all four models, variables reflecting educational attainment have coefficients that are insignificant at the 10% significance level.

4D. Hypothesis 3A

Table 5

Regression results concerning the relationship between an entrepreneur's level of family income and their education

	(1) OLS		(2) OLS		(3) IV		(4) IV	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
<i>Education years</i>	0.026***	0.003	.	.	0.062***	0.010	.	.
<i>High education</i>	.	.	0.202***	0.021	.	.	0.368***	0.060
<i>Male</i>	0.064***	0.018	0.067***	0.018	0.081***	0.020	0.080***	0.019
<i>Age</i>	-0.002**	0.001	-0.002***	0.001	-0.001	0.001	-0.002**	0.001
<i>Marriage</i>	0.123***	0.018	0.120***	0.018	0.129***	0.019	0.121***	0.018
<i>Ethnic minority</i>	-0.107	0.033	-0.120***	0.033	-0.086**	0.037	-0.117***	0.034
<i>Disabilities</i>	-0.049	0.040	-0.060	0.039	0.002	0.048	-0.039	0.042
<i>Father self-employment</i>	-0.027	0.019	-0.019	0.019	-0.018	0.02	-0.008	0.020
Constant	-0.119**	0.059	0.197***	0.041	-0.699***	0.177	0.107**	0.053
<i>R</i> ²	0.074		0.077		.		.	
<i>F</i> -statistic	27.57***		26.42***		14.71***		17.11***	
Observations	2,155		2,155		2,155		2,155	

Note: This table depicts regression results for four different regressions. For all four regressions, the dependent variable is high income. Column “(1)” concerns an ordinary least squares (OLS) regression of high income on education years and a range of control variables. Meanwhile, column “(2)” concerns an identical OLS regression, except that education years is replaced with high education. In addition, column “(3)” concerns an OLS instrumental variable regression, instrumenting education years with high father’s education and utilizing the same control variables. Finally, column “(4)” concerns an identical instrumental variable regression, except that high education is the instrumented variable. For all coefficients and *F*-statistics, “***” indicates a *p*-value at or below 0.01; “**” indicates a *p*-value at or below 0.05; and “*” indicates a *p*-value at or below 0.10. “*B*” represents regression coefficients, while “*SE*” represents robust standard errors. All coefficient values are rounded to the third nearest decimal place.

Hypothesis 3A is such that educational attainment positively associates with an entrepreneur’s level of family income. Table 5 contains regression results concerning this hypothesis. Column (1) pertains to

an OLS regression of high income on education years and a variety of control variables. High income entails a family income level in the top 20% of the national income distribution. Results show that education years maintains a positive and statistically significant coefficient at the 1% level. Given control variables at their regression sample average levels, a unitary increase in education years associates with a 2.6% increase in the probability of an entrepreneur having a high income. Column (2) entails an identical regression, except that high education replaces education years as the measure of educational attainment. The coefficient is positive and statistically significant at the 1% level. Hence, given control variables at their regression sample average, going from no high education to high education is associated with an approximately 20.2% increase in the probability of an entrepreneur having a high income.

In order to further isolate any possible association, instrumental variable regressions are conducted with their results recorded in columns (3) and (4). The regression results represented in column (3) are such that education years is instrumented with father's high education. The education years coefficient is positive and statistically significant at the 1% level. This indicates that a unitary increase in education years associates with an approximately 6.2% increase in the probability of earning high income. Column (4) concerns an identical instrumental variable regression, except that high education (instead of education years) is instrumented with father's high education. Findings are such that high education maintains a positive coefficient that is significant at the 1% significance level. This indicates that that going from no high education to high education associates with an approximately 36.8% increase in the probability of earning a high family income. For both instrumental variable models, the F -statistics are high such that associated p -values are all less than 1%. Hence, the models are relevant in the context of the analysis. The F -statistics of both instrumental variable models are statistically significant at the 1% level with a value greater than 10, indicating their relevance.

To conclude, Hypothesis 3A is accepted. More explicitly, educational attainment positively associates with an entrepreneur's family income. This results from the fact that all coefficients pertaining to educational attainment are positive and statistically significant at the 1% significance level.

4E. Hypothesis 3B

Table 6

Regression results concerning the relationship between an entrepreneur's level of comfort with their family income and their education.

	(1) OLS		(2) OLS		(3) IV		(4) IV	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
<i>Education years</i>	0.026***	0.003	.	.	0.058***	0.011	.	.
<i>High education</i>	.	.	0.203***	0.022	.	.	0.344***	0.064
<i>Male</i>	0.060***	0.021	0.064***	0.021	0.075***	0.022	0.075***	0.022
<i>Age</i>	-0.001	0.001	-0.001	0.001	0.000	0.001	-0.001	0.001
<i>Marriage</i>	0.072***	0.021	0.069***	0.021	0.078***	0.022	0.069***	0.021
<i>Ethnic minority</i>	-0.169***	0.039	-0.181***	0.039	-0.149***	0.042	-0.179***	0.041
<i>Disabilities</i>	-0.189***	0.043	-0.199***	0.042	-0.143***	0.05	-0.181***	0.043
<i>Father self-employment</i>	0.018	0.023	0.026	0.023	0.026	0.023	0.036	0.023
Constant	0.009	0.066	0.317***	0.047	-0.512***	0.185	0.241***	0.057
<i>R</i> ²	0.056		0.060		.		.	
<i>F</i> -statistic	22.27***		23.65***		13.59***		15.21***	
Observations	2,155		2,155		2,155		2,155	

Note: This table depicts regression results for four different regressions. For all four regressions, the dependent variable is high comfort (with family income). Column “(1)” concerns an ordinary least squares (OLS) regression of high comfort on education years and a range of control variables. Meanwhile, column “(2)” concerns an identical OLS regression, except that education years is replaced with high education. In addition, column “(3)” concerns an OLS instrumental variable regression, instrumenting education years with high father’s education and utilizing the same control variables. Finally, column “(4)” concerns an identical instrumental variable regression, except that high education is the instrumented variable. For all coefficients and *F*-statistics, “***” indicates a *p*-value at or below 0.01; “**” indicates a *p*-value at or below 0.05; and “*” indicates a *p*-value at or below 0.10. “*B*” represents regression coefficients, while “*SE*” represents robust standard errors. All coefficient values are rounded to the third nearest decimal place.

Hypothesis 3B is such that educational attainment positively associates with an entrepreneur’s level of family income. Table 6 contains regression results concerning this hypothesis. Column (1) pertains to

an OLS regression of high comfort with family income on education years and a variety of control variables. High comfort binarily reflects whether or not an individual is comfortable with their level of family income. Results indicate that education years entails a positive coefficient which is statistically significant at the 1% significance level. Given control variables at their regression sample average levels, a unitary increase in education years is associated with an approximately 2.6% increase in the probability of an entrepreneur being highly comfortable with their family income. Column (2) pertains to an almost identical regression, except that the measure used to reflect high educational attainment binarily reflects high education. High education entails a positive coefficient which is significant at the 1% significance level. Given control variables at their regression sample average levels, moving from no high education to high education is associated with an approximately 20.3% increase in the probability of an entrepreneur being highly comfortable with their family income.

In order to further isolate any possible association, instrumental variable regressions are conducted with their results recorded in columns (3) and (4). The regression results represented in column (3) are such that education years is instrumented with father's high education. The coefficient of the education years variable is positive and significant at the 1% significance level. Hence, a unitary increase in education years is associated with an approximately 5.8% increase in the probability with which an individual is highly comfortable with their family income. The regression results depicted in column (4) pertain to an identical regression to that depicted in column (3), except that high education is instrumented with father's high education. High education maintains a positive coefficient that is statistically significant at the 1% significance level. Hence, going from no high education to high education associates with an approximately 34.4% increase in the probability of an entrepreneur being highly comfortable with their family income. For both instrumental variable models, the F -statistics are high such that associated p -values are all less than 1%. Hence, the models are relevant in the context of the analysis. The F -statistics of the instrumental variable regressions are statistically significant at the 1% level with a value greater than 10, indicating their relevance

To conclude, Hypothesis 3B is thus accepted. To elaborate, educational attainment positively associates with an individual's level of comfort with their family income. This is because all coefficients relating to educational attainment are positive and statistically significant at the 1% significance level.

4F. Robustness Check

Table 7

Regression results concerning the relationship between an entrepreneur's level of family income and their education, for unmarried entrepreneurs

	(1) OLS		(2) OLS		(3) IV		(4) IV	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
<i>Education years</i>	0.014***	0.004	.	.	0.018	0.015	.	.
<i>High education</i>	.	.	0.122***	0.028	.	.	0.105	0.089
<i>Male</i>	0.084***	0.024	0.087***	0.024	0.086***	0.026	0.086***	0.025
<i>Age</i>	-0.003***	0.001	-0.003***	0.001	-0.003**	0.001	-0.003***	0.001
<i>Ethnic minority</i>	-0.054	0.048	-0.059	0.048	-0.051	0.049	-0.061	0.048
<i>Disabilities</i>	-0.127***	0.028	-0.123***	0.029	-0.124***	0.031	-0.124***	0.030
<i>Father self-employment</i>	-0.029	0.027	-0.021	0.027	-0.028	0.027	-0.023	0.028
Constant	0.076	0.083	0.245***	0.054	0.016	0.257	0.253***	0.071
<i>R</i> ²	0.045		0.051		.		.	
<i>F</i> -statistic	12.57***		12.62***		9.22***		9.73***	
Observations	1,000		1,000		1,000		1,000	

Note: This table depicts regression results for four different regressions. For all four regressions, the dependent variable is high income. Column “(1)” concerns an ordinary least squares (OLS) regression of high income on education years and a range of control variables. Meanwhile, column “(2)” concerns an identical OLS regression, except that education years is replaced with high education. In addition, column “(3)” concerns an OLS instrumental variable regression, instrumenting education years with high father’s education and utilizing the same control variables. Finally, column “(4)” concerns an identical instrumental variable regression, except that high education is the instrumented variable. For all coefficients and *F*-statistics, “***” indicates a *p*-value at or below 0.01; “**” indicates a *p*-value at or below 0.05; and “*” indicates a *p*-value at or below 0.10. “*B*” represents regression coefficients, while “*SE*” represents robust standard errors.

Table 7 concerns results from a set of regressions of family income level on educational attainment for the subsample of unmarried entrepreneurs. Columns (1) and (2) concern OLS regressions, with educational attainment variables being positive and statistically significant at the 1% level. Meanwhile,

columns (3) and (4) concern instrumental variable OLS regressions, with educational attainment variables being positive and insignificant at the 10% level.

Section 4D (Table 5) entails similar regressions, except that the sample in those regressions comprises of both married and unmarried entrepreneurs. Pertinent educational attainment coefficients in Table 5 are all statistically significant at the 1% level. This is in contrast to results outlined in Table 7 which entail insignificant education-related coefficients in the instrumental variable analyses. In addition, regressions in Table 7 entail education-related coefficients that are substantially smaller in magnitude relative to those in Table 5.

Table 8

Regression results concerning the relationship between an entrepreneur's level of comfort with their family income and their education, for unmarried entrepreneurs

	(1) OLS		(2) OLS		(3) IV		(4) IV	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
<i>Education years</i>	0.015***	0.004	.	.	0.051***	0.018	.	.
<i>High education</i>	.	.	0.174***	0.033	.	.	0.306***	0.105
<i>Male</i>	0.067**	0.031	0.076**	0.030	0.090***	0.034	0.089***	0.032
<i>Age</i>	-0.003**	0.001	-0.003***	0.001	-0.002	0.001	-0.003**	0.001
<i>Ethnic minority</i>	-0.111*	0.057	-0.114**	0.057	-0.076	0.063	-0.105*	0.059
<i>Disabilities</i>	-0.210***	0.051	-0.200***	0.050	-0.184***	0.055	-0.184***	0.051
<i>Father self-employment</i>	-0.007	0.034	0.006	0.033	0.005	0.035	0.019	0.035
Constant	0.246***	0.096	0.402***	0.062	-0.357	0.308	0.336***	0.080
<i>R</i> ²	0.037		0.055		.		.	
<i>F</i> -statistic	10.04***		13.07***		7.82***		9.03***	
Observations	1,000		1,000		1,000		1,000	

Note: This table depicts regression results for four different regressions. For all four regressions, the dependent variable is high comfort (with family income). Column “(1)” concerns an ordinary least squares (OLS) regression of high income on education years and a range of control variables. Meanwhile, column “(2)” concerns an identical OLS regression, except that education years is replaced with high education. In addition, column “(3)” concerns an OLS instrumental variable regression, instrumenting education years with high father’s education and utilizing the same control variables. Finally, column “(4)” concerns an identical instrumental variable regression, except

that high education is the instrumented variable. For all coefficients and F -statistics, “****” indicates a p -value at or below 0.01; “***” indicates a p -value at or below 0.05; and “**” indicates a p -value at or below 0.10. “ B ” represents regression coefficients, while “ SE ” represents robust standard errors. All coefficient values are rounded to the third nearest decimal place.

Table 8 concerns results from a set of regressions of high comfort with family income on educational attainment for the subsample of unmarried entrepreneurs. Columns (1) and (2) concern OLS regressions, with educational attainment variables being positive and statistically significant at the 1% level. In addition, columns (3) and (4) concern instrumental variable OLS regressions, with educational attainment variables being positive and statistically significant at the 1% level.

Section 4E (Table 6) entails similar regressions, except that the sample in those regressions comprises of both married and unmarried entrepreneurs. Pertinent educational attainment coefficients in Table 6 are all statistically significant at the 1% level, as is the case with results outlined in Table 8. However, regressions in Table 8 entail education-related coefficients that are somewhat smaller in magnitude relative to those in Table 6.

5. Discussion & Conclusion

5A. Discussion

The results of my analysis lead to an acceptance of Hypothesis 1. Hence, educational attainment indeed has a statistically significant and positive association with engagement in entrepreneurship. This result is largely expected, as entrepreneurs are more able to utilize their human capital under entrepreneurship rather than paid employment (Van Praag et al., 2013). In addition, education likely arms the entrepreneur with increased credibility (Caplan, 2019), potentially enabling her in finding an appropriate cofounder or in securing investments.

In contrast, I do not accept Hypothesis 2 given a lack of evidence from the pertinent regression analyses. Hence, educational attainment appears to not significantly associate with the number of employees under an entrepreneur. As discussed, the number of employees can be used as a proxy for organizational size and growth (Delmar, 2006). My result is largely unexpected, as it contradicts prior literature (Van der Sluis et al., 2008). However, it does not necessarily contradict human capital theory. This can be explained broadly by the notion that entrepreneurs can best exploit their human capital when they do not employ others (Hessels et al., 2019). Hence, it can be assumed that other factors unrelated to human capital play an imperative role in propelling growth. For instance, long-term organizational learning and growth may be related to the total stock of organizational human capital, rather than merely that of the founder(s) (Hsu and Fang, 2009). Finally, the lack of persistent organizational growth resultant from founders' human capital may derive from idiosyncratic growth preferences (Cassar, 2006). For instance, highly educated entrepreneurs may indeed have a greater capacity to pursue growth, though they may also disproportionately pursue a small organizational size in order to best capitalize on their human capital.

Given the pertinent regression analyses, Hypothesis 3A is accepted. As a result, an entrepreneur's level of educational attainment appears to positively associate with her level of family income. Similarly, I also accept Hypothesis 3B. Hence, an entrepreneur's level of educational attainment also appears to positively associate with her level of comfort with her family income. Both hypotheses reflect two aspects of financial security, being the objective component (for the former hypothesis) and the subjective component (for the latter hypothesis). The results hence indicate that if entrepreneurs are better-educated, they are more likely to have opportunity-related motivations for their entrepreneurship. This is because of two mechanisms underlying the relationship between financial security and an opportunity-related drive for entrepreneurship. Firstly, if educated entrepreneurs have partners who earn a substantial amount of household income, their entrepreneurship is likely opportunity-driven as there is less need for earning a second income. Or, for instance, if educated entrepreneurs have other robust and significant sources of income, they may similarly not need to pursue entrepreneurship. Secondly,

entrepreneurs who earn a substantial amount of income from their entrepreneurial operations are likely to be high-performers with opportunity costs in the context of paid employment. Hence, they would be opportunity-driven.

As a robustness check, regressions pertinent to the latter two hypotheses are reapplied to a subsample of unmarried entrepreneurs. This is in order to imperfectly isolate the aforementioned second mechanism, being that educated entrepreneurs are more likely to be financially secure due to their high performance. When considering Hypothesis 3A, the robustness check entails a mixture of statistically significant and insignificant results pertinent to the relationship between educational attainment and income level. This stands in contrast to the core results which indicate wholly statistically significant results in that regard. Meanwhile estimated educational attainment coefficients are substantially lower in the robustness check. This indicates that the aforementioned second mechanism is less likely to hold, or at least is not entirely significant. Statistically insignificant results are only detected in the instrumental variable regressions, and hence the importance of those results depends partially on the instrument's validity. As for the robustness check conducted on Hypothesis 3B, results largely line up. Educational attainment coefficients retain statistical significance, while coefficients drop but not substantially.

Hence, the level of family income associated with an entrepreneur seems to not be a useful proxy for her financial performance in a regression of family income level on educational attainment. This is the case because somewhat isolating the second mechanism (which focuses on an entrepreneur's financial performance) yields substantially different results. One reason for this is indeed that the first mechanism plays a prominent role. As their spouses earn incomes that are sufficient to sustain the family effectively, individuals may not feel a need to become entrepreneurs, and instead primarily do so when opportunities are substantial. It should be noted that the two mechanisms are largely interlinked; individuals who are only driven by substantial opportunity in pursuing enterprise should be more likely to reach high financial performance resultantly. However, the latter mechanism may be driven by the former.

Instead, the level of comfort with family income appears to be a better proxy for an entrepreneur's level of financial performance. This is because isolating the aforementioned second mechanism does not lead to substantially different results. In addition, it may be that an individual's income level is generally a poor proxy of anything regarding financial security. For instance, discrepancies in living costs, idiosyncratic expenditures, and other miscellaneous factors may lead to a difficulty in equating income standing to financial security. Glaeser et al. (2001) find that the growth in the costs of living in cities have even risen past the pertinent growth in wages. An urbanite may experience much less utility from a given income relative to an individual living in a remote low-cost community. Hence, financial comfort may better reflect both financial security and the second mechanism.

Hoogerheide et al. (2012) provide the justification for utilizing father's education as an instrument for education in income regressions. They suggest that the arising violations of the exclusion restriction are not substantial to the degree of causing substantial biasing. Hence, this is essentially direct justification for implementing father's education as an instrument when concerning the two latter hypotheses, as they involve income-related outcome variables. However, there is more doubt as for its validity when concerning other related outcome variables. Hence, it is imperative to consider the direction of potential bias. It would arguably be to the positive direction, as high paternal education may propel parental self-employment, which would then positively influence their children's decision to pursue self-employment. As a result, the effect of education on selection into entrepreneurship may not be as substantial as indicated in the results I present. However, the directional consistency of the effects across OLS and IV build confidence about the direction of effects.

5B. Conclusion

In exploring how educational attainment relates to entrepreneurship outcomes, I attempt to answer the following research question:

Does education relate to entrepreneurial occupational choice and success?

Findings indicate that educational attainment indeed does relate to entrepreneurial occupational choice and success. For instance, I accept Hypothesis 1, which suggests that better-educated individuals are more likely to engage in entrepreneurship. In addition, I accept Hypotheses 3A and 3B, which suggest that education propels an opportunity-basis for entrepreneurship. The opportunity-basis is gauged partially by looking at entrepreneurs' level of financial performance. Hence, education does appear to influence both entrepreneurial occupational choice and success. However, I do not accept Hypothesis 2, and thus suggest that there is no evidence that an entrepreneur's educational attainment associates with their organization's size. In doing so, I employ father's education as an instrument for education for multiple instrumental variable analyses. This is done as an attempt to deal with possible endogeneity concerns effectively, and provide more causal and robust estimates of the pertinent relationships.

Important social implications from the derived findings pertain to economic policy. For instance, as entrepreneurship positively impacts economic productivity (Geroski, 1989), it may be useful for policy-makers to target higher rates of entrepreneurship through making education more accessible. In addition, entrepreneurs tend to be more socio-economically mobile than paid employees (Quadrini, 2000). Hence, social policy can target educational outcomes in order to increase business generation at the lower-end of the income distribution. The kind of socially positively transformative change arising from the entrepreneurship Schumpeter (1968) envisions is one that is inherently opportunity-driven. Findings pertinent to Hypothesis 3A and Hypothesis 3B both indicate a greater likelihood for entrepreneurship to be opportunity-based given that the entrepreneur is highly educated. Hence, policy-

makers can impact both the quantity and quality of entrepreneurship through influencing educational attainment.

5C. Limitations and Directions for Future Research

Concerns about the internal validity of my findings exist. For instance, endogeneity concerns may not be fully accounted for in the models I construct. In answering each hypothesis, I initially employ a set of regular OLS regressions, and I follow this by conducting a set of OLS instrumental variable regressions. The objective in conducting the latter set of regressions is to further isolate a causal effect. However, as noted in the preceding sub-section, an upward bias in results is still possible. Future studies may overcome this bias by exploiting other types of instrumental variables, such as educational policy reforms.

There may also be limitations in regard to this paper's external validity. A possible source for this is that my analysis considers a European sample, excluding individuals from non-European countries. For instance, institutional factors may associate with the European region that influence my findings. In considering this, Van der Zwan et al. (2013) find that economic development levels across countries play a substantial role in determining levels of entrepreneurial engagement. In addition, they find that individual perceptions of administrative complexities are also impactful in this regard. Moreover, Anokhin and Schulze (2009) find that levels of institutional corruption impact the presence of entrepreneurship and innovation in an economy. Hence, such factors may make paid employment a more attractive option for highly educated individuals. As a result, future research should focus on applying similar analyses to diverse institutional contexts and comparatively evaluating respective findings.

In addition, the 2018 survey year may also be considered to be a significant limitation, given changes in socio-economic circumstances. For instance, the COVID-19 crisis has led to a substantial economic decline in much of the world (Fernandes, 2020). In such circumstances, necessity-driven entrepreneurship is likely to prevail (Fairlie and Fossen, 2018). Hence, if the study was to be conducted in 2021, the link between education and entrepreneurship engagement is likely to be weaker. This indicates a potentially cyclical nature of the relationship between entrepreneurship and education. As a result, future research may focus on investigating the cyclicity of this relationship through an intertemporal analysis. In addition, particular economic crises may have particular impacts on entrepreneurship. For instance, the COVID-19 crisis and the resultant digital transformation may have a unique impact on the types of new businesses created (Ratten, 2020). This could also impact the type of relationship prevalent between education and entrepreneurship and should hence be investigated in more depth in future research.

Moreover, empirical measures utilized in this analysis may be of concern. For instance, the administered survey asks individuals about their occupational status, with an option being self-employment. However, it may be unclear to the respondent as to what self-employment is in reference to. For instance, some individuals could perceive gig work as paid employment, given that gig work can often entail regular work that is accountable to a single organization (as can be the case with ride-sharing). In addition, it may be difficult for some individuals to effectively recall the number of years they spent in full-time education. This may especially be the case for individuals for whom full time education is in the distant past. Hence, future research should attempt to further reconcile such measures with the objects of measurement.

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