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# The unshackled entrepreneur: Occupational determinants of entrepreneurial effort

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# The unshackled entrepreneur: Occupational determinants of entrepreneurial effort [1]


## Abstract

Entrepreneurial effort triggers action towards business creation and constitutes the ultimate link between intention and action. Although occupations play a significant role in entrepreneurial entry, extant research has not thoroughly investigated primary occupational characteristics as specific antecedents of entrepreneurial effort. We contribute to this line of research by proposing and testing a model in which three occupational characteristics at the occupational level (managerial knowledge, self-accomplishment, and arduousness) are correlated with two cognitive factors at the individual level (effort-performance and instrumentality beliefs) that in turn affect behavior (entrepreneurial effort). We draw upon expectancy theory to motivate our model and combine data from the PSED and O*NET to test our hypotheses. We find compelling evidence that individuals facing arduous working conditions and lacking personal accomplishment in their salaried jobs will be more committed to their new business. In addition, we find that entrepreneurs coming from occupations involving high levels of managerial knowledge tend to put more effort into the new venture.



**Keywords:** Entrepreneurship, Occupational characteristics, Entrepreneurial effort.

**JEL Classification:** D22, J24, L26



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**Executive Summary**

People spend a very significant portion of their lives working and what they do at work matters for their well-being and their career in a variety of ways. On the one hand, people might develop knowledge and skills through their job. On the other hand, dissatisfaction with the characteristics of their job reduces productivity and overall quality of life (Argyle, 1989). Previous research has shown that both factors might be relevant for entrepreneurial entry, providing several potential explanations for the fact that some occupations are as much as 5,000 times more likely to generate entrepreneurs than other occupations (Shane, 2008, Table 3.2).

Different studies have focused on different aspects of the occupational context, providing a body of knowledge that is still fragmented and limited to some extent. One important limitation of the extant literature is that most studies do not directly assess the motivational mechanisms that link occupational characteristics to entrepreneurial behavior. Although previous research has offered a variety of causal explanations, only a few studies have directly measured the motivational mechanisms connecting occupational characteristics to entrepreneurship (e.g., through subjective evaluations of satisfaction in the previous job, Guerra and Patuelli, 2016). Most often, such mechanisms have been inferred from correlational evidence between some aspects of one's previous work experience, such as previous knowledge (Dencker, Gruber, and Shah, 2009; Shane, 2000), human capital (Åstebro and Young, 2016; Unger, Rauch, Frese, and Rosenvusch, 2011), balanced skills (Lazear, 2005) and one's decision to start a business. As a result, previous research has been limited in its ability to uncover the relationship between occupational characteristics and entrepreneurial action. For instance, knowledge-based theories of entrepreneurship have been criticized for inferring a transfer of knowledge from the effect of labor mobility on entrepreneurial entry, since several mechanisms that do not imply knowledge transfer may influence entrepreneurial entry in similar ways (Frederiksen, Wennberg, and Balachandran, 2016).

In this paper, we contribute to the existing literature by using expectancy theory to identify the theoretical mechanisms through which job characteristics influence effort. We analyze three occupational characteristics: managerial knowledge, arduousness and self-accomplishment in a given occupation. In our framework, the effort devoted to entrepreneurship depends on individuals' perception that their personal abilities in a chosen entrepreneurial activity will lead to success (effort-performance relationship) and that the outcome will provide better marginal reward (instrumentality) compared to other career choices (Manolova et al., 2008; Renko et al., 2012; Thompson, 2009; Vroom, 1964). We focus on these two types of expectancies—effort-performance and instrumentality—and hypothesize that they act as mediators, transferring the influence of occupational characteristics to effort. As such, these expectancies provide observable motivational mechanisms explaining the intensity of effort that entrepreneurs dedicate to their

nascent ventures. We assess these expectancies as well as entrepreneurial effort using data from the Panel Study of Entrepreneurial Dynamics (PSED), over the period 2005-2012.

Finally, we directly measure specific occupational characteristics using O*NET data on 974 US occupations. Specifically, we assess the level of managerial knowledge in each occupation, given that this type of knowledge is most likely to be relevant and transferable to entrepreneurship. We hypothesize that occupational managerial knowledge stimulates entrepreneurial effort through effort-performance expectancies. In addition, we also assess occupational levels of self-accomplishment and arduousness, which we hypothesize to have opposite effects on entrepreneurial effort through instrumentality expectancies.

Our results corroborate these hypotheses, showing how occupational characteristics shape individual expectancies and provide push and pull incentives for nascent entrepreneurs' efforts.

**Introduction**

How do different occupational characteristics influence the amount of effort entrepreneurs put in their emerging ventures? Despite extensive evidence that occupations constitute an important determinant of entrepreneurial activity (e.g., Berkhout et al., 2016; Guerra and Patuelli, 2016; Shane, 2008; Witte et al., 2014) and despite strong arguments for a career perspective on entrepreneurship (Burton et al., 2002; Burton et al., 2016; Carroll and Mosakowski, 1987; Frederiksen and Wennberg, 2011; Frederiksen et al., 2016), there is still little understanding of which occupational characteristics actually matter for the choice of an entrepreneurial career and how such occupational characteristics translate into individual entrepreneurial behavior.

In this article we contribute to shed light onto this question by examining how three occupational characteristics—the level of managerial knowledge, self-accomplishment, and arduousness in an occupation—affect the effort invested in starting a business. We retain entrepreneurial effort as dependent variable in our model because several studies suggest that effort is the missing piece of the puzzle that should connect entrepreneurial intentions to entrepreneurial activity (Carsrud and Brännback, 2011; Edelman et al., 2010).[2] Indeed, effort has been relatively neglected by previous studies that tend to focus on either entry

[2] For instance, Blanchflower and Oswald (1998) showed that 63% of Americans, 48% of Britons, and 49% of Germans would choose a self-employed job rather than being an employee. However, only a small fraction of these populations actually becomes self-employed (Delanoë-Guegen and Fayolle, 2018; Van Gelderen et al., 2015). The difference between those who declare that they intend to become entrepreneurs and those who actually become entrepreneurs seems to be mainly in the degree of effort the latter put in the process, because weak effort cannot transfer into real action (Carsrud and Brännback, 2011). As nascent entrepreneurs move on in their business plan, they can decide whether their effort should be intensified or discontinued. Increased effort in the process can drive the nascent entrepreneur forward, towards achieving the successful establishment of an operating venture. Thus, the evolution and progress of business creation seems to be critically dependent on the nascent entrepreneur's effort and, most importantly, on the pursuit of effort over time (Carsrud and Brännback, 2011; Edelman et al., 2010).

decisions or new venture performance as dependent variables, remaining unable to reconcile evidence that factors contributing to entry decisions are not necessarily contributing to new venture performance (Shane, 2012).[3]

As our independent variables, we focus on the occupational level of managerial knowledge, self-accomplishment, and arduousness for several reasons. Managerial knowledge includes management, marketing, and human relations skills that can be easily transferable to entrepreneurship and of great value for nascent entrepreneurs in their start-up efforts (Frederiksen and Wennberg, 2011; Gathmann and Schönberg, 2010; Hiscrich and Brush, 1984). As several studies have emphasized the importance of previous work experience in shaping entrepreneurs' knowledge and skills (e.g., Dencker et al., 2009; Hsieh, 2016; Lazear, 2004; Shane, 2000; Sorenson and Audia, 2000), and since occupations differ in the skillset they develop and on the transferability of skills from one occupation to another (Gathmann and Schönberg, 2010; Kambourov and Manovskii, 2009; Phelps, 1970), the level of managerial knowledge in an occupation is likely to influence individuals' belief that effort in entrepreneurship will lead (or not) to performance.

Self-accomplishment and arduousness are integral parts of the definition of work and occupation, as individuals tend to define work in terms of the arduousness of the tasks involved as well as a function of the feeling of personal accomplishment they produce, with such definitions varying from one occupation to another (e.g., England and Harpaz, 1990; Ruiz-Quintanilla and England, 1996; Weiss and Kahn, 1960). Arduousness generally relates to the level of physical or mental exertion required by an activity (Weiss and Kahn, 1960) whereas self-accomplishment relates to feelings of personal competency, self-realization, and achievement on the job (Maslach, Jackson, and Leiter, 1996). Both are occupational characteristics that directly influence job satisfaction.[4] As a consequence, they might also influence the relative attractiveness of an entrepreneurial career (Katz, 1992; Lee et al., 2011).

Finally and most importantly, we focus on expectancies as mediators for the relationship between occupational characteristics and entrepreneurial effort, because this allows us to identify and test the theoretical processes through which occupational characteristics influence effort. Outside of entrepreneurship studies, the theoretical framework most used to understand antecedents of effort is expectancy theory (Iaffaldano and Muchinsky, 1985; Miller and Monge, 1986; Vroom, 1964). The theory predicts that an individual will act in a certain way based on his or her expectation of the outcome. Application of expectancy theory to the field of entrepreneurship has been growing as it provides a comprehensive framework for venture emergence antecedents (Gatewood et al., 2002; Manolova et al.,

[3] As argued by Delmar (2016), new venture performance might be a variable too distal to capture the effects of organizational activities. Effort, on the contrary, is a closer behavioral variable that is both theoretically relevant and practically important for the unfolding of the entrepreneurial process.

[4] For instance, physical and emotional exhaustion (often caused by high levels of arduousness) and reduced personal accomplishment are key components of the psychological syndrome of burnout (Maslach et al., 1996).

2008). However, only a few studies have directly measured the motivational mechanisms connecting occupational characteristics to entrepreneurship (e.g., Guerra and Patuelli, 2016).

Thus, we use expectancy theory to understand the role of job characteristics that might act as push and/or pull factors on one's expectancy about entrepreneurship and in turn influence entrepreneurial effort. We identify two types of expectancies. The first is effort-performance relationship which is the individuals' perception that their personal abilities in a chosen entrepreneurial activity will lead to success. The second is instrumentality, which is the individuals' belief that the outcome will provide better marginal reward compared to other career choices (Manolova et al., 2008; Renko et al., 2012; Thompson, 2009; Vroom, 1964). We hypothesize that the level of managerial knowledge in a previous occupation affects nascent entrepreneurs' effort-performance expectancies, whereas occupational arduousness and self-accomplishment influence instrumentality expectancies.

We test these hypotheses with a dataset created by merging O*NET data on 974 US occupations with the Panel Study of Entrepreneurial Dynamics (PSED), over the period 2005-2012, based on equivalent SOC codes. Our results show that arduousness in one's occupation stimulates entrepreneurial effort, whereas self-accomplishment discourages entrepreneurial endeavors through instrumentality beliefs. Additionally, our results show that managerial knowledge encourages entrepreneurial effort through both effort-performance and instrumentality beliefs. Hence, arduous working conditions act as a push factor that triggers entrepreneurial effort by influencing the belief that entrepreneurship is of value, whereas managerial knowledge acts as a pull factor by working on the belief that entrepreneurship will lead to success.

Overall, our results expand the conversation about the role of occupational history in entrepreneurial effort in the earliest stage of the entrepreneurial process. More particularly, our study goes beyond the mutually exclusive categories of necessity entrepreneurs pushed to self-employment because they are out of work, and opportunity entrepreneurs who are currently employed. This study identifies factors stemming from entrepreneurs' previous occupation by identifying entrepreneurial effort as highly dependent upon the intensity of push and pull factors faced on the job.

## 1. Theoretical background

Why do nascent entrepreneurs expend effort when starting their business? Albeit fragmented, previous literature reveals many attempts to answer this question both directly and indirectly. One long-standing research stream in the literature on the determinants of entrepreneurial effort has focused on personality traits such as the need for achievement (Collins et al., 2004; Johnson, 1990), optimism (Cooper et al., 1988), tolerance for ambiguity (Begley and Boyd, 1987), and an internal locus of control (Mueller and Thomas, 2001). However, the quest to find a consistent set of traits characterizing successful entrepreneurs has been a challenge, to say the least (Gartner, 1988; Gatewood et al., 2002). Other studies

have analyzed the choice to become entrepreneur and the subsequent effort devoted to the entrepreneurial process as a utility-maximizing process, based on returns from cognitive and social abilities (Hartog et al., 2010), human capital and education (Van Praag and Cramer, 2001), portfolio of experience and tasks (Lazear, 2004), and the opportunity cost of leaving an occupation (Berkhout et al., 2016). Finally, some scholars have documented the importance of previous work experience in shaping an entrepreneur's knowledge, attitudes, and ability to identify opportunities (e.g., Dencker et al., 2009; Shane, 2000; Sorenson and Audia, 2000), and have argued for a career perspective on entrepreneurship (Burton et al., 2002; Burton et al., 2016; Carroll and Mosakowski, 1987; Frederiksen and Wennberg, 2011; Frederiksen et al., 2016). In this line of research, many studies have focused on financial incentives derived from occupational wage distribution to explain entrepreneurial entry (Berkhout et al., 2016; Witte et al., 2014). But occupations offer workers more than financial incentives (Carter, 2011); they actually provide a full experience that might be the only alternative an individual remembers and considers when making the choice to become an entrepreneur (Katz, 1992). Unfavorable work environments, for instance, have been shown to increase an individual's intent to pursue an entrepreneurial career (Lee et al., 2011).

Our study aims to shed light on this question by building upon Vroom's (1964) expectancy theory. This theory has been widely used to understand turnover, work motivation, work performance, and work satisfaction (Katzell and Thompson, 1990; Locke and Latham, 1990; Miller and Monge, 1986). In addition, expectancy theory has been increasingly applied to the field of entrepreneurship, as it provides a comprehensive framework for understanding antecedents of venture emergence (Gatewood et al., 2002; Manolova et al., 2008).

Expectancy theory predicts that an individual will act in a certain way based on the expectation that the act will be followed by a given outcome and on the attractiveness of that outcome to the individual (Renko et al., 2012). Thus, behavior unfolds from two types of beliefs: (i) the belief that effort will result in a particular outcome (effort-performance), and (ii) the belief that such outcome is desirable (instrumentality). Applying this reasoning to entrepreneurship suggests that entrepreneurial effort is dependent on (i) the belief that skills and abilities can result in the achievement of a particular level of performance (effort-performance in expectancy theory), and (ii) the strength of the belief that self-employment is the best path to achieve job satisfaction (instrumentality in expectancy theory).

We shall see below how occupational characteristics might affect these two types of beliefs.

### 1.1 Occupational characteristics and effort-performance beliefs

An occupation is defined as a collection of "tasks which are differentiated primarily by the skill—the training and talent—necessary for their performance" (Siegel 1971, p. 48). As such, occupations are best seen as repositories of skills that require and provide differentiated training to different subsets of individuals

in the labor market (Gathmann and Schönberg, 2010; Kambourov and Manovskii, 2009; Phelps, 1970). Moreover, although entrepreneurship might require a specific set of skills, occupations are likely to vary in the extent that they offer and develop skills that are transferable to entrepreneurship (Frederiksen and Wennberg, 2011; Gathmann and Schönberg, 2010). Thus, occupational characteristics are likely to affect the belief that skills acquired in a previous job can result in the achievement of a high level of performance in entrepreneurship.

Nascent entrepreneurs' beliefs about their ability to perform well depend on competencies in various fields, including accounting, production, marketing, human resources, and general organizational skills (Oehler et al., 2015; Scherer et al., 1989; Subramaniam and Freudenberg, 2007). Previous experience in an occupation can indeed provide valuable skills for the successful implementation of a new business (Birley and Norburn, 1987; Jones-Evans, 1996). Skills in management, marketing, and human relations may be influential in determining the success of new ventures, as they constitute valuable resources for guiding nascent entrepreneurs in their start-up efforts (Hiscrich and Brush, 1984). Thus, the greater the intensity of entrepreneurial tasks and knowledge (marketing, human resources, and general management) in one's primary occupation, the more one tends to believe in one's own ability to successfully run a business. Therefore, we hypothesize:

*Hypothesis 1: There is a positive relationship between managerial knowledge in a nascent entrepreneur's primary occupation and the belief that the individual has the right skills to pursue entrepreneurship.*

### 1.2. Occupational characteristics and instrumentality beliefs

While an occupation's level of managerial knowledge is likely to affect effort-performance beliefs associated with entrepreneurship, other occupational characteristics related to job satisfaction provide important information on instrumentality, i.e., the belief that the reward is attractive enough. Overall, the less one's occupation offers good prospects in terms of satisfaction, the more entrepreneurship is perceived as a good opportunity for achieving higher reward if the performance expectation is met (Lee et al., 2011; McCann and Folta, 2012). Specifically, we assume that job satisfaction is a function of self-accomplishment and the arduousness of working conditions in a given occupation, because both are essential constituents of how people define work, including the personal outcomes or states that result from engaging in working activity (England and Harpaz, 1990; Ruiz-Quintanilla and England, 1996; Weiss and Kahn, 1960).

Self-accomplishment is associated with feelings of personal competency, self-realization, and achievement on the job (Maslach et al., 1996). For instance, cases of burnout are generally associated with low levels of personal accomplishment in a job situation (Maslach et al., 1996). Occupations that favor self-

accomplishment are generally those offering good working conditions in terms of job security, wages, variety of tasks, and opportunities for career development. Self-accomplishment may also stem from occupations that frequently involve starting up and leading new projects, reward workers' achievements, and provide them with a considerable degree of autonomy and independence.

Clearly, individuals who find high self-accomplishment in an occupation will be less likely to believe that entrepreneurship provides higher marginal reward, even if an attractive business opportunity arises, because they have already achieved high job satisfaction in their occupation. In this case, there is little incentive to dedicate energy to entrepreneurial endeavors out of the current job. As a consequence, entrepreneurial effort is low. Conversely, an individual in an occupation with poor personal prospects in terms of self-accomplishment has a greater incentive to dedicate time and effort to entrepreneurship due to the greater marginal reward associated with it. This is in line with Shapero's assertion that individuals' perception of being deprived of an opportunity to advance in their job is an important determinant of entry into self-employment (Shapero, 1975; Shapero and Sokol, 1982). This is also consistent with Carter's (2011) view that entrepreneurship offers non-pecuniary compensating factors, such as autonomy and satisfaction. If entrepreneurship is associated with greater reward in terms of self-accomplishment, then individuals with low self-accomplishment in their occupation are more likely to expect that entrepreneurship is associated with a higher marginal reward.

*Hypothesis 2: There is a negative relationship between the level of personal accomplishment in an occupation and the belief that the marginal reward of entrepreneurship is high.*

The opposite reasoning applies to occupational arduousness. That is, for a similar level of personal accomplishment, individuals in occupations facing higher levels of arduousness are more likely to perceive greater marginal reward in entrepreneurship and therefore to dedicate more time and effort to it. Although the arduousness of the task is an essential part of how many individuals define work (Weiss and Kahn, 1960), high levels of arduousness can lead to physical, mental, and emotional exhaustion which is also characteristic of the psychological syndrome of burnout (Maslach et al., 1996). Thus, occupational arduousness—which includes stressful, physically demanding, and uncomfortable working conditions—can lead individuals to the conclusion that they do not want to stay in that job for the rest of their life, thereby strengthening the belief that entrepreneurship might offer higher rewards in terms of job satisfaction.

*Hypothesis 3: There is a positive relationship between the level of arduousness in an occupation and the belief that the marginal reward of entrepreneurship is high.*

### 1.3. Expectancy theory and entrepreneurial effort

Within the framework of expectancy theory, effort-performance and instrumentality beliefs offer a causal explanation and a mechanism through which occupational characteristics affect entrepreneurial effort. In this context, strong effort-performance beliefs are fueled by managerial knowledge acquired in a previous occupation that is potentially transferable to entrepreneurship. Such knowledge fuels the belief that the individual's skills and abilities can result in the achievement of a desired level of performance if enough effort is put in the entrepreneurial process. The more one believes that effort will result in a desired outcome, the more likely one is to make the effort. Thus, we hypothesize:

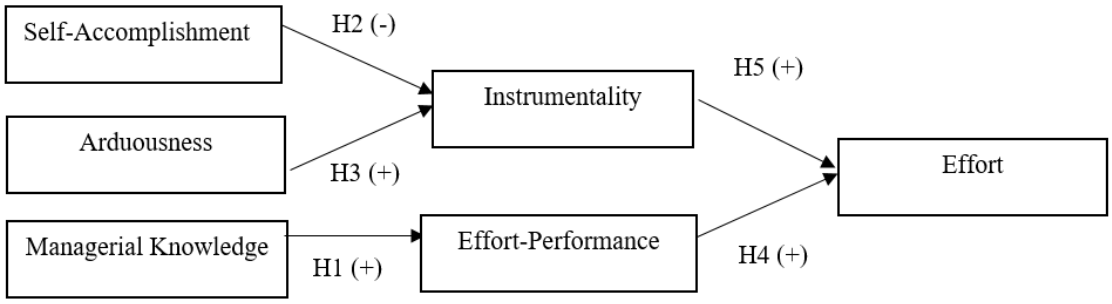
*Hypothesis 4: Effort-performance beliefs positively affect nascent entrepreneurs' efforts to start a business.*

In addition, instrumentality beliefs reinforce the perception that the outcome of effort is indeed attractive and desirable. We suggest that occupational arduousness is likely to increase the attractiveness of an entrepreneurial career, whereas self-accomplishment in an occupation is likely to decrease it. Indeed, by virtue of the availability heuristic, one's primary occupation is often the salient alternative that entrepreneurship is compared to (Katz, 1992). The more arduous the working conditions and the lower the possibility of self-accomplishment in an occupation, the more attractive the alternative of an entrepreneurial career. And the more attractive an entrepreneurial career—i.e., the stronger the belief that entrepreneurship is the best path to achieve job-satisfaction—the more likely a nascent entrepreneur is to put effort in the entrepreneurial process.

*Hypothesis 5: Instrumentality beliefs positively affect nascent entrepreneurs' efforts to start a business.*

The model depicted in Figure 1 summarizes our hypotheses and theoretical developments so far. It provides an overview of our hypothesized relationships, showing how certain occupational characteristics affect the belief that one's skills will result in a good performance as an entrepreneur (effort-performance) and the belief that entrepreneurship provides a high marginal reward (instrumentality), which in turn influence the degree of effort devoted to start a business.

**Figure 1. Occupational determinants of entrepreneurial effort: A model based on expectancy theory**




## 2. Methods and empirical analysis

### 2.1 Data

The dataset was created by merging data from the US Panel Study of Entrepreneurial Dynamics II (PSED) and from the O*NET database compiled by the Department of Labor's Occupational Information Network. PSED data are based on a representative sample of 1,214 nascent entrepreneurs identified in late 2005 and early 2006, with longitudinal information collected in follow-up waves conducted each year for six years (Reynolds and Curtin, 2007).[5] PSED data provide information on individuals' primary occupation by reporting the 3-digit SOC code of occupations (Standard Occupational Classification, SOC).[6] O*NET provides a taxonomy of 974 occupations that is based on the Standard Occupational classification which allows us to merge the two databases on the same SOC codes.

O*NET data are derived from a questionnaire completed by workers and experts[7], and designed to analyze the level and importance of tasks needed to perform a specific occupation. O*NET data provide a

[5] Nascent entrepreneurs were identified by four criteria: (i) they consider themselves as involved in the creation process, (ii) they have engaged in some kind of start-up activity in the past 12 months, (iii) they expect to own all or part of the new firm, and (iv) the initiative has not progressed to the point that it may be considered an operating business (Reynolds and Curtin, 2007). The second phase (named wave A) involved completing an interview with the 1,214 nascent entrepreneurs and collecting information on their motivations, perspective, background and family context. The third phase, labeled wave B, involved follow-up phone interviews. The topics varied depending on the status of the process. Entrepreneurs who reported that they had disengaged from the initiative were asked further questions about the reasons for their decision whereas the others were asked more questions about their start-up activity, growth expectation, competitive strategy, and financial support. Twelve months after the first detailed interview, 13% of nascent entrepreneurs reported an operational new firm, 24% reported they had disengaged, and 63% were continuing with the start-up effort. Waves C through F were completed 24, 36, 48, and 60 months after the initial interview and concerned 90% of nascent entrepreneurs (Reynolds and Curtin, 2007).

[6] We used the code corresponding to the occupation in which the respondent had spent the longest period in continual employment with the same employer (question X11 in the PSED).

[7] For occupations where it was difficult to sample workers, experts were identified and sampled from professional and/or trade association membership lists, and asked to answer the questionnaire.

detailed description of the characteristics of 974 occupations performed in the United States. The database provides information on hundreds of occupation-specific descriptors. We used different descriptors in O*NET to capture characteristics available in four different files: (i) Work Value, (ii) Context, (iii) Knowledge, and (iv) Occupational interest data (more details on O*NET are available in Appendix A).

### 2.2. Independent variables: Occupational characteristics

We used an extensive set of indicators to capture the nature of occupations performed by nascent entrepreneurs. Information was taken from the O*NET files described in the Data section (see also Appendix A). We built three indexes with respect to occupational characteristics in terms of (i) managerial knowledge, (ii) self-accomplishment, and (iii) arduousness.

**Managerial knowledge.** The index capturing the importance of managerial knowledge is obtained by using O*NET data related to areas of knowledge needed to address problems and issues routinely faced in a given occupation. Respondents had to assess the level of each knowledge area on a 7 point-scale. Given the focus of this paper, we considered areas of knowledge that have been shown to matter when starting a business. These areas are (i) administration and management, (ii) economics and accounting, (iii) sales and marketing, (iv) customer and personal service, (v) personnel and human resources, (vi) production and processing, and (vii) communications and media.[8] Our managerial knowledge index was calculated as the average score across all indicators and was occupation-specific. The index was then normalized across occupations such that an occupation with a score of 1 requires the highest knowledge in each of the areas included.

**Self-accomplishment.** The index capturing self-accomplishment was obtained by combining information available in the Work Value data and Occupational Interests data. Each file produced a score ranging from 1 to 7 revealing the extent to which some "values" are satisfied in a given occupation.[9] The values we took into account represent different aspects of self-accomplishment: (i) Achievement, (ii) Working Conditions, (iii) Independence and (iv) Enterprising.

(i) High values in "achievement" are typical of occupations that are results-oriented, that allow workers to use their strongest abilities, and that give them a feeling of accomplishment.

(ii) High values in "working conditions" are typical of occupations that offer job security and good working conditions (workers are often busy, workers are paid well, workers are independent, workers have steady employment, and workers perform a variety of tasks).

[8] For each knowledge area, examples are given to define the level of knowledge. For example, in the economic and accounting category, a level of 2 is associated with "answer billing questions from credit card customers", a level of 4 is associated with "develop financial investment programs for individual clients" and a level of 6 corresponds to "keep a major corporation's financial records."

[9] Rating scales used to express the extent of a value expressed in each category are based on the rates provided by Rounds et al. (1999).

(iii) High values in "independence" correspond to occupations that allow employees to work and make decisions on their own (workers can try out their own ideas, workers can make decisions on their own, they can plan their work with little supervision).

(iv) High values in "enterprising" are typical of occupations that frequently involve starting up and leading projects.

Each occupation has a score ranging from 1 to 7 in each of these categories. Our self-accomplishment index is simply the average score across the four categories for each occupational code. We then normalized the index by adjusting the minimum and maximum value to have a score that varies in the range of 0 to 1.

**Arduousness.** The index capturing the degree of arduousness in a given occupation was obtained by combining O*NET data for 24 indicators of occupational difficulty. The different items are the following: (1) frequency of dealing with conflict situations, (2) unpleasant or angry people, (3) physically aggressive people, (4) regularity of working indoors in non-controlled environmental conditions, (5) outdoors, exposed to all weather conditions, (6) recurrence of working in an open vehicle or equipment, (7) frequency of working in very hot or cold temperatures, (8) in extremely bright or inadequate lighting, (9) importance of being exposed to contaminants, (10) frequency of working in cramped work space that requires getting into awkward positions, (11) frequency of being exposed to whole body vibration, (12) to radiation, (13) importance of being exposed to disease or infections, (14) frequency of exposure to high places, (15) frequency of exposure to hazardous conditions, (16) equipment, (17) minor burns, cuts, bites, or stings, (18) importance of spending time standing, (19) climbing ladders, scaffolds, or poles, (20) kneeling, crouching, stooping or crawling, (21) bending or twisting the body, (22) making repetitive motions, (23) the extent to which pace is determined by the speed of equipment and (24) the frequency that the job requires the worker to meet strict deadlines.

Each indicator has a score ranging from 1 to 5 reflecting the frequency of exposure (from never to daily) to that specific form of occupational difficulty. Our arduousness index was calculated as the average score across all indicators and was occupation-specific. The index was then normalized across occupations such that it varies from 0 (low arduousness) to 1 (high arduousness).

### 2.3. Mediator variables: Effort-performance and instrumentality beliefs

We argue that the two main mechanisms by which occupations affect effort are the effort-performance relationship (the perception that the nascent entrepreneur's ability will lead to success) and instrumentality (the belief that entrepreneurship will provide better marginal reward compared to other career choices).

**Effort-performance beliefs**. We measured effort-performance beliefs using a PSED question asking nascent entrepreneurs to self-assess their own ability to complete entrepreneurial tasks. Respondents were asked to indicate their degree of agreement or disagreement with the following statement: "Overall, my skills and abilities will help me start this new business" (question Y6 in the PSED). Answers were given on a 5-item scale (ranging from strongly agree to strongly disagree). We normalized the average index to make it vary between 0 and 1. A value of one indicates entrepreneurs who strongly believe that their ability will lead to success.

**Instrumentality beliefs**. We measured instrumentality by means of two questions asked in the first wave of the PSED survey. The two questions were measured on a 5-item scale ranging from strongly agree to strongly disagree, and referred to the following statements:

(i) "starting this new business is much more desirable than other career opportunities I have" (question Y4);

(ii) "if I start this new business, it will help me achieve other important goals in my life" (question Y5).

We summed up the answers for both questions and normalized the average index by adjusting the maximum and minimum value for each nascent entrepreneur, so that for every individual the instrumentality index varies between 0 and 1. A value of one represents entrepreneurs who have a strong belief that entrepreneurship will offer great reward.

### 2.4. Dependent variable: Entrepreneurial effort

We chose three different proxies for effort in order to test the robustness of our results and capture in the best way possible the intensity of effort devoted to the new business.

**Subjective effort.** Our first measure of effort captures the perceived capacity of an individual to exert personal effort to start a business. This reflects individuals' perception of the effort they intend to put into venture creation. We used two 5-item scale questions from the PSED survey, with answers ranging from strongly agree to strongly disagree:

(i) "there is no limit as to how long I would give maximum effort to establish this new business" (question Y9);

(ii) "my personal philosophy is to do whatever it takes to establish my own business" (question Y10).

We normalized the average index by adjusting the maximum and minimum value for each nascent entrepreneur, so that for every individual, the effort index varies between 0 (minimal effort) and 1 (maximal effort).

**Work focus.** Our second measure of effort takes into account the time devoted to the business. We used a categorical question that accounts for the actual time spent on the business: "In the past twelve months, since the first interview, have you devoted more than one hundred sixty hours (four weeks of full time work) to this business start-up?" (Question A37: no=0/yes=1).

**Hours devoted to the business.** Our third measure of effort is the most straightforward. It measures the overall number of hours a founder worked for the start-up (question H14: "How many hours in total have you devoted to this new business?").

The three measures provide a clear proxy for what Katz and Gartner (1988) describe as "organizational intentionality," that is, the effort an agent actively puts into seeking information and working towards achieving the goal of creating a new organization.

### 2.5. Control variables

We used several control variables to rule out omitted variable bias. Specifically, one of our measures of effort was based on the time spent on the business. Time devoted to the business might depend on regular working hours in the current job, as part of the time spent on the business might be outside regular working hours. Workers working part-time should have more time to devote to the start-up. Thus, we accounted for the employment status at the time of the creation (part-time/full-time/unemployed/retired). Other variables might influence one's availability such as age, gender, marital status, and household income. Next, we accounted for entrepreneurial and industry experience. We measured entrepreneurial experience by building a dichotomous variable that takes the value of one if respondents declare owning another small business or being self-employed in some other way (question X1 in the PSED). Industry experience was measured by the number of years (if any) spent working in the industry where the nascent venture is expected to operate. We also accounted for different stages in the development of the venture by controlling for the number of years elapsed since the entrepreneur began working on it.[10] We also controlled for a dichotomous variable taking the value of one when the nascent entrepreneur was acting alone when starting the business.

Descriptive statistics for all variables included in the study are presented in Appendix B.

[10] The starting point of a business has been the source of heated debate in the field (for instance, see the exchange between Honig and Samuelson (2015) and Delmar (2015) in Journal of Business Venturing Insights). In this paper, we decided to code organizational activities that occurred before conception point because we were interested in entrepreneurial effort as our outcome variable. Therefore, our variable on the number of years elapsed since the entrepreneur started working on the new business was measured by the difference between the year of interview and the year when the entrepreneur first started thinking about this new business (question A8 in the questionnaire). The mean of this variable is 2.87 with a standard deviation of 4.52, a minimum value of zero and a maximum value of 48.

**2.6. Analytical strategy**

In our hypothesized framework, occupational characteristics influence entrepreneurial effort through instrumentality and effort-performance beliefs. In order to infer mediation, we needed to establish that (i) beliefs (the mediators) are correlated with entrepreneurial effort (the dependent variable), and (ii) occupational characteristics (mediated variables) are correlated with effort.

To examine condition (i), we estimated the following model on the pooled sample:

$$y_i = \theta X_i + u_i \qquad (1)$$

Where $X_i$ represent the matrix of variables of interest: instrumentality, effort-performance and occupation characteristics (self-accomplishment, arduousness and managerial knowledge) as well as control variables: age, gender, marital status, employment status, household income, entrepreneurial and industry experience, and solo-entrepreneurs. $y_i$ is a vector of the dependent variable which in our different robustness specifications can be: work focus (dichotomous variable), hours devoted to the business (continuous variable) and subjective effort (continuous variable). θ represents the matrix of estimated coefficients and $u_i$ is the error term.

We used the probit model when the dependent variable was work focus (dichotomous):

$$\Pr(y_i = 1|X_i) = \Pr(X_i\theta + u_i \geq 0|X_i) = \Pr((X_i\theta \geq -u_i|X_i) = F_{-u}(X_i\theta)$$

Where $F$ is the standard normal cumulative distribution function, $F(X_i\theta)=\Phi(X_i\theta)=\int_{-\infty}^{X_i\theta} \frac{e^{-t^2/2}}{\sqrt{2\pi}} dt$ and where $u_i \sim N(0,1)$.

We used OLS when the dependent variables were linear (subjective effort, hours devoted to the business).

To examine condition (i), we estimated the following model on the pooled sample:

$$\Omega_i = \beta Z_i + u_i \qquad (2)$$

Where Ω is a vector of dependent variable which is effort-performance in model A and instrumentality in model B. $Z_i$ is the matrix of independent variables which includes control variables (age, gender, marital status, employment status, household income, entrepreneurial and industry experience, and solo-entrepreneurs) and also includes managerial knowledge in model A and self-accomplishment, arduousness and managerial knowledge in model B. We use OLS to estimate equation (2).

We were concerned that endogeneity problems might affect the estimation of coefficients for determinants of entrepreneurial effort, and this for several reasons. First, our estimation could suffer from measurement bias because our proxy for effort does not perfectly reflect actual effort invested in the process. There might exist unobserved variables affecting both occupational choice and effort. For instance, some personality traits, such as need for achievement (Collis et al., 2004; Johnson, 1990), might influence career choices as well as entrepreneurial effort. This would lead to the problem of selecting individuals in specific

occupations who would also be more likely to put effort into entrepreneurship, thus raising concerns about endogeneity. We addressed these concerns by using instrumental variables and describe the results of controlling for endogeneity in section 4.5.

In addition, we were particularly attentive to the magnitude of coefficients in our analysis. Not only is statistical significance important to identify the existence of an effect, but the size of the effect is important to identify the most relevant outcome influencing entrepreneurial effort (Davidsson, 2016).[11] However, as Preacher and Kelley (2011) pointed out, mediation analysis does not fit any of the classic effect size measures such as the standardized mean difference (Cohen's d or Hedges' g) or the percentage of variance explained (intraclass correlation, $R^2$, $\eta^2$ or $\omega^2$). Meaningful metrics in this context are standardized regression coefficients (MacKinnon, 2012). Therefore, we provide the results with standardized coefficients to make it possible to compare the size of each coefficient within each of our models. In addition, we report the results with unstandardized coefficients in the appendix.

## 3. Empirical motivation

To compare the characteristics of occupations performed by nascent entrepreneurs and their control group (the entire salaried workforce), we calculated the weighted mean of each index, *i* (self-accomplishment, arduousness and managerial knowledge) by weighting each score associated with an occupation by the total number of employed workers in that occupation:

$$i = \frac{\sum_{j=1}^{n} w_j i_j}{\sum_{j=1}^{n} w_j}$$

Where $w_j$ is the number of employed workers in each 3-digit occupation *j*, and $i_j$ is the normalized index of self-accomplishment, managerial knowledge or arduousness in each occupation *j*.[12] Hence, each index i represents the average score of (a) arduousness, (b) self-accomplishment and (c) managerial knowledge in the population of nascent entrepreneurs and in the population of wage-workers.[13]

Table 1 shows that nascent entrepreneurs work, on average, in occupations that have lower levels of self-accomplishment and higher levels of arduousness than occupations performed by non-entrepreneurs. Table 1 also shows that nascent entrepreneurs, on average, perform occupations that require greater managerial knowledge than non-entrepreneurs. This provides some initial support to the premise that nascent entrepreneurs come from occupations characterized on average by more arduous working conditions, lower self-accomplishment but greater managerial knowledge.

[11] We thank one anonymous reviewer and the Field Editor Karl Wennberg for insisting on this point.
[12] Statistics on the number of employed persons by detailed occupation are provided by the US Bureau of Labor Statistics.
[13] The composition of the workforce of wage-workers is provided by the US Bureau of Labor and the composition of the workforce in terms of occupation in the population of entrepreneurs is provided by the PSED.

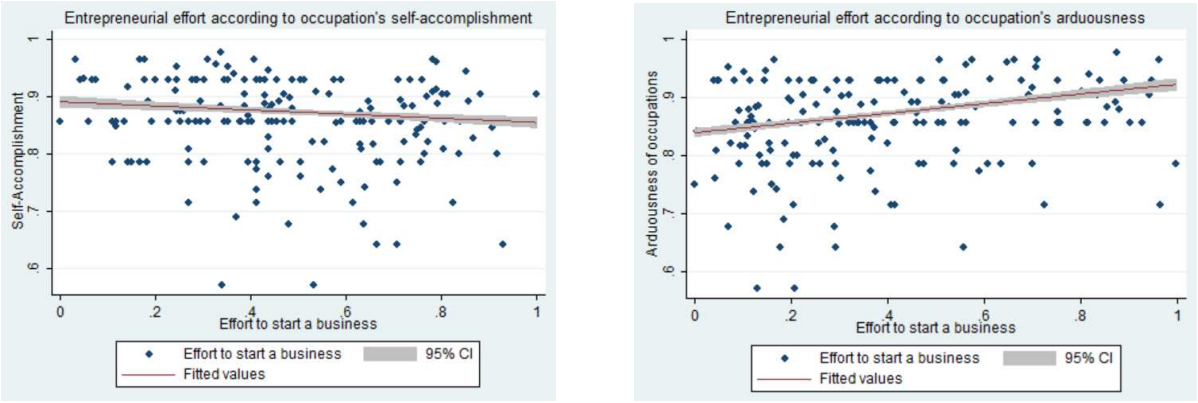
**Table 1. Occupational indexes of paid workers and nascent entrepreneurs**

| | Workforce population | Population of nascent entrepreneurs |
|---|---|---|
| Arduousness | 0.376 | 0.482 [0.243] |
| Self-accomplishment | 0.453 | 0.408 [0.250] |
| Knowledge | 0.458 | 0.511 [0.222] |

Source: Statistics on workforce population come from the US Bureau of Labor. Statistics on nascent entrepreneurs come from the PSED, and O*NET (2006). The indexes are normalized in order to vary between 0 (not important) and 1 (important). Standard errors in brackets.

Finally, we analyzed the correlation between the effort exerted by nascent entrepreneurs and their primary occupational characteristics.[14] We classified occupations according to their arduousness and self-accomplishment index ranging from the lowest to the highest score. We then measured the average score of effort for each occupation in the PSED sample of nascent entrepreneurs, defined by $\bar{\varphi}_j = \frac{1}{N}\sum_{i=1}^{N} m_i$. Where *N* is the total number of nascent entrepreneurs *i* performing occupation *j,* and *m* is the average score of effort exerted by each individual *i* in each occupation *j.* Results are shown in Figure 2.

**Figure 2. Correlation between the characteristics of primary occupations and the effort of nascent entrepreneurs to start a business**




The left-hand panel of Figure 2 shows a negative relationship between the average level of effort reported by nascent entrepreneurs in a given occupation and the average level of self-accomplishment in that occupation. The slope is equal to -0.106 and is significant at the 1% level. When dropping 5% of occupations at both extremes of the self-accomplishment index, the slope increases to -0.118 and is still

[14] The measure of effort used in the Figure corresponds to the index measured with questions Y9 and Y10 (see section 3.3.2)

significant at the 1% level. The slight increase in the slope suggests that the negative relationship between the level of self-accomplishment in an occupation is enhanced by occupations at the extreme, either with high or low self-accomplishment. Conversely, the right-hand panel of Figure 2 shows a positive relationship between the average level of effort reported by nascent entrepreneurs in a given occupation and the level of arduousness associated with that occupation. The slope is equal to 0.089 and is significant at the 1% level. When dropping outliers in the same manner as outlined above for the index of arduousness, the slope goes up to 0.093 and is significant at the 5% level. This increase also reveals that the positive relationship between arduousness in an occupation and average entrepreneurial effort is intensified by occupations with very high and very low levels of arduousness.

Correlations with the main variables of interest are presented in Table 2. Interestingly, we observe a positive correlation between self-accomplishment and managerial knowledge and a negative correlation between self-accomplishment and arduousness. These first descriptive correlations suggest that occupations characterized by greater managerial knowledge and low arduousness offer higher self-accomplishment at work. In addition, the results of the correlation table show a positive correlation between managerial knowledge and effort on the one hand and arduousness and effort on the other hand, but no significant correlation between self-accomplishment and effort. We find a positive correlation between arduousness and instrumentality (the belief that entrepreneurship provides a high marginal reward), lending initial support to Hypothesis 3. We also observe a positive relationship between managerial knowledge and effort-performance beliefs, as stated in Hypothesis 1. Finally, we also find significant positive correlations between entrepreneurial effort and instrumentality beliefs (Hypothesis 5) as well as between entrepreneurial effort and effort-performance beliefs (Hypothesis 4).

**Table 2. Correlations between variables of interest**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| (1) Subjective effort | 1.000 | | | | | | | |
| (2) Total hours | -0.011 | 1.000 | | | | | | |
| (3) Work focus | 0.065 | 0.003 | 1.000 | | | | | |
| (4) Instrumentality | 0.348* | -0.014 | 0.070 | 1.000 | | | | |
| (5) Performance | 0.291* | -0.008 | 0.045 | 0.361 | 1.000 | | | |
| (6) Managerial knowledge index | -0.016 | -0.068 | 0.111* | 0.024 | 0.135* | 1.000 | | |
| (7) Self-accomplishment index | -0.041 | -0.061 | 0.053 | -0.024 | 0.138* | 0.851* | 1.000 | |
| (8) Arduousness index | 0.124* | 0.093* | 0.004 | 0.057 | -0.030 | -0.329* | -0.419* | 1.000 |

Note: stars indicate correlation coefficient significance at 1%.

## 4. Results

### 4.1. Direct effects of occupational characteristics on effort-performance and instrumentality beliefs

This section aims to test the direct relationship between occupational characteristics, and instrumentality and effort-performance beliefs, as predicted by the theoretical model in figure 1 (Hypotheses 1 to 3). Column (1) in Table 3 reports the results for our measure of instrumentality and column (2) for our measure of effort-performance beliefs. Standardized coefficients are provided for our variables of interest when controlling for the full set of individual and firm control variables. Results with and without control variables for unstandardized coefficients are displayed in Appendix C. Most results are robust with respect to the inclusion of controls (see Table C1 in Appendix C).

**Table 3. Effects of occupational characteristics on instrumentality and effort-performance beliefs**

| | (1)<br>Instrumentality | (2)<br>Effort-performance |
|---|---|---|
| Managerial knowledge index | 0.150*** | 0.121*** |
| | (0.0274) | (0.014) |
| Self-accomplishment index | -0.054* | - |
| | (0.028) | - |
| Arduousness index | 0.063*** | - |
| | (0.017) | - |
| Control variables included | Yes | Yes |
| Year dummies | Yes | Yes |
| Income dummies | Yes | Yes |
| Observations | 5,178 | 5,178 |
| R2 | 0.069 | 0.071 |

Columns (1) and (2) show clustered and robust OLS estimates. Robust Standard Errors are in parentheses. ***, **, and * indicate significance at the 1, 5 and 10% levels respectively. Columns (1) and (2) control for age, gender, marital status, employment status, start-up experience, length of involvement in the business, industry experience and solo entrepreneurs. Coefficients are standardized.
See full table in Appendix C (Table C1) with and without controls for unstandardized coefficients.

Results in Table 3, column (2), provide support for Hypothesis 1: there is a positive relationship between managerial knowledge at the occupational level and effort-performance beliefs at the individual level. Workers who acquired managerial knowledge in a previous job might believe that they have the right

skills and abilities to become entrepreneurs. An increase of one standard deviation in our knowledge index is associated with an increase of 0.12 standard deviation in the effort-performance beliefs of the nascent entrepreneurs in the PSED.

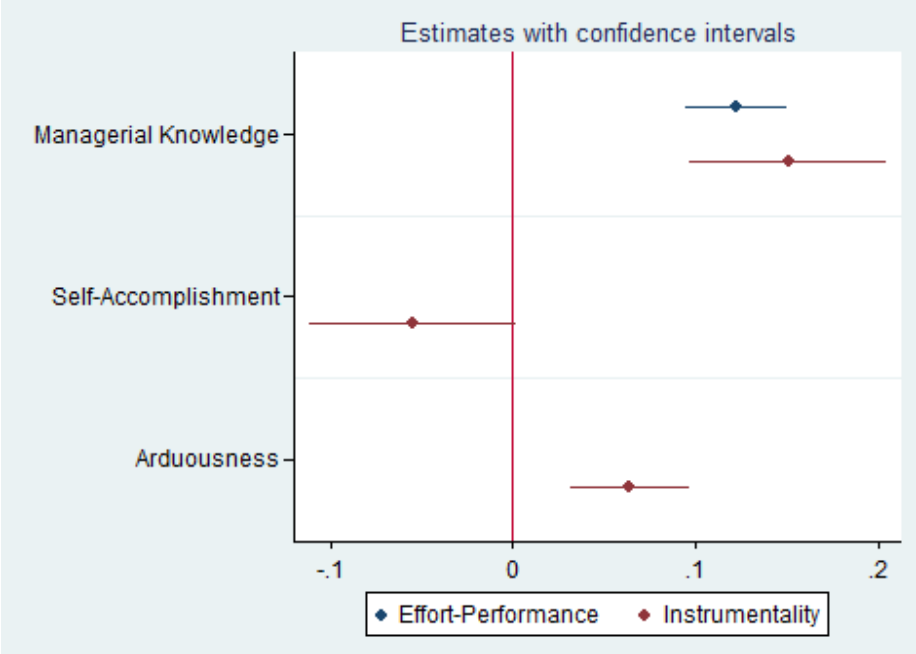
We also find a positive and significant relationship between managerial knowledge acquired on the job and instrumentality beliefs (column (1)). This was not hypothesized in our conceptual framework, but we introduced the variable as a control, since we suspected that managerial knowledge could influence individuals' perceptions of an entrepreneurial career. This result suggests that workers who acquired entrepreneurial and managerial knowledge on the job might believe that applying this knowledge to entrepreneurship is a good way to achieve satisfaction at work. Therefore, managerial knowledge seems to reinforce the belief that entrepreneurship is the best career alternative for achieving work satisfaction and important goals in life.

Table 3, column (1), also shows that self-accomplishment at the occupational level has a negative and significant sign effect on individual instrumentality beliefs, which provides support for Hypothesis 2. Workers experiencing good self-accomplishment at work believe less strongly that the marginal reward of entrepreneurship is high, compared to workers who face lower levels of self-accomplishment in their occupation. An increase of one standard deviation in our self-accomplishment index is associated with a decrease of 0.033 standard deviation in the instrumentality beliefs of the nascent entrepreneurs in the PSED.

Finally, there is a positive and significant relationship between occupational arduousness and instrumentality beliefs, which provides support for Hypothesis 3. This indicates that workers facing bad working conditions might indeed believe more strongly that entrepreneurship offers good potential rewards, compared to workers in occupations offering better working conditions. An increase of one standard deviation in our arduousness index is associated with an increase of 0.064 standard deviation in the instrumentality beliefs of the nascent entrepreneurs in the PSED.

In Figure 3, we report the effect of each occupational characteristic on our two beliefs of interest: instrumentality and effort-performance. Results in Figure 3 show that managerial knowledge is the most important driver of instrumentality and effort-performance. Arduousness is the second largest driver of instrumentality but has no effect on the effort-performance relationship, which is intuitive with respect to our theoretical framework.

**Figure 3. Magnitude of the effect of occupational characteristics on mediating variables**




Note: We turn Table 3 into a graph to present the two models (i) when the dependent variable is effort-performance (blue line), (ii) when the dependent variable is instrumentality (red line), by plotting parallel lines in the x-axis representing coefficients (dots) and their associated confidence intervals (lines) for each independent variable. The red vertical line represents the value zero which helps picturing significant coefficients.

### 4.2. Direct effects of occupational characteristics on entrepreneurial effort

In this section, we examine whether our set of occupational characteristics might have any direct effect on our measures of entrepreneurial effort. Column (1) in Table 4 reports the results for subjective entrepreneurial effort (questions Y9 and Y10 described in section 3.3.2). Column (2) reports the results for the total hours devoted to the new business and column (3) reports the results for a dummy variable taking the value of 1 if the worker reports having spent more than four weeks of full time work on the new startup (we label this variable "work focus").[15]

[15] The regression includes a number of individual- and firm-level control variables. Table 4 only displays the results for our variables of interest. A full description of the results is available in Table C2 in Appendix C.

**Table 4. Direct effects of occupational characteristics on entrepreneurial effort**

| | (1) Subjective effort | (2) Hours devoted to the business | (3) Work focus |
|---|---|---|---|
| Managerial knowledge index | **0.056**** | **0.046*** | **0.318***** |
| | **(0.0152)** | **(293.7)** | **(0.101)** |
| Self-accomplishment index | 0.0265 | -0.011 | -0.095 |
| | (0.0135) | (301.8) | (0.092) |
| Arduousness index | **0.125***** | **0.061***** | **0.182***** |
| | **(0.00930)** | **(206.4)** | **(0.068)** |
| Control variables included | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes |
| Income dummies | Yes | Yes | Yes |
| Observations | 5,124 | 4,716 | 1,959 |
| R2/Pseudo R2 (column 3) | 0.084 | 0.107 | 0.046 |

Columns (1) to (3) estimate effort with clustered and robust OLS estimates. Column (3) reports estimates from a clustered and robust probit regression. Robust Standard Errors are in parentheses. Column (1), (2) and (3) control for age, gender, marital status, employment status, start-up experience, length of involvement in the business, industry experience and solo entrepreneurs. Coefficients are standardized in columns (1), (2) and (3) and column (3) reports marginal effects.
***, **, and * indicate significance at the 1, 5 and 10% levels respectively.
See full table in Appendix C (Table C2) with and without controls for unstandardized coefficients.

In every column, we find a significant positive relationship between occupation-level managerial knowledge and individual-level entrepreneurial effort. Individuals who have worked in occupations that score high in managerial knowledge report putting more effort into starting a business than others. Thus, it seems that acquiring managerial knowledge on the job might act as a pull factor towards entrepreneurship.

We also observe a positive and significant relationship between occupational arduousness and entrepreneurial effort. Individuals facing high levels of arduousness at work are more willing to put positive effort into starting a business (column (1)), devote more time to starting a business (column (2)), and consider starting this business as a major work focus (column (3)).

However, we do not find any significant direct relationship between self-accomplishment at the occupational level and individual entrepreneurial effort. This seems to suggest that workers who are willing to start a business while being employed in a comfortable occupation might start a business anyway, even if their occupation offers good conditions in terms of self-accomplishment.

In order to analyze the magnitude of each effect, we compared the standardized coefficient for each dependent variable (subjective effort, work focus and hours devoted to the business). We reported the coefficients in Figure 4. This Figure shows that arduousness is the most important direct driver of entrepreneurial effort (except when it is measured by work focus). The second most important driver is managerial knowledge in determining subjective effort and hours devoted to the business. Thus, both occupational push and pull factors towards entrepreneurship are important drivers of entrepreneurial effort.

**Figure 4. Magnitude of the effect of occupational characteristics on effort**


Note: We turn Table 4 into a graph to visualize the size of coefficients. We present our three models for (i) subjective effort (top panel), (ii) work focus (middle panel), and (iii) hours devoted to the business (bottom panel), respectively, by plotting parallel lines on the x-axis representing coefficients (dots) and their associated confidence intervals for each independent variable. The red vertical line represents the value zero which helps picturing significant coefficients.

In the next section, we examine indirect effects in order to clarify these findings and further test our theoretical model.

### 4.3. Indirect effects of occupational characteristics on entrepreneurial effort

Above and beyond any direct effect, we have argued that occupational characteristics influence entrepreneurial effort through their effects on effort-performance and instrumentality beliefs (see Figure 1). That is, occupational characteristics might shape one's expectancies about entrepreneurship, which in turn should influence entrepreneurial effort. Hence, expectancies (effort-performance and instrumentality beliefs) might act as mediators, transferring the influence of occupational characteristics to effort.

In order to infer mediation between occupational characteristics and effort, three conditions need to be fulfilled (Baron and Kenny, 1986):

(i) Occupational characteristics should be correlated with expectancies, i.e., instrumentality and effort-performance beliefs (mediators).

(ii) Occupational characteristics should be correlated with entrepreneurial effort.

(iii) Occupational characteristics should be less correlated with entrepreneurial effort when expectancies are controlled for.

Condition (i) is verified in Table 3, namely, self-accomplishment and arduousness affect instrumentality, whereas managerial knowledge is positively correlated with effort-performance beliefs, as predicted in Hypotheses 1 to 3. Condition (2) is verified in Table 4 for managerial knowledge and arduousness. In order to infer mediation, we need to test the validity of condition (iii). Keeping our different measures of entrepreneurial effort, we provide such a test using effort-performance beliefs and instrumentality as mediators in Table 5.

Hypothesis 4 is supported in Table 5: effort-performance beliefs have a positive and significant effect on all three measures of entrepreneurial effort retained in this study. Thus, individuals who believe that they have the right skills and abilities to achieve a satisfactory level of performance in an entrepreneurial career tend to put greater effort in the entrepreneurial process. An increase of one standard deviation in effort-performance beliefs is associated with an increase of 0.038 standard deviation of hours devoted to the nascent business.

In addition, results in Table 5 support condition (iii) for effort-performance beliefs. The coefficients associated with occupational characteristics are lower when controlling for effort-performance beliefs. In particular, the coefficient associated with managerial knowledge becomes insignificant for two (out of three)

measures of entrepreneurial effort. Thus, our results suggest (at least) partial mediation: as predicted in our theoretical model (Figure 1), effort-performance beliefs mediate the effect of occupation-level managerial knowledge on entrepreneurial effort.

Further, our results lend support to Hypothesis 5: instrumentality beliefs also have a positive and significant correlation with all three measures of entrepreneurial effort retained in the study. This corroborates the idea that individuals who see entrepreneurship as a career alternative with best marginal rewards tend to put more effort in the entrepreneurial process than others. An increase of one standard deviation in instrumentality beliefs is associated with an increase of 0.057 standard deviation of hours devoted to the nascent business.

Results in Table 5 also offer some support to condition (iii) for instrumentality beliefs, but not as expected in our theoretical model (Figure 1). The coefficients associated with occupational characteristics tend to be smaller when controlling for instrumentality beliefs, but the coefficient associated with managerial knowledge is again the only one to become insignificant after the inclusion of the mediator variable. The effects of occupational arduousness and self-accomplishment do not seem to be significantly affected by the inclusion of instrumentality beliefs as a mediator variable. This indicates that the direct effect of occupational arduousness on individual entrepreneurial effort is not (or at least not fully) mediated by instrumentality beliefs.

Finally, when analyzing the magnitude of the coefficients, results in Table 5 show that instrumentality has a higher correlation with effort than effort-performance, which is similar to the results obtained in Renko et al. (2012). In order to differentiate the magnitude of each effect we measured the indirect effect of each occupational characteristic as well as the ratio of relative magnitude for each mediating variable, as presented in the following section.

**Table 5. Effect of occupational characteristics on entrepreneurial effort with mediator variables**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Subjective Effort | | | Total Hours | | | Work Focus | | |
| *Mediator Variable* | | | | | | | | | |
| Instrumentality | 0.286*** | 0.291*** | 0.294*** | 0.044*** | 0.057*** | 0.049*** | 0.131* | 0.168** | 0.253*** |
| | (0.0112) | (0.0126) | (0.0132) | (204.7) | (216.3) | (222.2) | (0.069) | (0.085) | (0.098) |
| Effort-performance | 0.155*** | 0.173*** | 0.157*** | 0.070*** | 0.046*** | 0.021** | 0.092 | 0.142* | 0.163* |
| | (0.00998) | (0.0112) | (0.0119) | (155.3) | (154.0) | (153.8) | (0.067) | (0.085) | (0.094) |
| *Instrument Variables* | | | | | | | | | |
| Knowledge index | | -0.0225 | 0.006 | | 0.012 | 0.036 | | 0.272*** | 0.217* |
| | | (0.0131) | (0.0135) | | (296.4) | (300.2) | | (0.103) | (0.112) |
| Self-accomplishment index | | 0.007 | 0.020 | | 0.035 | -0.008 | | 0.049 | -0.039 |
| | | (0.0113) | (0.0120) | | (295.8) | (302.2) | | (0.092) | (0.101) |
| Painfulness index | | 0.114*** | 0.113*** | | 0.064*** | 0.060*** | | 0.207*** | 0.186** |
| | | (0.00707) | (0.00825) | | (194.5) | (205.0) | | (0.067) | (0.074) |
| Control variables included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | No | No | Yes | No | No | Yes | No | No | Yes |
| Income dummies | No | No | Yes | No | No | Yes | No | No | Yes |
| Observations | 7,212 | 5,574 | 5,124 | 6,564 | 5,094 | 4,716 | 2,770 | 2,159 | 1,959 |
| R2 | 0.138 | 0.164 | 0.208 | 0.009 | 0.012 | 0.111 | 0.006 | 0.029 | 0.061 |

Columns (1) to (6) estimate effort with clustered and robust OLS estimates. Columns (7) to (9) report estimates from a clustered and robust probit regression. Robust Standard Errors are in parentheses. All columns control for age, gender, marital status, employment status, start-up experience, length of involvement in the business, industry experience and solo entrepreneurs. Coefficients are standardized in columns (1) to (6) and columns (7) to (9) report marginal effects.

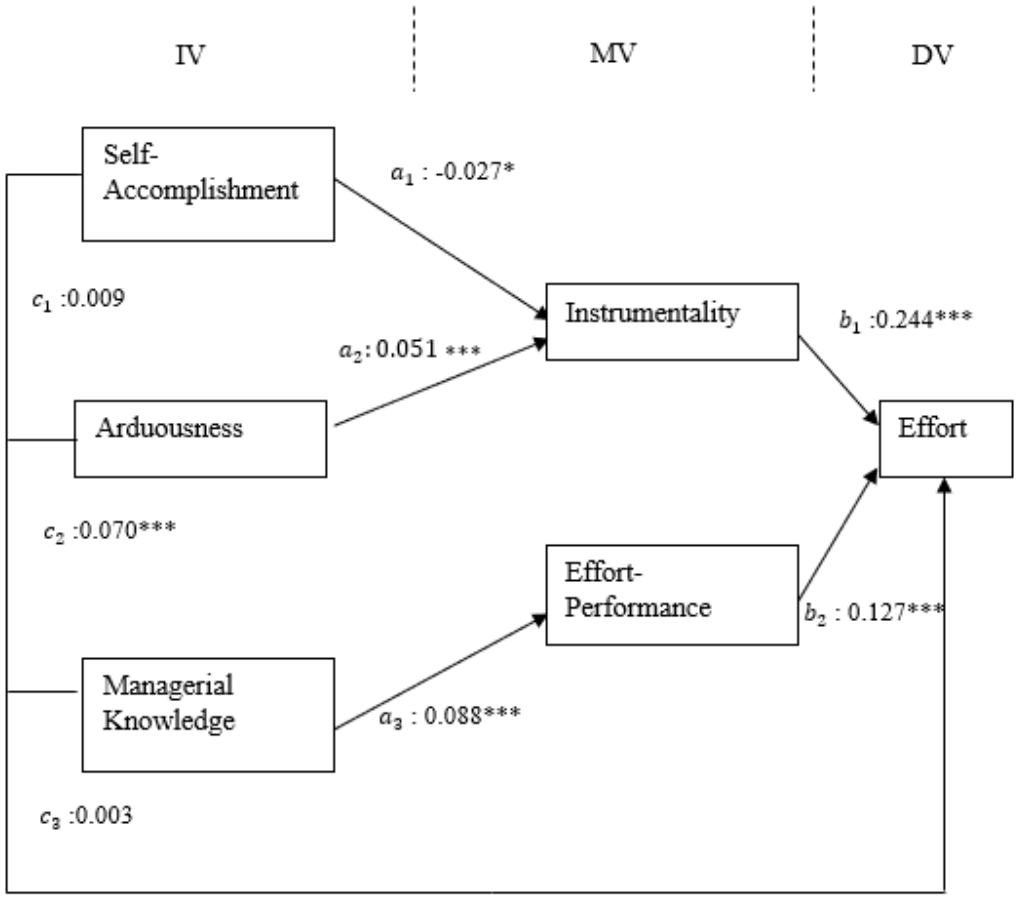
***, **, and * indicate significance at the 1, 5 and 10% levels respectively.

See full table in Appendix C (Table C3) for unstandardized coefficients.

### 4.4. Magnitude of the indirect effect

Which occupational characteristic is the most important indirect driver of entrepreneurial effort? In order to further analyze the magnitude of these results, we calculated the coefficient of the indirect effect associated with each independent variable of interest (Preacher and Kelley, 2012). Figure 5 reports the different relationships in our setting, which has three independent variables of interest and two mediators.

**Figure 5. Mediating relationship between occupational characteristics and expectancies**




Note: Figure 5 reports the coefficients obtained from seemingly unrelated regression coefficients with bootstrapped standard errors, when effort is measured by our subjective measure of effort.

In this figure, a's coefficients represent the regression coefficient for the independent variable (IV) when the mediating variable (MV) is the dependent variable, whereas b's coefficients represent the coefficient when the dependent variable is regressed on MV and IV. Because our independent variables

and mediating variables in this Figure are normalized to vary between 0 and 1, we can directly compare the size of coefficients and analyze the magnitude of the direct effects.

In order to identify which occupational characteristic is mediated more strongly by expectancies, we calculated indirect effects, measured by the product term ab. Table 6 reports the indirect coefficients for each mediating variable. When comparing the results associated with each occupational characteristic, we observe that managerial knowledge contributes the most to the indirect effect (0.096 when the MV is instrumentality and 0.088 when the MV is effort-performance). Instrumentality is the mediating variable that contributes the most to entrepreneurial effort (the direct coefficient of instrumentality is larger than the coefficient associated with effort-performance). Arduousness has the strongest indirect effect on entrepreneurial effort (Table 6) and is the only variable with a significant direct effect on entrepreneurial effort (Figure 5).

**Table 6. Magnitude of the indirect effects**

| | Formula | Coef. | Std. Dev. |
|---|---|---|---|
| Self-accomplishment | a1*b1 | -0.007* | [0.004] |
| Managerial knowledge | a3*b2 | 0.011*** | [0.001] |
| Arduousness | a2*b1 | 0.012*** | [0.002] |
| Indirect via Instrumentality | b1\|(a1+a2)\| | 0.019*** | [0.004] |
| Indirect via Effort-performance | b2\|(a3)\| | 0.011*** | [0.001] |
| Total indirect | b1\|(a1+a2)\|+b2\|(a3)\| | 0.017*** | [0.004] |

Note: Table 6 reports the results when the dependent variable is the subjective measure of effort. Bootstrapped standard errors are reported in brackets. The results are similar when using other dependent variables (work focus and number of hours devoted to the business). The results are available upon request.

The last line in Table 6 reports the coefficient for the total indirect effect of each mediating variable. The relative magnitude, i.e. the ratio between the indirect effect and the direct effect for the three occupational characteristics is quite large (34% for self-accomplishment, 80% for arduousness and 15% for managerial knowledge)[16]. Thus 80% of the total effect of arduousness is mediated by effort-performance. In contrast, the relative magnitude of the indirect effect of managerial knowledge on the total effect is smaller than that of self-accomplishment or arduousness (34%).

### 4.5. Dealing with endogeneity

A cause for concern with our estimations was that simultaneity problems, measurement errors and/or omitted variable bias could affect our results. Indeed, some personal characteristics might explain occupational choice and thus the characteristics of some occupation (managerial knowledge, arduousness

[16] 0.003/(0.017+0.003) for managerial knowledge, 0.070/(0.070+0.017) for arduousness and 0.009/(0.017+0.009) for self-accomplishment

and self-accomplishment) as well as individual stamina and the subsequent effort put into the venture emergence process. We addressed these concerns using instrumental variables, i.e., a set of exogenous variables that explain occupational choice but not entrepreneurial effort other than through occupations themselves. We used a set of exogenous instruments that explain occupational choice but not effort. However, finding such instruments was not an easy task and although we consider our assumptions plausible to explain occupational characteristics, it is possible that they might not be totally exogenous. Therefore, we do not want to overly stress the results from these estimations and consider them as robustness tests, even though the different tests corroborate the validity of our instruments.

We defined four specific instruments in order to have an over-identified equation that allows us to test the validity of our instruments.[17] The main predictors of occupational choice are education and experience. Therefore, we used 3 variables which capture education and experience: human capital (measured by the highest level of education completed by nascent entrepreneurs), managerial and supervisory responsibilities (measured by question H21 in the PSED survey), and number of years of full-time paid work experience. These were our first three instruments. Finally, as a determinant of occupational choice we used the occupation's employment outlook as our fourth instrument.[18]

Although we are confident about the correlation between our instruments and occupational choice, one can argue that education and experience may also be important drivers of effort in entrepreneurship, which would invalidate our instruments (e.g. Witte et al. (2014) outline a negative relationship between the employability prospects of an occupation and the self-employment rate). In order to test the validity of our instruments, Table 7 provides relevant post-estimation test results when using our instruments. There are two conditions for an instrument to work well. First, it must be valid: the instrument must be uncorrelated with the error term. Second, it must be powerful: the instrument must be correlated with the endogenous variable.[19]

**Table 7. Exogeneity test of IV**

| | Dependent variable | Subjective effort | | Hours devoted to the business | | Active work towards business creation | |
|---|---|---|---|---|---|---|---|
| Test | | Stat | pval. | Stat | pval. | Stat | pval. |
| Under-identification | Kleibergen-paap rk LM | 47.39 | 0.000 | 88.513 | 0.000 | 46.78 | 0.000 |
| Over-identification | Hansen J stat | 1.962 | 0.1613 | 7.255 | 0.070 | 0.017 | 0.991 |
| Endogeneity | C-test | 52.041 | 0.000 | 3.064 | 0.3818 | 2.530 | 0.470 |

[17] Our model accounts for three endogenous regressors captured by our three occupational characteristics. In order to test the validity of our instruments we needed an over-identified equation with at least four specific instruments. Our instruments had to be correlated with occupational characteristics but not with effort (other than through occupations).
[18] We define employment outlook as the percentage of employment change over the period 2002-2012, provided by the US Bureau of Labor Statistics.
[19] We use the Kleibergen-Paap rk stat because we do not assume i.i.d errors. The rk and F-test of joint significance of instruments in the first-stage regression reveal that our instruments are sufficiently strong.

Source: *PSED*, O*NET; period: 2006. Excluded instruments: employment outlook, work experience, managerial experience, education.

The first line tests the instruments' power. The second line analyzes the instruments' validity and the last line tests for the need to use instrumental variable regressions (C-test for the exogeneity of one or more regressors). Tests are conducted on different dependent variables: subjective effort (column (1)), hours devoted to the business (column (2)), and work focus (column (3)). Whatever the dependent variable, our instruments validate both conditions: (i) our instruments are orthogonal to the error term, and (ii) our instruments are sufficiently strong.

**Table 7. Testing of instrumental variables (IV): Impact of occupational characteristics on subjective effort**

| *Dependent variable:* Subjective Effort | (1) | (2) |
|---|---|---|
| *Variables of interest* | | |
| Knowledge index | 0.567*** | 0.568*** |
| | (0.102) | (0.102) |
| Self-accomplishment index | -0.366*** | -0.394*** |
| | (0.0883) | (0.0917) |
| Arduousness index | 0.315*** | 0.241*** |
| | (0.0517) | (0.0432) |
| *Control variables* | Yes | Yes |
| Year dummies | Yes | Yes |
| Income dummies | No | Yes |
| Observation | 5,514 | 5,124 |

Note: Robust standard errors are in parentheses. Full table available in Appendix D. Column (1) controls for age, gender, marital status, employment status. Column (2) controls for age, gender, marital status, employment status, start-up experience, industry experience, length of involvement, solo entrepreneurs.

However, the C-test of exogeneity is unable to accept the exogeneity assumption in column (1) but accepts it in columns (2) and (3). In other words, the IV model is legitimate when the dependent variable is subjective effort but not when it is a more objective measure of effort (work focus and hours devoted to the business). We therefore report in Table D1 the results associated with subjective effort, calculated using

2SLS estimators. The results when controlling for endogeneity do not alter our conclusions: occupational characteristics are important determinants of effort.[20]

## 5. Discussion

The choice to become an entrepreneur is usually seen as driven by the identification of a good business opportunity, or by necessity due to lack of employment options (Reynolds et al., 2002). Entrepreneurship, however, can still be perceived as a potential career choice even if neither a specific opportunity, nor a necessity are present (Folta et al., 2010; Raffiee and Feng, 2014).[21] In such case, one's current or previous occupation is most likely to be a key factor influencing the decision to quit wage employment and enter entrepreneurship (Katz, 1992; Lee et al., 2011).

Descriptive data on entrepreneurial entry suggest that occupations play a significant role in the decision to become an entrepreneur, but relatively little empirical research has investigated the effects of specific occupational characteristics on the decision and on the process of starting a new venture (Berkhout et al., 2016; Shane, 2008; Witte et al., 2014). We set out to investigate such effects, focusing on three occupational characteristics: managerial knowledge, self-accomplishment, and arduousness. Drawing upon expectancy theory, we propose a theoretical model in which occupation-level characteristics affect individual-level cognition, influencing effort-performance and instrumentality beliefs. Such beliefs, in turn, affect behavior, translating into entrepreneurial effort. Figure 1 summarizes our theoretical model and Table 8 below summarizes the results with respect to our hypotheses.

**Table 8. Summary of findings**

| Hypothesized relationship | Results |
|---|---|
| H1: Managerial knowledge → ↑ Effort-performance beliefs | Supported |
| H2: Self-accomplishment → ↓ Instrumentality beliefs | Supported |
| H3: Arduousness → ↑ Instrumentality beliefs | Supported |
| H4: Effort-performance beliefs → ↑ Effort to start a business | Supported |
| H5: Instrumentality beliefs → ↑ Effort to start a business | Supported |

[20] Although we do not need to apply IV to the other two dependent variables, applying it does not change the main conclusion of the article. The results of IV regressions are available upon request.

[21] Their work suggest that many individuals engage in entrepreneurship without any identification of a clear business opportunity while being in stable paid employment. Moreover, when looking at PSED data, 37.15% of US nascent entrepreneurs started their businesses because they had a business idea. For 62.19% of nascent entrepreneurs, the decision to start a business came before the business idea or the two arose together.

In addition to these hypothesized relationships, we also found that occupation-level managerial knowledge positively affects instrumentality beliefs, whereas occupational arduousness has a direct effect on the effort applied to starting a business, which is only partially mediated by instrumentality beliefs. We integrate these unexpected findings in our discussion below, in order to stimulate further research on the relationship between occupations and entrepreneurship.

### 5.1. Theoretical contributions

Taken together, these findings provide substantial evidence that occupational characteristics such as managerial knowledge, self-accomplishment, and arduousness can operate as pull and/or push factors towards entrepreneurship. We suggest that such influence occurs at the cognitive level through effort-performance and instrumentality beliefs. Hence, occupations providing workers with managerial knowledge foster effort-performance beliefs (Hypothesis 1), generating expectancies that current abilities are well suited to and will yield high performance in entrepreneurship. In addition, managerial knowledge also seems to foster instrumentality beliefs, increasing the attractiveness of an entrepreneurial career. High levels of managerial knowledge in an occupation thus constitute a factor pulling workers towards entrepreneurship through these expectancies. Our results suggest that its effect on entrepreneurial effort is fully mediated by effort-performance and instrumentality beliefs.

In addition, starting a business can clearly be a way to escape a negative work situation. Our results show that arduousness and lack of self-accomplishment are two occupational characteristics pushing workers towards entrepreneurship. Both factors foster instrumentality beliefs (Hypotheses 2 and 3). In turn, instrumentality beliefs affect entrepreneurial effort, fully mediating the effects of occupational self-accomplishment and partially mediating the effects of arduousness. Indeed, we found that occupational arduousness has a direct effect on entrepreneurial effort, above and beyond the indirect effect mediated by instrumentality beliefs.

Thus, although further research could test the robustness of these findings and explore alternative measures, these results provide significant empirical support for the idea that push factors are important determinants of entrepreneurial effort, not only for unemployed individuals (as research on necessity-based entrepreneurship has shown), but also for those in occupations providing unpleasant working conditions (low levels of personal accomplishment, high levels of arduousness). These "uncomfortable workers" become "unshackled entrepreneurs" and devote more effort to starting a business. They are also more likely to stay committed to the entrepreneurial process and to see their new ventures emerge.[22]

[22] In further analyses not shown here we investigated the effects of effort on new venture emergence and found a consistent and significant effect on several indicators of a successful venture creation process. Such results are available upon request.

We believe that our study contributes to research on the role of work experience in entrepreneurial decisions, motivations and intentionality. A large body of literature has examined the effects of previous work experience on entrepreneurial entry (e.g., Berkhout et al., 2016; Burke et al., 2008; Burton et al., 2016; Campbell, 2013; Chatterji et al., 2016; Folta et al., 2010; Nanda and Sørensen, 2010), but a systematic assessment of occupational characteristics likely to foster effort was lacking. Our study provides one first assessment within the theoretical framework of expectancy theory. The originality of this study resides not only in the choice of occupational variables and on its focus on entrepreneurial effort, but also in its ability to directly observe the mechanisms—instrumentality and effort-performance beliefs—predicted by the theory.

Our study also provides a potential explanation for the concentration of entrepreneurs on both ends of the "ability scale", either high or low ability types (Astebro and Chen, 2014). Theoretical support for this evidence relates to earning compensations (Joona and Wadensjö, 2013), corresponding quality in the labor market (Astebro et al., 2011), and the small firm effect (Chen, 2012; Elfenbein et al., 2010; Tag et al., 2016). But our results suggest that occupational characteristics may also influence bimodal entry patterns. On the one hand, high ability types with good managerial knowledge in their work are pulled to entrepreneurship due to high effort-performance expectations. On the other hand, low ability types facing bad working conditions might be pushed to entrepreneurship due to poor self-accomplishment and arduousness at work.

Finally, we also contribute to literature on the antecedents of entrepreneurial intentions (e.g., Kolvereid, 1996; Krueger et al., 2000; Lee et al., 2011) and motivations (e.g., Carter et al., 2003; Shane et al., 2003), by focusing on occupational characteristics as an important determinant of entrepreneurial action and effort. Indeed, effort is likely to be the missing link between intentions and actions (Carsrud and Brännback, 2011; Edelman et al., 2010). By focusing on entrepreneurial effort and by pooling together individual and occupational variables, our study goes beyond self-reported intentions. By articulating data from different sources and periods of time, our study overcomes limitations associated with common method biases that are frequent in research on entrepreneurial intentions. In addition, our study minimizes the person-centric bias that is also common in this literature, thereby contributing to offer a more nuanced view on the intentionality and motivations of nascent entrepreneurs.

### 5.2. Limitations and further research

Our study is not without limitations. Although our results are robust with respect to endogeneity tests, we interpret the findings on the relationships between occupational characteristics, cognitive factors and entrepreneurial behavior more as an informative correlation than as evidence of causality. In a further extension of our work, our model could be extended to investigate the influence of occupational characteristics on effort over time. In this study, due to data constraints, the correlation between occupational characteristics and our measure of subjective effort does not change over time. However, occupational

characteristics may have a different impact on effort over time, as individuals may adapt to their occupation or be able to find compensation for arduousness by receiving higher wages, for example. They may also get a clearer picture of the difficulty of starting a business. Oosterbeek et al. (2010), for example, showed that students enrolled in entrepreneurship training programs are significantly less motivated to start a business than those outside such programs because they may have obtained a more realistic perspective of the difficulties of becoming a successful entrepreneur.

Our inferences about the mediating role of effort-performance and instrumentality beliefs are also limited by the availability of measures in the PSED data. We have retained measures that visibly reflect, at least to some extent, the concepts of effort-performance and instrumentality beliefs. But despite their face validity, they might not entirely capture these concepts. We acknowledge that these questions were not initially formulated in an attempt to test expectancy theory. Hence, further research could use more comprehensive measures in order to test the robustness of the mediation effects.

In addition, although our study controls for multiple business owners, it does not take into account the occupational characteristics of other members of the entrepreneurial team. The role of occupational characteristics is likely to be altered when team dynamics are considered, since efforts among team members are likely to be heterogeneous (Hoogendoorn et al., 2013; Hoogendoorn and Van Praag, 2012). Analyzing the complexity of the effort dynamics of a start-up team was beyond the scope of our study, but it certainly constitutes a promising research area.

Finally, although our findings provide consistent support for using expectancy theory to explain why "uncomfortable workers" become "unshackled entrepreneurs", the fact is that entrepreneurship is not their only alternative. Depending on their skill sets, workers might be more or less able to shift to different employers and even to different occupations. Further research examining the effect of occupational characteristics on entrepreneurial entry might benefit from a more systematic examination of mobility within and between occupations, which were beyond the scope of our data.

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## APPENDIX A: Data Description

### A1- O*NET files

There are several files in the O*NET data that account for different aspects of work context (e.g. work value, work environment, work activity). We selected four specific files in the O*NET data to capture occupational characteristics:

**Work Value Data.** The first file provides information on work values. The record brings information on the extent to which (or point along a continuum ranging from 1 to 7) an occupation fulfills a range of specific needs that are important for achieving satisfaction. The Occupational Reinforcer Patterns (ORPs) that are developed in the survey are based on the Theory of Work Adjustment (Dawis and Lofquist, 1984) that varies from independence, achievement, recognition to financial compensation.

**Occupational Interest Data.** The second file presents the work environments of occupations. Occupational Interest Profiles (OIPs) developed in this file are compatible with Holland's (1997) model of personality types and work environments. We were particularly interested in the enterprising environment of occupations, i.e. occupations that frequently involve starting up and carrying out projects that can involve leading people and making many decisions.

**Context Data.** The third file analyzes work context, i.e. physical and social factors that influence the nature of work in terms of human interaction processes, body positioning and environmental conditions of the occupation.

**Knowledge Data.** Finally, the last file provides information on the knowledge required to perform the occupation that ranges from business and management to mathematics and science.

## APPENDIX B: Descriptive Statistics

**Table B1. Descriptive Statistics**

| | Mean | S.D |
|---|---|---|
| ***Dependent variables*** | | |
| Subjective effort | 0.838 | 0.149 |
| Total hours | 1185.7 | 2561.9 |
| Work focus | 0.629 | - |
| Instrumentality | 0.881 | 0.114 |
| Performance | 0.878 | 0.153 |
| ***Variables of interest*** | | |
| Knowledge index | 0.571 | 0.223 |
| Self-accomplishment index | 0.556 | 0.262 |
| Painfulness index | 0.361 | 0.206 |
| ***Control variables*** | | |
| Age | 47.49 | 10.70 |
| Sex (male) | 0.613 | - |
| *Marital status* | | |
| Married | 0.401 | - |
| Living as married | 0.031 | - |
| Single | 0.303 | - |
| Divorced | 0.191 | - |
| Separated | 0.035 | - |
| Widowed | 0.037 | - |
| *Employment status* | | |
| Full-time | 0.571 | - |
| Part-time | 0.151 | - |
| Retired | 0.082 | - |
| Not employed | 0.195 | - |
| Start-up experience | 0.286 | - |
| Length of involvement | 3.144 | 4.799 |
| Industry experience | 10.031 | 11.713 |
| ***Instruments*** | | |
| Highest level of education | 5.743 | 5.627 |

| | | |
|---|---|---|
| Managerial experience | 10.549 | 10.416 |
| Total employment experience | 22.014 | 14.852 |
| Employment outlook | 14.281 | 6.762 |

Note: Descriptive statistics on the pooled sample. Variables without s.d. are interpreted as percentage shares.

## APPENDIX C: Empirical Results

**Table C1. Role of occupational characteristics in instrumentality and effort-performance beliefs**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | Instrumentality | | | Performance | |
| *Variable of interest* | | | | | | |
| Knowledge index | 0.114*** | 0.0996*** | 0.100*** | 0.0937*** | 0.0893*** | 0.0847*** |
| | (0.0175) | (0.0172) | (0.0183) | (0.00903) | (0.00916) | (0.00978) |
| Self-accomplishment index | -0.0859*** | -0.0531*** | -0.0313* | - | - | - |
| | (0.0157) | (0.0156) | (0.0165) | - | - | - |
| Painfulness index | 0.0364*** | 0.0495*** | 0.0470*** | - | - | - |
| | (0.0109) | (0.0119) | (0.0123) | - | - | - |
| *Control Variables* | | | | | | |
| Age | | -0.000763*** | -0.00199*** | | -0.000311 | -0.00136*** |
| | | (0.000237) | (0.000431) | | (0.000199) | (0.000285) |
| Sex(male=ref) | | -0.0230*** | -0.0243*** | | -0.00257 | -0.00711 |
| | | (0.00477) | (0.00482) | | (0.00450) | (0.00476) |
| *Marital Status* | | | | | | |
| Married (ref) | | | | | | |
| Living as married | | 0.00775 | -0.00223 | | 0.0340*** | 0.0282*** |
| | | (0.0107) | (0.0122) | | (0.00915) | (0.00932) |
| Single | | 0.0286*** | 0.0173*** | | -0.0108* | -0.0159** |
| | | (0.00536) | (0.00581) | | (0.00564) | (0.00619) |
| Divorced | | 0.0231*** | 0.00542 | | 0.000629 | -0.00987 |
| | | (0.00594) | (0.00619) | | (0.00618) | (0.00651) |
| Separated | | 0.0622*** | 0.0419*** | | 0.0288*** | 0.00270 |
| | | (0.00879) | (0.0101) | | (0.00977) | (0.0112) |
| Widowed | | -0.0151 | -0.0408*** | | -0.0108 | -0.0212** |
| | | (0.0145) | (0.0151) | | (0.0106) | (0.0108) |
| *Employment Status* | | | | | | |
| Full-time (ref) | | | | | | |
| Part-time | | -0.0254*** | -0.0330*** | | -0.0191*** | -0.0223*** |
| | | (0.00687) | (0.00713) | | (0.00677) | (0.00686) |
| Retired | | -0.0352*** | -0.0444*** | | -0.0138** | -0.00702 |
| | | (0.00710) | (0.00735) | | (0.00633) | (0.00674) |
| Not employed | | -0.00829 | -0.0182*** | | -0.0313*** | -0.0276*** |
| | | (0.00607) | (0.00638) | | (0.00627) | (0.00602) |
| Start-up experience | | | 0.00897* | | | 0.0222*** |
| | | | (0.00488) | | | (0.00463) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Length of involvement | | | -0.00121*** | | | 0.000354 |
| | | | (0.000437) | | | (0.000437) |
| Industry experience | | | 0.00134*** | | | 0.00198*** |
| | | | (0.000206) | | | (0.000206) |
| Solo Entrepreneurs | | | -0.00890*** | | | -0.0119*** |
| | | | (0.00257) | | | (0.00272) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Income dummies | No | No | Yes | No | No | Yes |
| Observation | 5,634 | 5,574 | 5,178 | 5,634 | 5,574 | 5,178 |
| R2 | 0.011 | 0.033 | 0.069 | 0.011 | 0.033 | 0.071 |

**Table C2: Direct effects of occupational characteristics on entrepreneurial effort**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Subjective effort | | | Number of hours devoted to the business | | | Active work towards business creation | | |
| *Variables of interest* | | | | | | | | | |
| Knowledge index | 0.0181 | 0.0140 | 0.0329** | 333.4 | 200.5 | 506.2* | 0.933*** | 0.931*** | 0.837*** |
| | (0.0140) | (0.0141) | (0.0152) | (289.9) | (292.7) | (293.7) | (0.245) | (0.254) | (0.267) |
| Self-accomplishment index | -0.00280 | 0.00562 | 0.00802 | 237.9 | 235.6 | -107.0 | 0.00569 | -0.126 | -0.251 |
| | (0.0124) | (0.0128) | (0.0135) | (288.8) | (297.3) | (301.8) | (0.218) | (0.230) | (0.244) |
| Painfulness index | 0.0754*** | 0.0797*** | 0.0812*** | 810.2*** | 652.5*** | 740.2*** | 0.596*** | 0.486*** | 0.480*** |
| | (0.00768) | (0.00872) | (0.00930) | (196.4) | (208.0) | (206.4) | (0.160) | (0.173) | (0.179) |
| *Control variables* | | | | | | | | | |
| Age | | 0.000226* | 0.000163 | | 1.301 | -4.832* | | 0.00189 | 0.00734** |
| | | (0.000131) | (0.000187) | | (1.878) | (2.606) | | (0.00242) | (0.00364) |
| Sex (male=ref) | | -0.00896** | -0.00951** | | 109.4 | 85.82 | | 0.0652 | 0.0675 |
| | | (0.00377) | (0.00414) | | (75.94) | (73.09) | | (0.0671) | (0.0739) |
| *Marital status* | | | | | | | | | |
| Married (ref) | | | | | | | | | |
| Living as married | | 0.0335*** | 0.0162* | | 509.4* | 499.4* | | -0.115 | -0.112 |
| | | (0.00736) | (0.00905) | | (270.9) | (283.0) | | (0.140) | (0.149) |
| Single | | 0.00991** | 0.0108** | | 193.9** | 29.62 | | -0.0573 | 0.0229 |
| | | (0.00409) | (0.00450) | | (78.94) | (88.15) | | (0.0804) | (0.0895) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Divorced | | 0.0147*** | 0.00890 | | 469.6*** | 319.4** | | -0.251*** | -0.218** |
| | | (0.00480) | (0.00550) | | (147.7) | (132.3) | | (0.0869) | (0.0969) |
| Separated | | 0.0325*** | 0.0324*** | | -271.4*** | -283.0** | | 0.0952 | 0.169 |
| | | (0.00768) | (0.00864) | | (84.94) | (115.6) | | (0.197) | (0.205) |
| Widowed | | -0.0156 | -0.0218** | | 227.4* | -198.8 | | 0.248 | 0.154 |
| | | (0.00969) | (0.0108) | | (132.0) | (148.6) | | (0.185) | (0.193) |
| *Employment status* | | | | | | | | | |
| Full-time (ref) | | | | | | | | | |
| | | - | | | | | | | |
| Part-time | | 0.0277*** | -0.0375*** | | -224.3*** | -228.2*** | | -0.140 | -0.0465 |
| | | (0.00535) | (0.00617) | | (85.10) | (82.16) | | (0.0855) | (0.0917) |
| Retired | | -0.0121** | -0.0155** | | -336.4*** | -333.2*** | | -0.367*** | -0.309*** |
| | | (0.00541) | (0.00666) | | (94.44) | (91.89) | | (0.105) | (0.111) |
| Not employed | | -0.00551 | 0.00353 | | -276.5** | -389.5*** | | -0.115 | -0.0996 |
| | | (0.00444) | (0.00461) | | (117.3) | (93.08) | | (0.0952) | (0.102) |
| Start-up experience | | | 0.00133 | | | -20.47 | | | -0.0143 |
| | | | (0.00384) | | | (65.50) | | | (0.0683) |
| Length of involvement | | | 0.00202*** | | | 178.2*** | | | -0.00784 |
| | | | (0.000411) | | | (17.06) | | | (0.00749) |
| Industry experience | | | 0.000279 | | | 8.408*** | | | 0.00814*** |
| | | | (0.000187) | | | (2.957) | | | (0.00289) |
| Solo entrepreneurs | | | -0.00240 | | | 1.553 | | | -0.0530 |
| | | | (0.00215) | | | (34.58) | | | (0.0389) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Income dummies | No | No | Yes | No | No | Yes | No | No | Yes |
| Observation | 5,574 | 5,514 | 5,124 | 5,094 | 5,040 | 4,716 | 1,960 | 1,929 | 1,784 |
| R2/Pseudo R2 (column 7-9) | 0.016 | 0.031 | 0.084 | 0.005 | 0.014 | 0.107 | 0.022 | 0.032 | 0.046 |

**Table C3: Role of occupational characteristics in entrepreneurial effort with effort-performance beliefs and instrumentality as a mediator variables**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Subjective Effort | | | Total Hours | | | Work Focus | | |
| *Mediator Variable* | | | | | | | | | |
| Instrumentality | 0.238*** | 0.240*** | 0.245*** | 752.9*** | 920.5*** | 799.2*** | 0.348* | 0.447** | 0.670*** |
| | (0.0112) | (0.0126) | (0.0132) | (204.7) | (216.3) | (222.2) | (0.183) | (0.226) | (0.258) |
| Effort-performance | 0.123*** | 0.139*** | 0.127*** | 1,118*** | 711.8*** | 321.6** | 0.244 | 0.376* | 0.430* |
| | (0.00998) | (0.0112) | (0.0119) | (155.3) | (154.0) | (153.8) | (0.179) | (0.227) | (0.248) |
| *Instrument Variables* | | | | | | | | | |
| Knowledge index | | -0.0126 | 0.00354 | | 133.1 | 393.4 | | 0.722*** | 0.574* |
| | | (0.0131) | (0.0135) | | (296.4) | (300.2) | | (0.273) | (0.297) |
| Self-accomplishment index | | 0.00342 | 0.00973 | | 330.7 | -76.44 | | 0.132 | -0.103 |
| | | (0.0113) | (0.0120) | | (295.8) | (302.2) | | (0.244) | (0.268) |
| Painfulness index | | 0.0709*** | 0.0704*** | | 783.0*** | 721.6*** | | 0.548*** | 0.492** |
| | | (0.00707) | (0.00825) | | (194.5) | (205.0) | | (0.177) | (0.197) |
| *Control Variables* | | | | | | | | | |
| Age | | | 0.001*** | | | -2.887 | | | 0.00757* |
| | | | (0.0002) | | | (2.575) | | | (0.00409) |
| Sex(male=ref) | | | -0.00165 | | | 105.1 | | | 0.0482 |
| | | | (0.00387) | | | (74.20) | | | (0.0813) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Marital Status* | | | | | | | | | |
| Married (ref) | | | | | | | | | |
| Living as married | | | 0.0137 | | | 489.8* | | | -0.154 |
| | | | (0.00859) | | | (280.9) | | | (0.163) |
| Single | | | 0.00823* | | | 17.01 | | | 0.0204 |
| | | | (0.00423) | | | (88.46) | | | (0.0990) |
| Divorced | | | 0.00872* | | | 317.4** | | | -0.184* |
| | | | (0.00512) | | | (133.0) | | | (0.107) |
| Separated | | | 0.0203*** | | | -326.6*** | | | 0.158 |
| | | | (0.00730) | | | (113.9) | | | (0.241) |
| Widowed | | | -0.0103 | | | -167.4 | | | 0.336 |
| | | | (0.00959) | | | (145.3) | | | (0.211) |
| *Employment Status* | | | | | | | | | |
| Full-time (ref) | | | | | | | | | |
| Part-time | | | -0.0262*** | | | -193.2** | | | -0.0243 |
| | | | (0.00576) | | | (83.40) | | | (0.103) |
| Retired | | | -0.00368 | | | -299.5*** | | | -0.268** |
| | | | (0.00650) | | | (93.31) | | | (0.122) |
| Not employed | | | 0.0114*** | | | -369.2*** | | | -0.0448 |
| | | | (0.00427) | | | (93.08) | | | (0.112) |
| Start-up experience | | | -0.00461 | | | -42.03 | | | -0.000963 |
| | | | (0.00355) | | | (63.35) | | | (0.0761) |
| Length of involvement | | | 0.00221*** | | | 178.9*** | | | -0.00383 |
| | | | (0.000390) | | | (16.99) | | | (0.00858) |
| Industry experience | | | -0.000265 | | | 6.533** | | | 0.00639** |
| | | | (0.000177) | | | (2.834) | | | (0.00324) |
| Solo Entrepreneurs | | | 0.000823 | | | 11.14 | | | -0.0419 |
| | | | (0.00199) | | | (34.53) | | | (0.0428) |
| Year dummies | No | No | Yes | No | No | Yes | No | No | Yes |
| Income dummies | No | No | Yes | No | No | Yes | No | No | Yes |
| Observation | 7,212 | 5,574 | 5,124 | 6,564 | 5,094 | 4,716 | 2,770 | 2,159 | 1,959 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R2 | 0.138 | 0.164 | 0.208 | 0.009 | 0.012 | 0.111 | 0.006 | 0.029 | 0.061 |

**APPENDIX D: Dealing with Endogeneity**

**Table D1. Testing of Instrumental Variables (IV): Role of occupational characteristics in subjective effort**

| | (1) | (2) | (3) |
|---|---|---|---|
| | Subjective effort | | |
| *Variable of interest* | | | |
| Knowledge index | 0.534*** | 0.567*** | 0.568*** |
| | (0.0975) | (0.102) | (0.102) |
| Self-accomplishment index | -0.353*** | -0.366*** | -0.394*** |
| | (0.0807) | (0.0883) | (0.0917) |
| Arduousness index | 0.272*** | 0.315*** | 0.241*** |
| | (0.0458) | (0.0517) | (0.0432) |
| *Control variables* | | | |
| Age | | 0.000631*** | 0.000586** |
| | | (0.000125) | (0.000228) |
| Sex (male=ref) | | -0.0494*** | -0.0379*** |
| | | (0.00802) | (0.00685) |
| *Marital status* | | | |
| Married (ref) | | | |

| | | |
|---|---|---|
| Living as married | 0.0258*** | 0.0101 |
| | (0.00971) | (0.0101) |
| Single | 0.00532 | -0.00228 |
| | (0.00585) | (0.00567) |
| Divorced | 0.00647 | 0.000210 |
| | (0.00600) | (0.00636) |
| Separated | 0.0114 | -0.00260 |
| | (0.0132) | (0.0134) |
| Widowed | -0.0203* | -0.0343*** |
| | (0.0112) | (0.0118) |
| *Employment status* | | |
| Full-time (ref) | | |
| Part-time | -0.0151** | -0.0152** |
| | (0.00616) | (0.00597) |
| Retired | 0.00319 | -0.000828 |
| | (0.00716) | (0.00720) |
| Not employed | -0.0133** | -0.0117* |
| | (0.00663) | (0.00678) |
| Start-up experience | | -0.00131 |
| | | (0.00455) |
| Length of involvement | | 0.00263*** |
| | | (0.000466) |
| Industry experience | | 0.000221 |
| | | (0.000206) |

| | | | |
|---|---|---|---|
| Solo entrepreneurs | | | 0.00218 |
| | | | (0.00232) |
| Year dummies | Yes | Yes | Yes |
| Income dummies | No | No | Yes |
| Observation | 5,574 | 5,514 | 5,124 |