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Entrepreneurial persistence beyond survival: Measurement and determinants

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ABSTRACT

Entrepreneurial persistence is demonstrated by an entrepreneur's continued positive maintenance of entrepreneurial motivation and constantly renewed active engagement in a new business venture despite counterforces or enticing alternatives. It thus is a crucial factor for entrepreneurs when pursuing and exploiting their business opportunities and in realizing potential economic gains and benefits. Using rich data on a representative sample of German business founders, we investigated the determinants of entrepreneurial persistence. Next to observed *survival*, we also constructed a *hybrid persistence measure* capturing the motivational dimension of persistence. We analyzed the influence of individual-level (human capital and personality) and business-related characteristics on both measures as well as their relative importance. We found that the two indicators emphasize different aspects of persistence. For the survival indicator, the predictive power was concentrated in business characteristics and human capital, while for hybrid persistence the dominant factors were business characteristics and personality. Finally, we showed that results were heterogeneous across subgroups. In particular, formerly unemployed founders did not differ in survival chances, but they were more likely to lack a high psychological commitment to their business ventures.

KEYWORDS

Entrepreneurship; startups; persistence; survival

Introduction

Entrepreneurship has been recognized as vital to increasing productivity, spurring innovation, and enhancing employment opportunities (Audretsch, Keilbach, & Lehmann, 2006; Fritsch, 2008; Koellinger & Thurik, 2012). However, to realize the economic benefits of their entrepreneurial activity, individuals not only must choose to become entrepreneurs, but also must persist with their business venture (Patel & Thatcher, 2014). Persistence can be considered as a prerequisite to exploit the business potential of a given venture and, consequently, its chances of success. Entrepreneurial persistence entails two distinct components: First, the motivation and decision to

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continue to actively pursue a previously selected entrepreneurial opportunity; and, second, doing so in the face of adversity or attractive alternatives (Gimeno, Folta, Cooper, & Woo, 1997; Holland, 2011; Holland & Shepherd, 2013). Accordingly, an entrepreneur's persistence decision is fundamentally different from the initial startup decision. An entrepreneur makes the decision to start a new business at a single point in time and under conditions that are likely to be favorable for the creation of the new venture. By contrast, the decision to persist with the new venture has to be repeatedly made, and is often most salient if the environment is changing and conditions are challenging (Holland & Garrett, 2015). The venturing effort may prove more difficult, expensive, or time consuming than originally expected. Governmental regulations may delay development or the market may prove to be much less interested in one's product/service/technology than initially hoped. Furthermore, conflicts with business partners may arise. Persistence is therefore an important ingredient for pursuing an entrepreneurial endeavor despite uncertainties, challenges, and setbacks (Adomako, Danso, Uddin, & Damoah, 2016; Cardon & Kirk, 2015).

While some early work has considered persistence as a trait (for example, Baum & Locke, 2004), the more recent literature suggests that entrepreneurial persistence is a function of individual, business-related, and contextual factors (DeTienne, Shepherd, & De Castro, 2008; Holland & Shepherd, 2013). For instance, studies have found that individual dispositions derived from personality factors (for example, Caliendo, Fossen, & Kritikos, 2014; Patel & Thatcher, 2014), and competencies, skills, and knowledge all strongly relate to persistence with a newly founded business (for example, Freeland & Keister, 2016; Gimeno et al., 1997). DeTienne et al. (2008) show that entrepreneurs are more likely to persist when personal investment is high, even with underperforming firms. Other studies emphasize the predictive role of firm- and opportunity-related factors such as startup capital (for example, Brüderl & Preisendörfer, 1998; DeTienne et al., 2008) and industry sector (Fritsch, Brixy, & Falck, 2006) or the regional economic conditions (Gimeno et al., 1997; Millán, Congregado, & Román, 2012).

Despite these prior efforts to understand the determinants of the persistence decision, we still lack a thorough understanding of why some individuals choose to stay in entrepreneurship when faced with unexpected obstacles and challenges while others do not, and whether differences exist across distinct subgroups of entrepreneurs. In particular, not much is known about the *relative* importance of the multitude of persistence predictors identified in previous studies. Moreover, given the complex nature of the concept of entrepreneurial persistence, a diverse variety of persistence measures are established in the literature, which makes a direct comparison of previous results challenging and possibly reflects the source of ambiguous findings for particular covariates. Previous persistence

variables can roughly be grouped into three different types of measures. While many studies use business survival as a proxy for entrepreneurial persistence, others apply more subjective measures to capture the motivational commitment to the business venture. Finally, some studies combine survival and subjective persistence to obtain hybrid measures.

Using data from representative samples of regular and formerly unemployed entrepreneurs in Germany (Caliendo, Hogenacker, Künn, & Wießner, 2015; Caliendo, Künn, & Weißenberger, 2019a), we contribute to the literature on the determinants of entrepreneurial persistence in three important ways. First, we examined survival and a constructed hybrid measure as different types of persistence from one single dataset. In particular, the data contain indicators of entrepreneurial persistence in terms of observed survival as well as a subjective measure capturing the motivational dimension of persistence (that is, strong commitment to the business despite a hypothetical offer of a similar job in paid employment). Thus, we could directly compare results between the commonly applied survival indicator with findings using the individual-level hybrid measure of entrepreneurial persistence, which more directly reflects the psychological commitment part of entrepreneurial persistence. Second, we had access to a rich list of predictors of entrepreneurial persistence covering a multitude of individual-level, business-related, and contextual characteristics. We drew from research that proposes founding/founder effects to explain variance in new venture performance (Baum & Locke, 2004; Boeker, 1989; Stinchcombe, 1965) to identify a set of relevant persistence predictors. Hence, we focused on human capital and personality traits of the entrepreneur as well as business characteristics while controlling for other determinants of the persistence decision such as sociodemographic characteristics, intergenerational transmissions, startup motives, and the regional economic context. This enabled an in-depth analysis of predictors of entrepreneurial persistence and for testing the robustness of results when including other relevant determinants while also minimizing potential threats of omitted variable bias. Furthermore, the availability of this extensive variable list enabled a more holistic approach to investigate the relative importance for entrepreneurial persistence between covariate groups. Third, we took account of the fact that entrepreneurs are heterogeneous (Alvarez & Busenitz, 2001). We provided a separate analysis for the subgroups of formerly unemployed and regular (nonunemployed) founders for the following reasons. Unemployed founders represent a substantial share of all founders in Germany, partly due to a series of active labor market policies promoting self-employment (Caliendo & Kritikos, 2010; Caliendo et al., 2015), and they are different from the "general population" of founders in terms of availability of or access to human, social, and financial capital (Caliendo et al., 2015, 2019a). They are more likely to be necessity founders with lower

business attachment and, thus, their persistence is likely to depend on different factors compared to regular founders.

Overall, our empirical results yielded the following findings. First, while some factors (locus of control, startup capital) had a robust influence on persistence, the importance of most other factors was sensitive to the choice of the persistence measure (for example, unemployment and industry-specific experience, Big Five personality traits). Second, for the survival indicator, the relative importance of predictors was concentrated in business characteristics and human capital, while for hybrid persistence the dominant factors were business characteristics and personality. Third, our heterogeneity analysis enabled a detailed subgroup analysis and revealed that the psychological commitment of unemployed founders was more strongly influenced by personality compared to regular founders.

The remainder of this article is organized as follows. In the next section, we review the literature on entrepreneurial persistence. Next, we introduce our dataset, describe the construction of our persistence measures, and present some descriptive statistics. We then describe our empirical strategy, after that present the results. We conclude the article with a summary and discussion of our results.

Literature review

Measurement of entrepreneurial persistence

The notion of individual persistence in the context of entrepreneurship usually involves two aspects: First, the founders maintain their entrepreneurial motivation, choosing to continue their effortful and active engagement in their business ventures at a particular point in time; and, second, they do so despite challenging conditions, impediments, counterforces, or attractive alternatives (Gimeno et al., 1997; Holland, 2011; Holland & Shepherd, 2013).[1] Given the complexity of the concept, we found a varied range of persistence measures applied in previous entrepreneurship studies on this topic. Overall, we identified three distinct approaches in the literature to measure entrepreneurial persistence.

First, the most common practice is to use the founder's objective *survival* in self-employment or running a business as a proxy variable for persistence if longitudinal data are available.[2] While survival and persistence are undoubtedly

[1]Davidsson (2012) distinguishes this shorter-term perspective from a longer-term view, in which entrepreneurial persistence captures reentries to the venture creation processes after previous efforts have been concluded. Although, in principle, persistence can also be defined at the level of the business venture, we followed the large majority of previous studies in the literature and considered persistence at the individual founder's level.

[2]See, for example, Block and Sandner (2009), Brüderl and Preisendörfer (1998), Brüderl and Ziegler (1992), Caliendo et al. (2014), Ciavarella et al. (2004), Fritsch et al. (2006), Georgellis et al. (2007), Gimeno et al. (1997), Millán et al. (2012), Oberschachtsiek (2012), Patel and Thatcher (2014), van Praag (2003), Zhu et al. (2011).

closely linked, they are not necessarily identical. The definition of *persistence* usually involves a psychological commitment; that is, the motivation to actively engage in and the decision to continue business activities irrespective of circumstances. For instance, founders might be observed operating their businesses despite actively seeking alternative business opportunities, thus lacking full commitment to their original business ventures. The difference between survival and persistence can also be illustrated by founders who were predominantly motivated to start a business due to push factors as a last resort (for example, a lack of employment alternatives). These founders might show a persistent survival of their businesses, albeit not mainly due to their motivational dedications or preferences, but rather because there remains a shortage of employment opportunities. Second, as an alternative to survival, a cross-section of entrepreneurs are surveyed on *subjective measures* of persistence, often by presenting hypothetical scenarios to them and asking them whether or not they would continue operations under the described circumstances in the future (for example, Holland & Garrett, 2015; DeTienne et al., 2008, applying conjoint analyses).[3] Purely subjective measures could be criticized because they solely rely on self-reported assessments of artificial hypothetical scenarios and might differ from actual behavior or attitudes displayed in reality. As a third option in the literature, Davidsson (2012) and Freeland and Keister (2016) combine survival measures with a subjective question about the founder's projected active business engagement in the near future to construct a *hybrid persistence measure*.

Determinants of entrepreneurial persistence

The entrepreneurship literature presents the prevailing view that entrepreneurial persistence is a function of a variety of predictors (DeTienne et al., 2008; Holland & Shepherd, 2013). Both individual attributes of the entrepreneur and initial characteristics of the startup are among the most prominent determinants of the pivotal strategic decision to persist or disengage. This is also consistent with research positing that new ventures are imprinted at the time of founding and that this has long-lasting effects on their strategy (Boeker, 1989), structure (Stinchcombe, 1965), and performance (Cooper, Gimeno-Gascon, & Woo, 1994). Driven by their values, motivations, goals, and personalities, the founders determine the subsequent development of startups because they shape the basic identity and configuration of the new organizations (Baum & Locke, 2004; Boeker, 1989; Stinchcombe, 1965). The founder effects most persistently and extensively studied by entrepreneurship researchers include: (a) entrepreneur dispositions derived from personality factors, and (b) individual competencies, skills, and knowledge (Cooper et al.,

[3]See, for example, Cardon and Kirk (2015), DeTienne et al. (2015), DeTienne et al. (2008), Holland and Garrett (2015), Holland and Shepherd (2013), Wu et al. (2007).

1994). The former reflect the influence of long-run stable individual traits (Zhao & Seibert, 2006), whereas the latter reflect the impact of human capital accumulated over time (Unger, Rauch, Frese, & Rosenbusch, 2011).

In the following, we elaborate on individual characteristics of the entrepreneur; that is, (a) human capital and (b) personality traits as well as (c) business characteristics as determinants of entrepreneurial persistence. We further developed hypotheses for predicting our two distinct persistence measures, *survival* and *hybrid persistence*. Our data also allowed us to control for other characteristics (sociodemographic characteristics, intergenerational transmissions, startup motives, and the regional economic context), although they were not the focus of our interest. Table 1 provides an overview of previous findings.

Human capital

Human capital reflects knowledge and skills that individuals have acquired through education, training, and on-the-job experience, which provide them

Table 1. Determinants of persistence in the empirical literature.

Covariate	Sign of relation	Literature references
(1) *Human capital*		
Schooling	$^{+}/_{0}$	a, b, c, h, i, k, n, o
Professional education	+	a, j, o
Unemployment experience	$^{+}/_{-}$	g, i, j, l, o
Industry-specific experience	+	b, c, e, j, l, n, o
Skills and knowledge		
Strategy/leadership	0	c, h, j
Back office	+	h
Front office	0	j
Industry knowledge	+	h
(2) *Personality*		
Big Five		
Openness	$^{0}/_{-}$	d, e, k
Conscientiousness	$^{+}/_{0}$	d, e, k
Extraversion	0	d, e, k
Agreeableness	$^{0}/_{-}$	d, e, k
Neuroticism	$^{+}/_{0}$	d, e, k
Locus of control	0	d
Self-efficacy	+	p
Readiness to take risk	Concave	d
(3) *Business characteristics*		
Startup capital	+	b, c, h, j, m, o, r
Business sector	$^{+}/_{-}$	b, c, f, g, h, l, n

Note: The table summarizes the findings of the literature review about the direction of the relationship between covariates and entrepreneurial persistence. + denotes a positive effect; − denotes a negative effect; 0 denotes no effect; and $^{+}/_{-}$, $^{+}/_{0}$, and $^{0}/_{-}$ denote ambiguous effects. Literature references by type of persistence measure: Survival: a. Block and Sandner (2009), b. Brüderl and Preisendörfer (1998), c. Brüderl and Ziegler (1992), d. Caliendo et al. (2014), e. Ciavarella et al. (2004), f. Fritsch et al. (2006), g. Georgellis et al. (2007), h. Gimeno et al. (1997), i. Millán et al. (2012), j. Oberschachtsiek (2012), k. Patel and Thatcher (2014), l. van Praag (2003), m. Zhu et al. (2011); Hybrid: n. Davidsson (2012), o. Freeland and Keister (2016); Subjective: p. Cardon and Kirk (2015), q. DeTienne, McKelvie, and Chandler (2015), r. DeTienne et al. (2008), s. Holland and Garrett (2015), t. Holland and Shepherd (2013), u. Wu, Matthews, and Dagher (2007)

with increased cognitive abilities, leading to higher levels of productivity at work (Becker, 1964). Entrepreneurship researchers have investigated the influence of a variety of human capital factors for over three decades (Cooper et al., 1994; Unger et al., 2011). This work has strongly focused on the ways in which individuals' employment careers shape the knowledge and skills available to them when they become entrepreneurs. Human capital may be influential in shaping the predispositions and entrepreneurial outlook of individuals, with some studies showing that different prior experiences contribute to different perceptions about the market opportunities available from the same innovation (Shane, 2000). Based on Unger et al. (2011)'s meta-analysis of 70 studies, it also appears that human capital has a significant relationship with venture performance. Because human capital encompasses a diverse range of skills and knowledge, it may lead to divergent influences on startup firms. Investments in general education and work experience yield quite different performance impacts than specific industry experience. For example, previous research provides some support for a positive relationship between the level of education and self-employment longevity (Freeland & Keister, 2016; Gimeno et al., 1997; Millán et al., 2012), while there is also evidence that education has no effect on persistence (for example, Davidsson, 2012; Georgellis, Sessions, & Tsitsianis, 2007; Patel & Thatcher, 2014). Block and Sandner (2009) demonstrate a positive effect of education if entrepreneurs have been educated in the professional area in which they start their venture. Furthermore, industry-specific experience provides knowledge and information about rules and regulations that are specific to the industry sector, customer and supplier networks, and employment practices. Several studies have found this kind of human capital to be positively associated with entrepreneurial survival (for example, Ciavarella, Buchholtz, Riordan, Gatewood, & Stokes, 2004; Davidsson, 2012; Freeland & Keister, 2016). Likewise, skills related to labor market experience, management experience, and previous entrepreneurial experience have a strong and positive impact on persistence (for example, Georgellis et al., 2007; Gimeno et al., 1997; Oberschachtsiek, 2012). On the other hand, unemployment experience may imply skill obsolescence or reflect a lack of business acumen, which might indicate a lower probability of survival. In line with these arguments, van Praag (2003), Georgellis et al. (2007), and Millán et al. (2012) report that individuals with previous unemployment experience are more likely to terminate their current startup projects. This negative effect on survival seems to be pronounced for longer unemployment spells. Oberschachtsiek (2012) found that an unemployment duration of less than four months before starting a business indeed positively relates to survival in self-employment. Taken together, the literature offers an abundant basis for expecting a strong relationship between human capital attributes and our survival measure of entrepreneurial persistence. Beyond the well-established link with survival, there are also arguments proposing human capital as a determinant of an entrepreneur's

motivational dedication and preferences to continue business activity, as reflected in our hybrid measure of entrepreneurial persistence. For example, according to expectancy-value theory (see, for example, Vroom, 1964), the motivation to commence a particular course of action is influenced by the expectation that the action will lead to valued outcomes. Applied to the persistence decision of an entrepreneur, human capital may influence the motivation to persist by affecting expectancy (that is, the entrepreneur's belief in running a successful business) and value (that is, the perceived desirability of the expected performance of the new venture) (Holland, 2011; Holland & Shepherd, 2013). In particular, prior knowledge and skills help the entrepreneur to define, understand, and respond to the challenges and obstacles that they face while running a startup. Overcoming these challenges and increasingly believing in one's ability to control events will increase one's own expectations of entrepreneurial success (Urbig & Monsen, 2012). Additionally, a broader perspective and understanding enable the entrepreneur to derive a wider range of possible development pathways for the new venture when facing adverse situations. This may result in the entrepreneur perceiving the expected performance of the startup as more desirable. With higher expectancy and a more favorable appraisal of the expected entrepreneurial outcomes, the entrepreneur shows a higher motivation to persist (Holland, 2011; Holland & Shepherd, 2013). Overall, we propose:

Hypothesis 1: For both persistence measures, entrepreneurs' human capital is a significant predictor of entrepreneurial persistence.

Personality

From an early stage, entrepreneurship scholars suggest that there might be important relationships between individual personality traits and entrepreneurship (McClelland, 1965). Within the vocational psychology literature, scholars share a broad agreement that personality scores systematically vary across job types and work environments (Zhao & Seibert, 2006, p. 260). Researchers conjecture that people's personalities affect what interests them, thus resulting in differences in personality configurations across job types. The person-job fit literature emphasizes that people seek to secure a good match between their personal predispositions and their career choices (Kristof, 1996). Such predispositions include personality factors (which are generally viewed as innate and stable over time) as well as more variable factors such as identity, values, and beliefs (which may be partly culture dependent and may change over a person's lifetime). Person-job fit theory suggests that some people are more likely to choose entrepreneurship than others regardless of whether the perceived match is necessarily true (Zhao & Seibert, 2006). We restrict the discussion below to the personality characteristics available in our dataset. One of the most commonly

applied personality constructs is the Five Factor model of personality (Barrick, Mount, & Gupta, 2003; Rauch & Frese, 2007; Schmitt-Rodermund, 2004, 2007; Zhao & Seibert, 2006), which establishes the five broad personality dimensions of openness, conscientiousness, extraversion, agreeableness, and neuroticism (the Big Five, McCrae & Costa, 2008; Costa & McCrae, 1992; see, for example, John & Srivastava, 1999, for a detailed description of each factor). To date, evidence on the relationship between the Big Five personality traits and persistence in self-employment is rather ambiguous. Patel and Thatcher (2014) found that less open and more neurotic individuals are more likely to persist in self-employment, while Ciavarella et al. (2004) demonstrate the importance of conscientiousness for long-term venture survival. Caliendo et al. (2014) report a positive link between agreeableness and exit from self-employment, whereas no significant relationship can be found for the other Big Five traits. Control beliefs such as locus of control (Rotter, 1966) and self-efficacy (Bandura, 1997) represent more specific personality constructs and they are key in theories on vocational choice in general (Lent, Brown, & Hackett, 1994), as well as playing a prominent role in entrepreneurship research in particular (for example, Rauch & Frese, 2007). One basic result in past entrepreneurship studies is that inter-individual differences in control beliefs (for example, higher levels of self-efficacy or internal locus of control) are among those personal factors that show the strongest effects on entrepreneurial success (Rauch & Frese, 2007) and self-employment entry and exit decisions (Caliendo et al., 2014). Creating and sustaining a business involves risky decisions with uncertain outcomes, which implies a positive relationship with the willingness to take risks. However, overly risky investments can lead to large losses and business failure. Taken together, this implies an inverse u-shaped influence of risk tolerance on entrepreneurial persistence (Chell, Harworth, & Brearley, 1991), which has also found empirical support (Caliendo, Fossen, & Kritkos, 2010; Caliendo et al., 2014). Given the ambiguous associations between personality traits and survival found in previous entrepreneurship studies, we expect a stronger relationship with our hybrid persistence measure as it additionally captures the motivational component of the persistence decisions. Therefore, we predict:

Hypothesis 2: The relationship between entrepreneurs' personality traits and entrepreneurial persistence is stronger for the hybrid persistence measure relative to the survival measure.

Business-related determinants

Previous research has proposed a number of organizational characteristics of the new venture that help to explain variance in the persistence decision of entrepreneurs. Among these characteristics, the amount of financial resources

available at startup has been shown to increase the chances of a new venture surviving and growing (Brüderl & Ziegler, 1992; Cooper et al., 1994), for example by providing a buffer against random shocks such as market downturns or managerial mistakes, and facilitating the pursuit of resource-intensive growth strategies (Cooper et al., 1994). A number of studies underpin the positive influence of a higher level of startup capital on an entrepreneur's persistence decision (Freeland & Keister, 2016; Gimeno et al., 1997; Oberschachtsiek, 2012). Industry affiliation also plays a significant role for explaining persistence differences (for example, Fritsch et al., 2006). Industries differ in competition intensity, capital intensity, demand structure, and barriers to exit. In some industries, switching to wage employment is less difficult due to local demand conditions. Overall, the evidence is quite diverse and does not provide a consistent picture of the relation between the chosen industry sector and the entrepreneur's probability of persisting (for example, Davidsson, 2012; Georgellis et al., 2007; van Praag, 2003). To our knowledge, the literature does not provide any arguments suggesting differences in the relationship between business characteristics and either of our persistence measures. As a result, we propose:

Hypothesis 3: For both persistence measures, business characteristics are significant predictors of entrepreneurial persistence.

Other characteristics

To avoid omitted variable bias, later in the empirical analysis we also controlled for other characteristics that had been proven to be important in previous research (but were not in the focus of our interest). These variables include sociodemographic characteristics (for example, age, based on the findings by Block & Sandner, 2009; Gimeno et al., 1997; van Praag, 2003), intergenerational transmissions (for reviews see, for example, Aldrich & Kim, 2007; Parker, 2009), startup motivations and the distinction between opportunity and necessity entrepreneurs (for example, Caliendo, Kritikos, & Stier, 2019b; Gimeno et al., 1997; Oberschachtsiek, 2012; Patel & Thatcher, 2014), as well as the macro environment in which an entrepreneur operates (see, for example, Audretsch, Keilbach, & Thurik, 2000; Georgellis et al., 2007; Millán et al., 2012; van Praag, 2003).

Data

Data creation and estimation sample

We used data originally collected by Caliendo et al. (2015, 2019a) on a sample of male founders who started full-time businesses in the first quarter of 2009 in

Germany. The dataset comprised random samples of unemployed founders who participated in the German startup subsidy program for unemployed individuals (*Gründungszuschuss*), and "regular" founders; that is, founders who were not unemployed directly prior to startup and consequently did not receive the subsidy (see Caliendo et al., 2015, 2019a for details on data construction). The startup subsidy could be legally claimed if the eligible unemployed individuals met the following requirements: First, they had a remaining unemployment benefit I entitlement[4] of at least another 90 days, which was then offset against the subsidy receipt; and, second, they were required to provide a business and financing plan to the employment agency that had been evaluated by a competent external institution. The subsidy amount was equivalent to the individual's last unemployment I benefit plus a lump sum of 300 euros to cover social security costs during the first nine months, with an optional six-month extension during which only the lump sum was paid. Finally, it should be mentioned that subsidized startups out of unemployment constituted a large share, about 40 percent to 60 percent, of all full-time startups in Germany between 2006 and 2011 (depending on the underlying data source, see Caliendo et al., 2015), which is why we included them in our analysis.[5]

The business founders in our sample were surveyed twice. The first interview was conducted about 19 months after startup (wave 1) and focused on an extensive list of startup characteristics, sociodemographics, previous labor market experiences, and intergenerational transmissions as well as the founders' labor market status and, conditional on ongoing business activity with their initial startup from the first quarter in 2009, their business performance. In total, 1,478 (930) valid interviews were completed with male, formerly unemployed (regular) founders (see Figure 1). Conducted with the same individuals, the second interview (wave 2) extended the observation window to 40 months after startup. Figure 1 shows that we had 827 (453) panel observations on formerly unemployed (regular) founders in wave 2. Some of the important variables for our analysis were only surveyed for a random subsample due to budget constraints. This resulted in 653 observations for our final estimation sample, of which 388 (265) were formerly subsidized (regular) founders. An examination of selective sample attrition showed that our estimation sample was similar to the original full sample. Most importantly, survival rates in wave 1 were not affected by significant sample selectivity.[6] The estimation sample contained 495 founders who were still

[4]In Germany, every individual who has been in employment subject to social security for at least one out of the two previous years is eligible for unemployment benefit I. The amount of the benefit comprises 60 percent (67 percent with children) of the last net wage and is basically paid for a period of 12 months, with the exception of older individuals (see Caliendo & Hogenacker, 2012).

[5]Meanwhile, a major reform of the program at the end of 2011 has substantially reduced entry numbers (see Bellmann, Caliendo, & Tübbicke, 2018, for details).

[6]See Table A.1 in the Appendix in the online supplement for details.

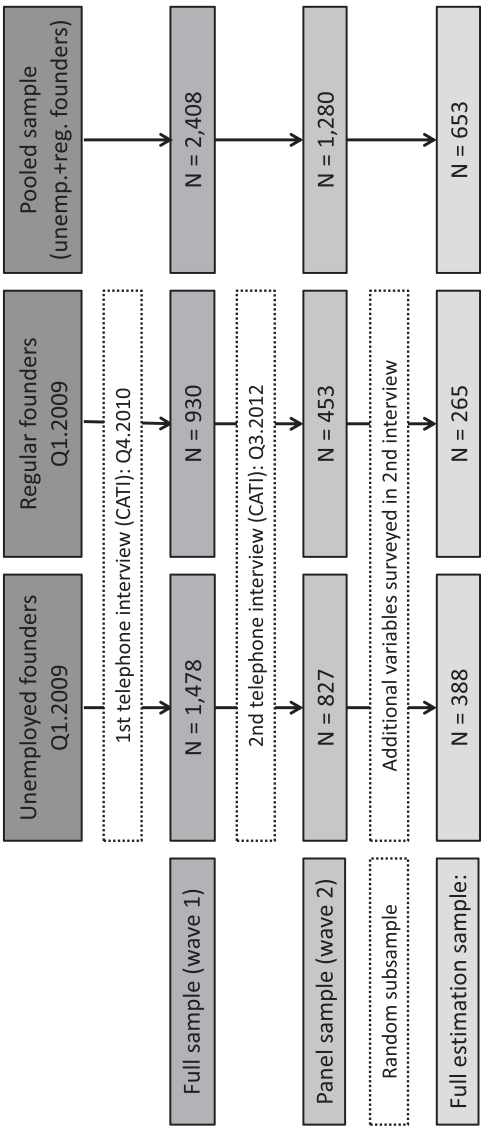


Figure 1. Data generation and sample restrictions. *Note:* For details, see Caliendo et al. (2015, 2019a).

self-employed in wave 2 with the same business as at startup in 2009, divided between 287 formerly subsidized and 208 regular founders.

Definition of persistence measures

In the literature review, we classified previous empirical studies on the topic of persistence into the following three categories according to the persistence measures used: survival, subjective measures, and hybrid measures combining survival with subjective persistence indicators. In our dataset, we captured the latter aspect by surveying the founder's willingness to remain self-employed while having the hypothetical option of performing the same type of job in wage employment. In the wave 2 survey, using a 7-point Likert-type scale, all surviving founders were asked whether they would terminate their current self-employment in the hypothetical case that they were offered a similar job as a dependent employee. Because this question was asked only in the second interview, we were unable to conduct a full panel analysis, but used this information cross-sectional at the end of our observation period instead. Based on the reverse scores, we constructed a persistence index, whereby higher values indicated higher entrepreneurial motivation to continue to actively pursue self-employment despite the (hypothetical) presence of potentially attractive job alternatives. The distribution of this persistence index is depicted in Figure 2. A clear and distinctive majority were fully motivated and committed to continue their self-employment and score the highest value on the index, which applied across all subgroups. Based on this, we constructed the following two measures:

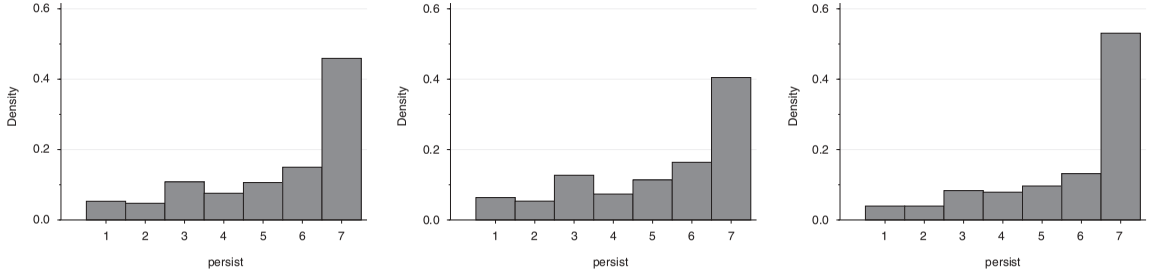
Survival

Following the majority of studies using survival as a proxy variable for entrepreneurial persistence, our first persistence measure was a binary survival dummy indicating whether the founder was still self-employed and actively operating the same business in wave 2 as at the original startup in the first quarter of 2009; that is, 40 months after business formation:

$$\begin{aligned} \text{Survival} &= 1 \text{ if self-employed with the same business in wave 2,} \\ &= 0 \text{ if not self-employed with the same business in wave 2.} \end{aligned}$$

Hybrid persistence

For this measure, we combined survival and the willingness to remain self-employed into one indicator. According to the hybrid measure, a *highly persistent founder* is defined as someone who is still self-employed with the same business and shows a strong commitment to their business activity:



a. Pooled sample b. Unemployed founders c. Regular founders

Figure 2. Willingness to stay self-employed. *Note*: Respondents in the second wave were asked: "Now, I would like to know how satisfied you are overall with your professional self-employment. Assume you were offered a similar job as a dependent employment. Would you terminate your current self-employment and accept the offer of the dependent employment? Please answer on the basis of a scale ranging from 1 "does not apply at all" to 7 "applies completely.""

$$\begin{aligned}\text{Hybrid persistence} &= 1 \text{ if self-employed with the same business in wave 2} \\ &\quad \textit{and} \text{ persistence index} \in\{7\}, \\ &= 0 \text{ if not self-employed with the same business in} \\ &\quad \text{wave 2 } \textit{or} \text{ persistence index } \in\{1,2,3,4,5,6\}.\end{aligned}$$

In this sense, the hybrid measure differs from survival by imposing the additional requirement of a high score on the subjective persistence index to be considered as persistent.[7] Overall, both persistence measures emphasize a different aspect of persistence, and, consequently, the examination of their determinants has different implications depending on which measure is applied. While the analysis of survival reveals which factors contribute to the founder's mere continuation of the business venture (compared to non-survival), examining the hybrid measure also shows which variables contribute to a high psychological commitment of the founder. Essentially, this compares survival with a high commitment to nonsurvival or survival with a stronger preference to abandon self-employment.

Selected descriptive statistics

Distribution of persistence measures

The top panel in Table 2 reports the mean values for our two persistence measures. The survival indicator reveals that 75.8 percent of all founders were still self-employed in wave 2. Comparing across subgroups, we found moderately lower survival rates among formerly unemployed founders (74.0 percent, column 2) compared to regular founders (78.5 percent, column 3). Moving to our hybrid persistence indicator revealed that 35.5 percent of all founders displayed high persistence in the full sample (column 1), where the share of highly persistent formerly unemployed founders was significantly lower (30.4 percent) than the respective share of regular founders (43.0 percent).

Control variables

Based on our review of the entrepreneurship literature, we arranged our 46 control variables into four blocks X_i, with $i = 1, \ldots, 4$. They comprised: (1) human capital (12 variables), (2) personality (9 variables), (3) business characteristics (8 variables), and (4) other characteristics (17 variables).[8] Taking into account that our sample comprised regular founders and

[7]Our subjective component reflects the presence of strong persistence. Given the wording and design of the scale, motivational persistence could alternatively be defined as scoring 5, 6, or 7 on the index. While a few results are no longer significant at conventional levels for this alternative, the findings are qualitatively robust to this slight change in the definition. Detailed estimation tables are available from the authors on request.

[8]The fourth category comprises (4a) sociodemographic characteristics, (4b) intergenerational transmissions, (4c) startup motives, as well as (4d) the current regional economic context at the time of the second interview.

Table 2. Descriptive statistics.

	Pooled	By former employment status	
	Estimation sample (1)	Unemployed founders (2)	Regular founders (3)
Number of observations	653	388	265
Survival (same business)	0.758	0.740	0.785
Hybrid persistence	0.355	0.304	0.430***
(1) *Human capital*			
Highest schooling certificate Upper secondary school	0.518	0.518	0.517
Professional education University education	0.325	0.332	0.313
Unemployment experience before startup[a]			
0 or not specified	0.248	0.072	0.506***
> 0–2	0.332	0.381	0.260***
> 2–5	0.225	0.281	0.143***
> 5	0.194	0.265	0.091***
Industry-specific experience before startup			
Due to former self-emp.	0.225	0.193	0.272**
Due to dependent emp.	0.784	0.812	0.743**
None	0.093	0.082	0.109
Skills and knowledge[b]			
Strategy and leadership	5.6	5.6	5.5
Back office	4.6	4.6	4.7
Front office	4.8	4.9	4.8
Industry knowledge	5.8	5.9	5.8
(2) *Personality*			
Big Five[b]			
Openness	4.8	4.9	4.8
Conscientiousness	5.9	6.0	5.8**
Extraversion	5.6	5.6	5.4**
Agreeableness	5.9	5.9	6.0
Neuroticism	3.8	3.8	3.8
Locus of control[b]	5.5	5.5	5.5
General self-efficacy[b]	5.3	5.3	5.3
Readiness to take risk[c]	6.2	6.3	6.1
(3) *Business characteristics*			
Startup capital			
None or not specified	0.161	0.160	0.162
< 10,000 euros	0.349	0.379	0.306*
10,000– < 50,000 euros	0.322	0.345	0.287
≥ 50,000 euros	0.149	0.108	0.208***
Share of own equity at startup	0.575	0.589	0.556
Business sector			
Manufacturing, construction	0.271	0.242	0.313**
Retail	0.152	0.144	0.162
Information, financial, and IT services	0.164	0.183	0.136
Other services	0.315	0.320	0.309
Other sector	0.098	0.111	0.079

Note: Reported are shares and mean values. ***, **, * indicate significantly different means between subgroups at the 1, 5, 10 percent level. [a]Measured as share of working time, standardized by age − 15. [b]Measured on a 7-point Likert-type scale ranging from 1 "does not apply at all" to 7 "applies completely"; see Table A.2 in the Appendix (available online) for details. [c]Measured on an 11-point Likert-type scale ranging from 0 "not at all willing to take risks" to 10 "very willing to take risks"; see Table A.2 in the Appendix (available online) for details.

formerly unemployed participants in a startup subsidy program, our list also included a corresponding group dummy. Descriptive statistics for the main variables are reported in Table 2, whereas statistics for the other variables are available in Table A.3 in the Appendix (available online).[9]

The founders in our estimation sample (column 1) were, on average, 42 years old. The majority had German citizenship (95 percent), were married (65 percent), and had completed upper secondary school (52 percent). About one in four founders had industry-specific experience due to former self-employment, whereas 10 percent did not have any such experience prior to business formation. Close to 40 percent had at least one parent who was currently or was self-employed in the past. The average startup capital amounted to around 30,000 euros, and one-fourth of all businesses were set up in the manufacturing or construction sector.

Comparing the subgroups of formerly unemployed and regular business founders (column 2 versus column 3) showed that, as expected, formerly unemployed founders had more unemployment experience and less industry-specific experience prior to their new business formation. They also suffered from shortages in intergenerational transmissions, in particular with respect to parental self-employment. Necessity motives were more pronounced among formerly unemployed business founders, who also invested less capital in their new businesses at startup. Moreover, formerly unemployed founders also operated in slightly less favorable regional economic environments in terms of open vacancies and unemployment rates.

Empirical strategy

Our main goal for the empirical section was twofold: First, we examined the main determinants of entrepreneurial persistence and their relative importance; and, second, we compared results across the two distinct persistence measures to reveal differences and the sensitivity of findings to the choice of persistence indicator.

For this purpose, we conducted a series of robust ordinary least squares (OLS) estimations for each persistence measure.[10] In a first step, we regressed persistence on each covariate block X_i separately in the simple specifications 1 to 4, see Equation (1), and determined their individual coefficients vector $\tilde{\beta}_i$ and goodness-of-fit measures, which indicated their joint explanatory power. Because we did not condition on any other covariate blocks at this stage, the results are labeled "unconditional."

[9]For details on the construction of selected control variables, see Table A.2 in the Appendix (available online).

[10]The results are robust to applying a logit/probit approach and are presented in the Robustness analysis. We used robust ordinary least squares (OLS) because the interpretation of R^2 measures is more straightforward than in logit/probit approaches.

$$\text{Persistence} = \tilde{\beta}_0 + \tilde{\beta}_i \cdot X_i + \tilde{u} \quad \forall i = 1, \ldots, 4 \tag{1}$$

In a second step, we regressed persistence on all covariate blocks jointly (full specification), see Equation (2) below, and determined the individual coefficients vector β_i and the *partial* joint explanatory contribution for each covariate block X_i. Because these findings relate to a full specification and describe the results *conditional* on all other covariate blocks, refer to them as "conditional" results.

$$\text{Persistence} = \beta_0 + \sum_{i=1}^{4} (\beta_i \cdot X_i) + u \tag{2}$$

The comparison of unconditional and conditional results for a particular covariate block and a given persistence measure reveals how sensitive the results are to the inclusion of other covariate blocks. As goodness-of-fit measures, we chose the joint significance of all control variables in each covariate block X_i as well as the (partial) regression-R_i^2 for this block, which reflects the share of explained variance in persistence.[11]

In the first two parts of the following empirical discussion, we describe how we conducted the analysis for the full sample. In the third part, we account for the heterogeneous nature of our sample and distinguish between unemployed and regular founders to investigate heterogeneity across these two subgroups. Finally, we present a brief robustness analysis in the fourth part.

Empirical results

Individual effects of covariates

We begin our analysis by comparing the detailed regression results between the two persistence indicators and discuss the most notable similarities and differences. Table 3 reports the regression results for the survival indicator in columns 1 and 2 and the hybrid persistence measure in columns 3 and 4. For each outcome variable, the first column contains the unconditional regression results $\tilde{\beta}$ from the simple specifications 1 to 4 (stacked over each other into one column to save space), where only the respective covariate block X_i is included; see Equation (1) above. The second column per outcome variable reports the conditional results β from the full specification, which includes all four covariate blocks jointly; see Equation (2).

[11] Since the number of control variables varies across covariate blocks, we also calculated the adjusted R_a^2, which is better comparable across non-nested specifications because it adjusts the original R^2 for the number of included control variables.

Table 3. Main regression results: Regression coefficients.

	A. Survival (same business)		B. Hybrid Persistence	
	unc. ($\tilde{\beta}$) (1)	cond. β (2)	unc. ($\tilde{\beta}$) (3)	cond. β (4)
(1) *Human capital*				
Highest schooling certificate Upper secondary school	0.048	0.092**	0.016	0.026
Professional education University education	0.0008	0.019	−.025	−.033
Unemployment experience before startup[a]				
0 (ref.)				
>0–2	−.025	0.002	−.074	−.023
>2–5	−.025	0.012	−.096*	−.033
>5	−.155***	−.127**	−.163***	−.074
Joint *F*-stat.	3.1	2.8	3.0	0.6
Industry-specific experience before start-up				
Due to former self-emp.	0.006	−.001	0.105**	0.075
Due to dependent emp.	0.141**	0.129**	−.034	−.033
None	−.006	0.01	0.016	0.044
Joint *F*-stat.	3.5	2.8	2.1	1.4
Skills and knowledge				
Strategy and leadership	−.014	−.007	0.018	−.015
Back office	0.037**	0.012	0.029	0.011
Front office	0.0004	−.004	0.051**	0.044*
Industry knowledge	0.071***	0.054***	0.035	0.026
(2) *Personality*				
Big Five[b]				
Openness	0.034*	0.033*	0.031	0.026
Conscientiousness	0.004	−.016	−.002	−.002
Extraversion	−.040**	−.038**	0.009	−.00002
Agreeableness	−.023	−.008	−.033*	−.035*
Neuroticism	−.017	−.017	−.038*	−.040**
Locus of control[b]	0.051***	0.048**	0.063***	0.062***
General self-efficacy[b]	0.017	0.012	0.046**	0.024
Readiness to take risk[c]	−.012	−.035	−.060	−.085*
Squared	0.0004	0.003	0.005	0.007*
Joint *F*-stat.	0.3	0.4	0.8	1.7
(3) *Business characteristics*				
Startup capital				
None or not spec. (ref.)				
< 10,000 euros	−.033	0.015	0.007	0.096
10,000–< 50,000 euros	0.124**	0.133**	0.166**	0.203***
≥ 50,000 euros	0.209***	0.191***	0.259***	0.233***
Joint *F*-stat.	12.0	7.8	9.3	6.3
Share of own equity	0.062	0.007	0.073	−.001
Business sector				
Other sector (ref.)				
Manufacturing, construction	0.092*	0.114**	−.023	−.058
Retail	−.096	−.049	−.067	−.091
Information, financial, and IT services	−.082	−.074	−.118	−.173**
Other services	−.087	−.054	−.071	−.100
Joint *F*-stat.	7.6	6.3	1.0	1.7
Number of obs.	653	653	653	653

(*Continued*)

Table 3. (Continued).

	A. Survival (same business)		B. Hybrid Persistence	
	unc. ($\tilde{\beta}$) (1)	cond. β (2)	unc. ($\tilde{\beta}$) (3)	cond. β (4)
Controls for other characteristics	No	Yes	No	Yes
Joint *F*-stat.		4.95		5.11
Joint *p*-value		0.000		0.000
Regression-R^2		0.227		0.203

Note: Reported are robust ordinary least squares (OLS) coefficients. The unconditional (unc.) results $\tilde{\beta}$ refer to a specification where only the covariates from the respective covariate block are included, see Equation (1) in the text; separate results of all covariates blocks are stacked in one column to save space. The conditional (cond.) results β refer to a full specification containing all covariates from all covariate blocks, see Equation (2) in the text. For details on the definition and construction of the outcome variables, see subsection Definition of persistence measures. ***, **, * indicate significantly different means between subgroups at the 1, 5, 10 percent level. [a]Measured as share of working time, standardized by age − 15. [b]Initially measured on a 7-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely"; see Table A.2 in the Appendix (available online) for details, and then standardized. [c]Measured on an 11-point Likert-type scale from 0 "not at all willing to take risks" to 10 "very willing to take risks"; see Table A.2 in the Appendix (available online) for details.

Human capital

A higher lifetime share of unemployment proved to be negatively associated with objective persistence (that is, business survival). Its significant negative effect on hybrid persistence was not robust to the inclusion of other covariate blocks, and it did not affect the motivational persistence of surviving business founders in any significant way. This comparison shows that while a higher share of lifetime unemployment did have negative implications for survival, presumably due to the greater lack of work experience, depreciation of human capital, and smaller professional and business networks, it did not affect hybrid persistence.

Furthermore, we found ambiguous effects of industry-specific experience. First, previous self-employment had no significant effect on the survival indicator of persistence. As our heterogeneity analysis below reveals, this finding was the result of a negative effect for formerly unemployed and a positive effect for regular founders, which together yielded a net effect in the full sample close to zero. Second, industry-specific experience acquired through former dependent employment had a robust positive impact on survival. However, the negative (but insignificant) coefficient for hybrid persistence might indicate that founders who have previously been employed might feel a strong desire to return to dependent employment and, therefore, exhibit lower psychological commitment to their businesses.

Personality

While the signs of the personality variables were relatively similar across both persistence measures, with the exception of extraversion, the magnitudes and significances of particular personality items differed. Locus of control had

a relatively robust positive impact of similar magnitude on both measures. The comparison across the outcome variables revealed that the personality traits openness and extraversion had a significant impact on business survival, whereas motivational persistence depended more strongly on agreeableness, neuroticism, and risk attitudes.

Business characteristics

Formerly unemployed founders did not show any significant difference in persistence as indicated by business survival after 40 months. With respect to the hybrid persistence measure, unemployed founders showed a relatively large and highly significant negative gap in the unconditional specification, albeit which substantially decreased in size and became insignificant once we controlled for all covariate blocks in the full specification. The role of startup capital was robust and unambiguous across both persistence measures. A higher startup capital increased survival chances and hybrid persistence.

Relative importance of covariate blocks

After comparing the individual coefficients of all covariates for the two persistence measures, we now determined the relative importance of the four covariate blocks X_i – (1) human capital, (2) personality, (3) business characteristics as well as (4) other characteristics (including (4a) sociodemographic characteristics, (4b) intergenerational transmissions, (4c) startup motives, (4d) the current regional economic context) – relative to each other.

We assessed the relative importance as the share of the regression-R_i^2 of the covariate block i relative to the full regression-R^2 in the full specification. Results are reported in Table 4, where we again separated by survival (Panel A) and hybrid persistence (Panel B).[12] We again distinguished between unconditional regression results from the simple specifications 1 to 4, where only the respective covariate block X_i was included (compare to Equation (1)), and conditional results from the full specification controlling for all other covariate blocks as well (compare to Equation (2)).

Survival

All covariate blocks were individually significant at the 10 percent level in the simple specifications. The explanatory contributions varied considerably, however, with the highest unconditional contributions coming from human capital (40.3 percent, column 1) and business characteristics (38.9 percent,

[12]The results of a robustness check applying the adjusted R_a^2, which was corrected for the number of variables in each block, are similar to the standard regression-R^2 results reported here; see Table A.4 in the Appendix (available online) for details.

Table 4. Main regression results: Explanatory contributions.

	Specification				
	Full	(1)	(2)	(3)	(4)
A. *Outcome*: Survival (same business)					
Unconditional contributions in the simple specification					
Joint *p*-value	0.000	0.000	0.004	0.000	0.000
R^2	0.228	0.092	0.033	0.088	0.067
Share of R^2 (in %)	100	40.3	14.4	38.9	29.6
Conditional contributions in the full specification					
Joint *p*-value	0.000	0.000	0.013	0.000	0.000
R^2	0.228	0.08	0.031	0.067	0.048
Share of R^2 (in %)	100	35.2	13.6	29.3	20.9
B. *Outcome*: Hybrid persistence					
Unconditional contributions in the simple specification					
Joint *p*-value	0.000	0.000	0.000	0.000	0.000
R^2	0.203	0.066	0.063	0.061	0.088
Share of R^2 (in %)	100	32.5	30.9	29.9	43.5
Conditional contributions in the full specification					
Joint *p*-value	0.000	0.264	0.000	0.000	0.000
R^2	0.203	0.023	0.049	0.045	0.059
Share of R^2 (in %)	100	11.1	24.4	22.2	29.4
C. *Control variables*					
(1) Human capital	✓	✓			
(2) Personality	✓		✓		
(3) Business characteristics	✓			✓	
(4) Other characteristics	✓				✓
Number of control variables	46	12	9	8	17

Note: Reported are results from robust ordinary least squares (OLS) estimations. The reported results always refer to the joint block of indicated control variables in Panel C only. The unconditional contributions stem from regressions of the indicated outcome variable on only the indicated block of control variables (see Equation (1) in the text), while the conditional contributions stem from regressions of the persistence measure on the indicated block of control variables and all other blocks (full specification) (see Equation (2) in the text). Detailed estimation results are reported in Table 3.

column 3). Personality (column 2) displayed a moderate explanatory power of around 15 percent, while the combined other characteristics explained about 29.6 percent.[13] The values for the *partial* regression-R^2 in the full specification controlling for all variables simultaneously were slightly lower than in the unconditional regressions as expected since correlations between covariates across blocks were now controlled for. Nevertheless, we found a similar pattern across covariate blocks, with human capital and business characteristics having the largest predictive power.[14]

Hybrid persistence

For the hybrid indicator (Table 4, Panel B), the strong roles of human capital and business characteristics were confirmed, but now personality was similarly important, with unconditional R^2 shares around 30 percent for each of

[13]See Table A.5 in the Appendix (available online) for detailed information on the other characteristics.

[14]The explanatory shares of the full specification R^2 did not add up to 100 percent across covariate blocks in either case because correlations between covariates across (unconditional case) and within covariate blocks (unconditional and conditional case) were not controlled for.

these three blocks. The conditional contributions in the full specification confirmed this observation with a notable difference. Human capital was no longer significant, and its predictive power declined sharply to one-third of its unconditional value. This reflects the finding from the detailed coefficient results that some human capital variables in the full specification had opposing effects on survival and hybrid persistence and canceled out with respect to the hybrid measure.

Summary and hypotheses

Overall, our results generally match previous evidence in the literature (summarized in Table 1), but they also reveal that findings depend to a certain extent on the choice of persistence measure applied. For the survival indicator, the predictive power was concentrated in business characteristics and human capital, while for hybrid persistence the dominant factors were business characteristics and personality. We can therefore confirm all three hypotheses from the subsection Determinants of entrepreneurial persistence.

Heterogeneity analysis among different types of entrepreneurs

In the second part of our empirical analysis, we conducted a heterogeneity analysis to account for the fact that our full sample was comprised of both formerly unemployed and regular (nonunemployed) founders. As seen in the descriptive statistics, the share of necessity startups was significantly higher among unemployed founders, who also suffered from a shortage of industry-specific experience from former self-employment. They also set up smaller businesses, whereby they might have exhibited a lower level of business attachment and might have been more affected in their persistence by external factors, such as the local labor market, compared to regular founders. Therefore, we split the sample by former employment status and reran the estimations for both subgroups separately. The conditional explanatory contributions from the full specification (compare to Equation (2)) for the two persistence measures are reported in Table 5.[15]

The separate results for unemployed and regular founders reported in Table 5 showed in general higher overall regression-R^2 values for each subsample, indicating a better model fit for the split sample. The dominant roles of human capital and business characteristics for survival in the pooled sample were confirmed for both unemployed and regular founders (Table 5, Panel A). The most notable difference between the two groups concerned the role of personality. For formerly unemployed founders personality had only a moderate influence on survival, but carried the largest importance for the

[15]The corresponding detailed regression results for the individual coefficients are presented in Table A.6 in the Appendix (available online).

Table 5. Heterogeneity results by former employment status.

	Specification				
	Full	(1)	(2)	(3)	(4)
A. *Outcome*: Survival (same business)					
Conditional contributions in the full specification: Unemployed founders					
Joint *p*-value	0.000	0.001	0.000	0.000	0.018
R^2	0.255	0.092	0.022	0.073	0.069
% of full spec. R^2	100	36.2	8.6	28.5	27.0
Conditional contributions in the full specification: Regular founders					
Joint *p*-value	0.000	0.002	0.03	0.001	0.153
R^2	0.36	0.118	0.067	0.129	0.072
% of full spec. R^2	100	32.7	18.7	35.8	20.0
Number of obs.					
Subsidized	388	388	388	388	388
Regular	265	265	265	265	265
B. *Outcome*: Hybrid persistence					
Conditional contributions in the full specification: Unemployed founders					
Joint *p*-value	0.000	0.74	0.022	0.086	0.048
R^2	0.187	0.025	0.054	0.038	0.062
% of full spec. R^2	100	13.5	29.0	20.2	33.3
Conditional contributions in the full specification: Regular founders					
Joint *p*-value	0.000	0.435	0.091	0.008	0.332
R^2	0.29	0.045	0.06	0.08	0.071
% of full spec. R^2	100	15.5	20.6	27.7	24.5
Number of obs.					
Subsidized	388	388	388	388	388
Regular	265	265	265	265	265
C. *Control variables*					
(1) Human capital	✓	✓			
(2) Personality	✓		✓		
(3) Business characteristics	✓			✓	
(4) Other characteristics	✓				✓
Number of control variables	46	12	9	8	17

Note: Reported are results from robust ordinary least squares (OLS) estimations. The reported results always refer to the joint block of indicated control variables in Panel C only. The conditional contributions stem from regressions of the persistence measure on the indicated block of control variables and all other blocks (full specification), see Equation (2) in the text. Detailed estimation results are reported in Table A.6 in the Appendix (available online).

hybrid measure (Table 5, Panel B). For regular founders, hybrid persistence was mainly determined by business-related characteristics.

Robustness analysis

Adjusted R^2

Results of a robustness check applying the adjusted R^2_a, which is corrected for the number of variables in each block, were similar to the standard regression-R^2 results reported here; see Table A.4 in the Appendix for details (available online).

Estimation method (logit versus OLS)

To analyze whether our results were robust to the chosen OLS estimation method we alternatively applied logit regressions, and present the results in

Table A.7 in the Appendix (available online). We used McFadden's (1974) pseudo-R^2 as goodness-of-fit measures, which are shown in Table A.4 for the different specifications.[16] Below the pseudo-R^2, the table shows an index where the pseudo-R^2 achieved with the full model was normalized to 100 percent. The row below this index provides the difference in the index between two adjacent columns. This difference may be interpreted as an approximation of the share in the full model's explanatory power that was provided by the variables added in this column.[17] The results confirmed our findings and our hypotheses.

Conclusion

Entrepreneurial persistence is the constantly renewed decision to commit to a previously selected business venture activity despite opposing forces and enticing alternatives, and it is an essential prerequisite for entrepreneurs to exploit their business potential and realize economic gains and benefits (Patel & Thatcher, 2014). Based on a representative sample of German startups, in this article, we add to the evidence on entrepreneurial persistence in three important ways.

First, we identified the basic approaches to measure entrepreneurial persistence that had typically been applied in the entrepreneurship literature, and were able to construct two indicators – survival and hybrid persistence – from one single dataset and compare results. Second, we compared the *relative* importance of different predictors of entrepreneurial persistence. Based on an extensive literature review, we incorporated a long list of individual-level (human capital and personality) and business-related characteristics, which were previously identified as individually important determinants. Third, we took account of the fact that the population of entrepreneurs was highly diverse and determinants of entrepreneurial persistence might be heterogeneous between formerly unemployed and regular (nonunemployed) founders.

Our empirical results generally encompassed previous findings, although they revealed that the influence of most of the determinants was sensitive to the choice of persistence measure. For the full sample, we found that human capital and business-related characteristics had the highest explanatory contribution to survival, while personality and business characteristics held similar importance in explaining the hybrid measure. Our findings underline the complex nature of entrepreneurial persistence. Both persistence measures were inevitably approximations, and each one emphasized different aspects

[16]Results were qualitatively similar when other pseudo-R^2 statistics (McKelvey and Zavoina's R^2 or Efron's $R'2$) were used (the results are available from the authors on request).

[17]Full estimation results for these logit estimations are available on request from the authors.

of the construct. Survival indicators reflected the mere continuation of a business venture and did not necessarily imply or capture the psychological commitment to actively engage in the business and to invest physical and psychological resources to advance the venture as implied by entrepreneurial persistence. The hybrid measure in our setting combined survival with a subjective measure of entrepreneurial commitment in the presence of a hypothetical offer of similar paid employment. Therefore, it specifically accentuated an entrepreneur's commitment despite the availability of (potentially) attractive alternatives.

In the context of our German sample, which comprised formerly unemployed founders participating in a startup subsidy program as well as regular founders, the nature of our hybrid measure also allowed us to draw some policy conclusions about the subsidy program. We found descriptive evidence that 40 months after startup, the share of business owners with a high commitment to their businesses was significantly lower among formerly unemployed compared to regular founders, whereas we found only a small difference in survival rates. This implies that among the group of formerly unemployed founders, there was a higher share of (successfully surviving) self-employed business owners with lower business attachment, who would prefer dependent employment if those job opportunities were indeed available. This could be one contributing factor in explaining why unemployed founders were shown to create fewer jobs, induce less innovation, and invest less in their businesses, which can only insufficiently be explained by observable characteristics and endowments at business formation or (restricted) access to capital in poststartup phases (see Caliendo et al., 2019a, for a more detailed discussion) and, in turn, reinforces lower levels of entrepreneurial persistence (Gimeno et al., 1997; Zhu, Chen, & Li, 2011). From a policy perspective this needs to be considered when implementing (or redesigning) startup subsidy programs for unemployed individuals. Additional soft support measures such as coaching, counseling, mentoring, or training (accompanying the subsidy) during the pre- or early startup phase (see, for example, Rotger, Görtz, & Storey, 2012) might improve commitment and, henceforth, business potential and long-term development.

On a final note, it should be kept in mind that although persistence can be viewed as a prerequisite to exploit the potential of a given business opportunity, high persistence does not necessarily lead to positive results or outcomes (Holland & Shepherd, 2013). It rather depends on how persistent business founders react to feedback, changing environments, and adversity. On the one hand, there is evidence that persisting entrepreneurs with high resilience use their resourcefulness to adapt and improve their business performances (Ayala & Manzano, 2014). On the other hand, staying with a previously chosen, but failing, course of action is a sign of a perilous escalation of commitment. In this case, founders overly commit

to their original strategies and react to negative feedback by investing too much into and staying too long with the same plan (McCarthy, Schoorman, & Cooper, 1993). This then results in an inefficient and ineffective use of one's own and society's resources (DeTienne et al., 2008). Thus, a deeper understanding of the link between entrepreneurial persistence and entrepreneurial success is important, but beyond the scope of this article.

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References

Adomako, S., Danso, A., Uddin, M., & Damoah, J. O. (2016). Entrepreneurs' optimism, cognitive style and persistence. *International Journal of Entrepreneurial Behavior & Research*, *22*(1), 84–108. doi:10.1108/IJEBR-07-2015-0158

Aldrich, H. E., & Kim, P. H. (2007). A life course perspective on occupational inheritance: Self-employed parents and their children. In M. Ruef & M. Lounsbury (Eds.), *The sociology of entrepreneurship (Research in the sociology of organizations)* (pp. 33–82). Amsterdam, The Netherlands: Elsevier.

Alvarez, S. A., & Busenitz, L. W. (2001). The entrepreneurship of resource-based theory. *Journal of Management*, *27*(6), 755–775. doi:10.1177/014920630102700609

Audretsch, D. B., Keilbach, M. C., & Lehmann, E. E. (2006). *Entrepreneurship and economic growth*. New York, NY: Oxford University Press.

Audretsch, D. B., Keilbach, M. C., & Thurik, A. R. (2000). Capitalism and democracy in the 21st century: From the managed to the entrepreneurial economy. *Journal of Evolutionary Economics*, *10*(1), 17–34. doi:10.1007/s001910050003

Ayala, J.-C., & Manzano, G. (2014). The resilience of the entrepreneur. Influence on the success of the business. A longitudinal analysis. *Journal Of Economic Psychology*, *42*, 126–135. doi:10.1016/j.joep.2014.02.004

Bandura. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Barrick, M. R., Mount, M. K., & Gupta, R. (2003). Meta-analysis of the relationship between the five-factor model of personality and Holland's occupational types. *Personnel Psychology*, *56*(1), 45–74. doi:10.1111/peps.2003.56.issue-1

Baum, J. R., & Locke, E. A. (2004). The relationship of entrepreneurial traits, skill, and motivation to subsequent venture growth. *Journal of Applied Psychology*, *89*(4), 587–598. doi:10.1037/0021-9010.89.4.587

Becker, G. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. Chicago, IL: University of Chicago Press.

Bellmann, L., Caliendo, M., & Tübbicke, S. (2018). The post-reform effectiveness of the New German start-up subsidy for the unemployed. *LABOUR: Review of Labour Economics and Industrial Relations, 32*(3), 293–319.

Block, J., & Sandner, P. (2009). Necessity and opportunity entrepreneurs and their duration in self-employment: Evidence from German micro data. *Journal of Industry, Competition and Trade*, *9*(2), 117–137. doi:10.1007/s10842-007-0029-3

Boeker, W. (1989). Strategic change: The effects of founding and history. *Academy of Management Journal*, *32*(3), 489–515.

Brüderl, J., & Preisendörfer, P. (1998). Network support and the success of newly founded businesses. *Small Business Economics*, *10*(3), 213–225. doi:10.1023/A:1007997102930

Brüderl, J., & Ziegler, R. (1992). Survival chances of newly founded business organizations. *American Sociological Review*, *57*(2), 227–242. doi:10.2307/2096207

Caliendo, M., Fossen, F., & Kritikos, A. (2010). The impact of risk attitudes on entrepreneurial survival. *Journal of Economic Behavior and Organization*, *76*(1), 45–63. doi:10.1016/j.jebo.2010.02.012

Caliendo, M., Fossen, F., & Kritikos, A. (2014). Personality characteristics and the decisions to become and stay self-employed. *Small Business Economics*, *42*(4), 787–814. doi:10.1007/s11187-013-9514-8

Caliendo, M., & Hogenacker, J. (2012). The German labor market after the great recession: Successful reforms and future challenges. *IZA Journal of European Labor Studies*, *1*, 3. doi:10.1186/2193-9012-1-3

Caliendo, M., Hogenacker, J., Künn, S., & Wießner, F. (2015). Subsidized start-ups out of unemployment: A comparison to regular business start-ups. *Small Business Economics*, *45*(1), 165–190. doi:10.1007/s11187-015-9646-0

Caliendo, M., & Kritikos, A. (2010). Start-ups by the unemployed: Characteristics, survival and direct employment effects. *Small Business Economics*, *35*(1), 71–92. doi:10.1007/s11187-009-9208-4

Caliendo, M., Kritikos, A., & Stier, C. (2019b). The importance of start-up motives for entrepreneurial performance. *Working Paper*. Potsdam, Germany: University of Potsdam.

Caliendo, M., Künn, S., & Weißenberger, M. (2019a). Catching up or lagging behind? The long-term business potential of subsidized start-ups out of unemployment. IZA Discussion Paper No. 12690, Bonn.

Cardon, M. S., & Kirk, C. P. (2015). Entrepreneurial passion as mediator of the self-efficacy to persistence relationship. *Entrepreneurship Theory and Practice*, *39*(5), 1027–1050. doi:10.1111/etap.2015.39.issue-5

Chell, E., Harworth, J., & Brearley, S. (1991). The search for entrepreneurial traits. In E. Chell, J. Harworth, & S. Brearley (Eds.), *The entrepreneurial personality: concepts, cases and categories* (pp. 29–53). London, UK: Routledge.

Ciavarella, M. A., Buchholtz, A. K., Riordan, C. M., Gatewood, R. D., & Stokes, G. S. (2004). The big five and venture survival: Is there a linkage? *Journal of Business Venturing*, *19*(4), 465–483. doi:10.1016/j.jbusvent.2003.03.001

Cooper, A., Gimeno-Gascon, F., & Woo, C. (1994). Initial human capital and financial capital as predictors of new venture performance. *Journal of Business Venturing*, *9*(5), 371–396. doi:10.1016/0883-9026(94)90013-2

Costa, P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five Factor Inventory (FNEO-FFI)*. Odessa, FL: Psychological Assessment Resources.

Davidsson, P. (2012). Engagement, persistence, progress and success as theoretically distinct aspects of business creation processes. In *Frontiers of entrepreneurship research, Volume 31-2011: Proceedings of the 31st annual entrepreneurship research conference* (vol. 31, pp. 307–321). Syracuse, New York: Babson College, Arthur M. Blank Center for Entrepreneurship.

Dehne, M., & Schupp, J. (2007). *Persönlichkeitsmerkmale im Sozio-oekonomischen Panel (SOEP) - Konzept, Umsetzung und empirische Eigenschaften* (Research Notes 26). DIW Berlin.

DeTienne, D. R., McKelvie, A., & Chandler, G. N. (2015). Making sense of entrepreneurial exit strategies: A typology and test. *Journal of Business Venturing*, *30*(2), 255–272. doi:10.1016/j.jbusvent.2014.07.007

DeTienne, D. R., Shepherd, D. A., & De Castro, J. O. (2008). The fallacy of "only the strong survive": The effects of extrinsic motivation on the persistence decisions for under-performing firms. *Journal of Business Venturing*, *23*(5), 528–546. doi:10.1016/j.jbusvent.2007.09.004

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, *9*(3), 522–550. doi:10.1111/jeea.2011.9.issue-3

Freeland, R. E., & Keister, L. A. (2016). How does race and ethnicity affect persistence in immature ventures? *Journal of Small Business Management*, *54*(1), 210–228. doi:10.1111/jsbm.12138

Fritsch, M. (2008). How does new business development affect regional development? Introduction to the special issue. *Small Business Economics*, *30*(1), 1–14. doi:10.1007/s11187-007-9057-y

Fritsch, M., Brixy, U., & Falck, O. (2006). The effect of industry, region, and time on new business survival - A multi-dimensional analysis. *Review of Industrial Organization*, *28*(3), 285–306. doi:10.1007/s11151-006-0018-4

Georgellis, Y., Sessions, J., & Tsitsianis, N. (2007). Pecuniary and non-pecuniary aspects of self-employment survival. *The Quarterly Review of Economics and Finance*, *47*(1), 94–112. doi:10.1016/j.qref.2006.03.002

Gerlitz, J.-Y., & Schupp, J. (2005). *Zur Erhebung der Big-Five-basierten Persönlichkeitsmerkmale im SOEP* (Research Notes 4). DIW Berlin.

Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly*, *42*(4), 750–783. doi:10.2307/2393656

Holland, D. V. (2011). Utility maximization? An expectancy view of entrepreneurial persistence. *Management Research Review*, *34*(3), 337–352. doi:10.1108/01409171111116349

Holland, D. V., & Garrett, R. P. (2015). Entrepreneur start-up versus persistence decisions: A critical evaluation of expectancy and value. *International Small Business Journal*, *33*(2), 194–215. doi:10.1177/0266242613480375

Holland, D. V., & Shepherd, D. A. (2013). Deciding to persist: Adversity, values, and entrepreneurs' decision policies. *Entrepreneurship Theory and Practice*, *37*(2), 331–358. doi:10.1111/etap.2013.37.issue-2

John, O., Donahue, E., & Kentle, R. (1991). *The big five inventory - versions 4a and 54*. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

John, O. P., & Srivastava, S. (1999). The big five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (pp. 102–138). New York, NY: Guilford Press.

Koellinger, P., & Thurik, A. (2012). Entrepreneurship and the business cycle. *The Review of Economics and Statistics*, *94*(4), 1143–1156. doi:10.1162/REST_a_00224

Kristof, A. L. (1996). Person-organization fit: An integrative review of its conceptualizations, measurement, and implications. *Personnel Psychology*, *49*(1), 1–49. doi:10.1111/peps.1996.49.issue-1

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior*, *45* (1), 79–122. doi:10.1006/jvbe.1994.1027

McCarthy, A. M., Schoorman, F. D., & Cooper, A. C. (1993). Reinvestment decisions by entrepreneurs: Rational decision-making or escalation of commitment? *Journal of Business Venturing*, *8*(1), 9–24. doi:10.1016/0883-9026(93)90008-S

McClelland, D. C. (1965). N achievement and entrepreneurship: A longitudinal study. *Journal of Personality and Social Psychology*, *1*, 4. doi:10.1037/h0021956

McCrae, R., & Costa, P. (2008). The five-factor theory of personality. In O. P. John, R. Robins, & L. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 159–181). New York, NY: Guilford.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In P. Zarembka (Ed.), *Frontiers in econometrics* (pp. 105–142). New York, NY: Academic Press.

Millán, J. M., Congregado, E., & Román, C. (2012). Determinants of self-employment survival in Europe. *Small Business Economics*, *38*(2), 231–258. doi:10.1007/s11187-010-9260-0

Nolte, H., Weischer, C., Wilkesmann, U., Maetzel, J., & Tegethoff, H. G. (1997). *Kontrolleinstellungen zum Leben und der Zukunft - Auswertung eines neuen sozialpsychologischen Itemblocks im Sozio-oekonomischen Panel*. Bochum, Germany: Ruhr University Bochum, Faculty of Social Sciences.

Oberschachtsiek, D. (2012). The experience of the founder and self-employment duration: A comparative advantage approach. *Small Business Economics*, *39*(1), 1–17. doi:10.1007/s11187-010-9288-1

Parker, S. C. (2009). *The economics of entrepreneurship*. New York, Cambridge: Cambridge University Press.

Patel, P. C., & Thatcher, S. M. (2014). Sticking it out: Individual attributes and persistence in self-employment. *Journal of Management*, *40*(7), 1932–1979. doi:10.1177/0149206312446643

Rauch, A., & Frese, M. (2007). Let's put the person back into entrepreneurship research: A meta-analysis on the relationship between business owners' personality traits, business creation, and success. *European Journal of Work and Organizational Psychology*, *16*(4), 353–385. doi:10.1080/13594320701595438

Rotger, G. P., Görtz, M., & Storey, D. J. (2012). Assessing the effectiveness of guided preparation for new venture creation and performance: Theory and practice. *Journal of Business Venturing*, *27*(4), 506–521. doi:10.1016/j.jbusvent.2012.01.003

Rotter, J. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs*, *80*(1), 1–28. doi:10.1037/h0092976

Schmitt-Rodermund, E. (2004). Pathways to successful entrepreneurship: Parenting, personality, early entrepreneurial competence, and interests. *Journal of Vocational Behavior*, *65* (3), 498–518. doi:10.1016/j.jvb.2003.10.007

Schmitt-Rodermund, E. (2007). The long way to entrepreneurship: Personality, parenting, early interests, and competencies as precursors for entrepreneurial activity among the 'termites'. In R. K. Silbereisen & R. M. Lerner (Eds.), *Approaches to positive youth development* (pp. 205–224). London, UK: SAGE Publications.

Schwarzer, R., & Jerusalem, M. (1999). *Skalen zur Erfassung von Lehrerund Schülermerkmalen. Dokumentation der psychometrischen Verfahren im Rahmen der Wissenschaftlichen Begleitung des Modellversuchs Selbstwirksame Schulen*. Berlin, Germany: Freie Universität Berlin.

Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science, 11*(4), 448–469.

Stinchcombe, A. L. (1965). Social structures and organizations. In J. G. March (Ed.), *Handbook of organizations* (pp. 142–193). Chicago, IL: Rand McNally.

Unger, J., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing*, *26*(3), 341–358. doi:10.1016/j.jbusvent.2009.09.004

Urbig, D., & Monsen, E. (2012). The structure of optimism: Controllability affects the extent to which efficacy beliefs shape outcome expectancies. *Journal Of Economic Psychology*, *33* (4), 854–867. doi:10.1016/j.joep.2012.03.004

van Praag, C. (2003). Business survival and success of young small business owners: An empirical analysis. *Small Business Economics*, *21*(1), 1–17. doi:10.1023/A:1024453200297

Vroom, V. H. (1964). *Work and motivation*. New York, NY: Wiley.

Wagner, G., Frick, J., & Schupp, J. (2007). The German Socio-Economic Panel Study (SOEP): Scope, evolution and enhancements. *Schmollers Jahrbuch*, *127*(1), 139–170.

Wu, S., Matthews, & Dagher, G. K. (2007). Need for achievement, business goals, and entrepreneurial persistence. *Management Research News*, *30*(12), 928–941. doi:10.1108/01409170710833358

Zhao, H., & Seibert, S. (2006). The big five personality dimensions and entrepreneurial status. *Journal of Applied Psychology*, *91*(2), 259–271. doi:10.1037/0021-9010.91.2.259

Zhu, F., Chen, R., & Li, M. (2011). The divergent effects of autonomy and passion on persistence in new venture creation. *Academy of Management Proceedings*, *2011*(1), 1–6.