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ABSTRACT

Entrepreneurial Persistence beyond Survival: Measurement and Determinants[*]

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 counter forces or enticing alternatives. It is thus a crucial factor for entrepreneurs when pursuing and exploiting their business opportunities and to realize potential economic gains and benefits. Using rich data on a representative sample of German business founders, we investigate the determinants of entrepreneurial persistence. Next to observed survival we also construct a hybrid persistence measure capturing also the motivational dimension of persistence. We analyze the influence of individual-level (human capital and personality) and business-related characteristics on both measures as well as their relative importance. We find that the two indicators emphasize different aspects of persistence. For the survival indicator, the predictive power is concentrated in business characteristics and human capital, while for hybrid persistence, the dominant factors are business characteristics and personality. Finally, we show that results are heterogeneous across subgroups. In particular, formerly-unemployed founders do not differ in survival chances, but they are more likely to lack a high psychological commitment to their business ventures.

JEL Classification:	L26, M13
Keywords:	entrepreneurship, start-ups, persistence, survival

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1 Introduction

Entrepreneurship has been recognized as vital to increasing productivity, spurring innovation, and enhancing employment opportunities (Koellinger and Thurik, 2012; Fritsch, 2008; Audretsch *et al.*, 2006). However, to realize the economic benefits of their entrepreneurial activity, individuals must not only choose to become entrepreneurs but also persist with their business venture (Patel and 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 continue to actively pursue a previously-selected entrepreneurial opportunity; and second, doing so in the face of adversity or attractive alternatives (Holland and Shepherd, 2013; Holland, 2011; Gimeno *et al.*, 1997). Accordingly, an entrepreneur's persistence decision is fundamentally different from the initial start-up 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 and Garrett, 2015). The venturing effort may prove more difficult, expensive, or time-consuming than originally expected. Governmental regulations may delay development and/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 *et al.*, 2016; Cardon and Kirk, 2015).

While some early work has considered persistence as a trait (e.g., Baum and Locke, 2004), the more recent literature suggests that entrepreneurial persistence is a function of individual, business-related and contextual factors (Holland and Shepherd, 2013; DeTienne *et al.*, 2008). For instance, studies have found that individual dispositions derived from personality factors (e.g. Caliendo *et al.*, 2014; Patel and Thatcher, 2014), and competencies, skills and knowledge all strongly relate to persistence with a newly-founded business (e.g. Freeland and Keister, 2016; Gimeno *et al.*, 1997). DeTienne *et al.* (2008) showed 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 start-up capital (e.g. DeTienne

et al., 2008; Brüderl and Preisendörfer, 1998) and industry sector (Fritsch *et al.*, 2006) or the regional economic conditions (Millán *et al.*, 2012; Gimeno *et al.*, 1997).

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 *et al.*, 2019b, 2015), we contribute to the literature on the determinants of entrepreneurial persistence in three important ways. First, we examine survival and a constructed hybrid measure as different types of persistence from one single data set. In particular, the data contain indicators of entrepreneurial persistence in terms of both observed survival as well as a subjective measure capturing the motivational dimension of persistence (i.e. strong commitment to the business despite a hypothetical offer of a similar job in paid employment). Thus, we can 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 have access to a rich list of predictors of entrepreneurial persistence covering a multitude of individual-level, business-related, and contextual characteristics. We draw from research that proposes founding/founder effects to explain variance in new venture performance (Baum and Locke, 2004; Boeker, 1989; Stinchcombe, 1965) in order to identify a set of relevant persistence predictors. Hence, we focus 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 socio-demographic characteristics, intergenerational transmissions, start-up motives and the regional economic context. This enables 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 enables a more holistic approach to investigate the relative importance for entrepreneurial persistence between covariate groups. Third, we take account of the fact that entrepreneurs are heterogeneous (Alvarez and Busenitz, 2001). We provide a separate analysis for the subgroups of formerly-unemployed and regular (non-unemployed) 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 *et al.*, 2015; Caliendo and Kritikos, 2010), and they are different from the "general population" of founders in terms of availability of and/or access to human, social, and financial capital (Caliendo *et al.*, 2019b, 2015). 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 yield the following findings. First, while some factors (locus of control, start-up capital) have a robust influence on persistence, the importance of most other factors is sensitive to the choice of the persistence measure (e.g. unemployment and industry-specific experience, Big Five personality traits). Second, for the survival indicator, the relative importance of predictors is concentrated in business characteristics and human capital, while for hybrid persistence the dominant factors are business characteristics and personality. Third, our heterogeneity analysis enables a detailed sub-group analysis and reveals that the psychological commitment of unemployed founders is more strongly influenced by personality compared to regular founders.

The remainder of this paper is organized as follows. In the next section, we review the literature on entrepreneurial persistence. Section 3 introduces our dataset, describes the construction of our persistence measures, and presents some descriptive statistics. Our empirical strategy is described in Section 4, while the results are presented in Section 5. The paper concludes with a summary and discussion of our results.

2 Literature review

2.1 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, counter forces, or attractive alternatives (Holland and Shepherd, 2013; Holland, 2011; Gimeno *et al.*, 1997).[1] Given the complexity of the concept, we find a varied range of persistence measures applied in previous entrepreneurship studies on this topic. Overall, we identify 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 closely linked, they are not necessarily identical. The definition of persistence usually involves a psychological commitment, i.e. 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 (e.g. 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 (e.g. Holland and Garrett, 2015; DeTienne *et al.*,

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[1]Davidsson (2012) distinguishes this shorter-term perspective from a longer-term view, in which entrepreneurial persistence captures re-entries 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 follow the large majority of previous studies in the literature and consider persistence at the individual founder's level.

[2]See e.g. Block and Sandner (2009), Brüderl and Preisendörfer (1998), Brüderl *et al.* (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).

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*.

2.2 Determinants of entrepreneurial persistence

The entrepreneurship literature presents the prevailing view that entrepreneurial persistence is a function of a variety of predictors (Holland and Shepherd, 2013; DeTienne *et al.*, 2008). Both individual attributes of the entrepreneur and initial characteristics of the start-up 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 *et al.*, 1994). Driven by their values, motivations, goals, and personalities, the founders determine the subsequent development of start-ups because they shape the basic identity and configuration of the new organizations (Baum and 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.*, 1994). The former reflect the influence of long-run stable individual traits (Zhao and Seibert, 2006) whereas the latter reflect the impact of human capital accumulated over time (Unger *et al.*, 2011).

In the following, we elaborate on individual characteristics of the entrepreneur, i.e. (1) human capital and (2) personality traits, as well as (3) business characteristics as determinants of entrepreneurial persistence. We further develop hypotheses for predicting our two distinct persistence measures, *survival* and *hybrid persistence*. Our data also allows us to control for other characteristics (socio-demographic characteristics, intergenerational transmissions, start-up motives and the regional economic context), although they are not the focus of our interest. Table 1 provides an overview of previous findings.

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

[Insert Table 1 about here]

Human capital   Human capital reflects knowledge and skills that individuals have acquired through education, training and on-the-job experience, which provides them 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. Since human capital encompasses a diverse range of skills and knowledge, it may lead to divergent influences on start-up 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 and Keister, 2016; Millán *et al.*, 2012; Gimeno *et al.*, 1997), while there is also evidence that education has no effect on persistence (e.g. Patel and Thatcher, 2014; Davidsson, 2012; Georgellis *et al.*, 2007). 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 (e.g. Freeland and Keister, 2016; Davidsson, 2012; Ciavarella *et al.*, 2004). Likewise, skills related to labor market experience, management experience, and previous entrepreneurial experience have a strong and positive impact on persistence (e.g. Oberschachtsiek, 2012; Georgellis *et al.*, 2007; Gimeno *et al.*, 1997). 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

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(2003), Georgellis *et al.* (2007), and Millán *et al.* (2012) report that individuals with previous unemployment experience are more likely to terminate their current start-up projects. This negative effect on survival seems to be pronounced for longer unemployment spells. Oberschachtsiek (2012) finds that an unemployment duration of less than four months before starting a business indeed positively relates to survival in self-employment. Taking 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, e.g. 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 both expectancy (i.e. the entrepreneur's belief in running a successful business) and value (i.e. the perceived desirability of the expected performance of the new venture) (Holland and Shepherd, 2013; Holland, 2011). 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 start-up. Overcoming these challenges and increasingly believing in one's ability to control events will increase one's own expectations of entrepreneurial success (Urbig and Monsen, 2012). Additionally, a broader perspective and understanding enables 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 start-up 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 and Shepherd, 2013; Holland, 2011). 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 suggested 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 and 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 both 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 and 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 *et al.*, 2003; Schmitt-Rodermund, 2004, 2007; Rauch and Frese, 2007; Zhao and Seibert, 2006), which establishes the five broad personality dimensions of openness, conscientiousness, extraversion, agreeableness, and neuroticism (the "Big Five", McCrae and Costa, 2008, Costa and McCrae, 1992; see e.g. John and 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) find 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 *et al.*, 1994), as well as playing a prominent role in entrepreneurship research in particular (e.g. Rauch and Frese, 2007). One basic result in past entrepreneurship studies is that interindividual differences in control beliefs, e.g. higher levels of self-efficacy or internal locus of control, are among those personal factors that show the strongest effects on entrepreneurial success (Rauch and 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 *et al.*, 1991), which has also found empirical support (Caliendo *et al.*, 2014, 2010). 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 start-up has been shown to increase the chances of a new venture surviving and growing (Brüderl *et al.*, 1992; Cooper *et al.*, 1994), among others 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 start-up capital on an entrepreneur's persistence decision (Freeland and Keister, 2016; Oberschachtsiek, 2012; Gimeno *et al.*, 1997). Industry affiliation also plays a significant role for explaining persistence differences (e.g. Fritsch *et al.*, 2006). Industries differ in competition intensity, capital intensity, demand structure, or 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 (e.g. Davidsson, 2012; Georgellis *et al.*, 2007; van Praag, 2003). The literature does not provide any arguments suggesting differences in the relationship between business characteristics and both 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 In order to avoid omitted variable bias, later in the empirical analysis we will also control for other characteristics that have been proven to be important in previous research (but are not in the focus of our interest). These variables include socio-demographic characteristics (e.g. age, based on the findings by Block and Sandner, 2009; van Praag, 2003; Gimeno *et al.*, 1997), intergenerational transmissions (for reviews, see e.g. Aldrich and Kim, 2007; Parker, 2009), start-up motivations and the distinction between opportunity and necessity entrepreneurs (e.g. Gimeno *et al.*, 1997; Oberschachtsiek, 2012; Patel and Thatcher, 2014; Caliendo *et al.*, 2019a), as well as the macro environment in which an entrepreneur operates (see e.g. Audretsch and Thurik, 2000; Georgellis *et al.*, 2007; van Praag, 2003; Millán *et al.*, 2012).

3 Data

3.1 Data creation and estimation sample

We use data originally collected by Caliendo *et al.* (2019b, 2015) on a sample of male founders who started full-time businesses in the first quarter of 2009 in Germany. The data set comprises random samples of unemployed founders who participated in the German start-up subsidy program for unemployed individuals (*Gründungszuschuss*), and "regular" founders, i.e. founders who were not unemployed directly prior to start-up and consequently did not receive the subsidy (see Caliendo *et al.*, 2019b, 2015, for details on data construction). The start-up subsidy could be legally claimed if the eligible unemployed individuals met the following two 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 start-ups out of unemployment constituted a large share, about 40% to 60%, of all full-time start-ups in Germany between 2006 and 2011 (depending on the underlying data source, see Caliendo *et al.*, 2015), which is why we include

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[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% (67% 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 and Hogenacker, 2012).

them in our analysis.[5]

[Insert Figure 1 about here]

The business founders in our sample were surveyed twice. The first interview was conducted about 19 months after start-up (wave 1) and focused on an extensive list of start-up characteristics, socio-demographics, previous labor market experiences, intergenerational transmissions, as well as the founders' labor market status and, conditional on ongoing business activity with their initial start-up 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) extends the observation window to 40 months after start-up. Figure 1 shows that we have 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 results in 653 observations for our final estimation sample, of which 388 (265) are formerly-subsidized (regular) founders. An examination of selective sample attrition shows that our estimation sample is very similar to the original full sample. Most importantly, survival rates in wave 1 are not affected by significant sample selectivity.[6] The estimation sample contains 495 founders who are still self-employed in wave 2 with the same business as at start-up in 2009, divided between 287 formerly-subsidized and 208 regular founders.

3.2 Definition of persistence measures

In the literature review, we have 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 data set, we capture 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 seven-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. Since this question was only

[5]Meanwhile, a major reform of the program at the end of 2011 has substantially reduced entry numbers (see Bellmann *et al.*, 2016, for details)

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

asked in the second interview, we are unable to conduct a full panel analysis but use this information cross-sectional at the end of our observation period instead. Based on the reverse scores, we construct a persistence index, whereby higher values indicate 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 are fully motivated and committed to continue their self-employment and score the highest value on the index, which applies across all subgroups. Based on this, we construct the following two measures:

[Insert Figure 2 about here]

1. Survival   Following the majority of studies using *survival* as a proxy variable for entrepreneurial persistence, our first persistence measure is a binary survival dummy indicating whether the founder is still self-employed and actively operating the same business in wave 2 as at the original start-up in the first quarter of 2009, i.e. 40 months after business formation:

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

2. Hybrid persistence   For this measure, we combine 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:

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

In this sense, the hybrid measure differs from survival by imposing the additional requirement of a high score on the subjective persistence index in order to be considered as persistent.[7] Overall, both persistence measures emphasize a different aspect of persistence, and, consequently,

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[7]Our subjective component reflects the presence of very 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 very robust to this slight change in the definition. Detailed estimation tables are available from the authors upon request.

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 non-survival or survival with a stronger preference to abandon self-employment.

3.3 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% of all founders are still self-employed in wave 2. Comparing across subgroups, we find moderately lower survival rates among formerly-unemployed founders (74.0%, column 2) compared to regular founders (78.5%, column 3). Moving to our hybrid persistence indicator reveals that 35.5% of all founders display high persistence in the full sample (column 1), where the share of highly persistent formerly-unemployed founders is significantly lower (30.4%) than the respective share of regular founders (43.0%).

[Insert Table 2 about here]

Control variables Based on our review of the entrepreneurship literature, we arrange our 46 control variables into four blocks X_i, with $i = 1, \ldots, 4$. They comprise (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 comprises regular founders and formerly-unemployed participants in a start-up subsidy program, our list also includes 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.[9]

The founders in our estimation sample (column 1) are, on average, 42 years old. The majority have German citizenship (95%), are married (65%) and have completed upper secondary school (52%). About one in four founders have industry-specific experience due to former self-employment, whereas 10% do not have any such experience prior to business formation. Close

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

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

to 40% have at least one parent who is currently or was self-employed in the past. The average start-up capital amounts 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 3) shows that, as expected, formerly-unemployed founders have more unemployment experience and less industry-specific experience prior to their new business formation. They also suffer 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 invest less capital in their new businesses at start-up. Moreover, formerly-unemployed founders also operate in slightly less favorable regional economic environments in terms of open vacancies and unemployment rates.

4   Empirical strategy

Our main goal for the empirical section is twofold: first, we examine the main determinants of entrepreneurial persistence and their relative importance; and second, we compare 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 conduct a series of robust OLS estimations for each persistence measure.[10] In a first step, we regress persistence on each covariate block X_i separately in the simple specifications 1 to 4, see equation (1) below, and determine their individual coefficients vector $\tilde{\beta}_i$ and goodness-of-fit measures, which indicate their joint explanatory power. Since we do not condition on any other covariate blocks at this stage, the results will be labeled "unconditional."

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

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

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[10]The results are robust to applying a logit/probit approach and will be presented in Section 5.4. We use robust OLS because the interpretation of R^2 measures is more straightforward than in logit/probit approaches.

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

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 choose 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 part (Sections 5.1 to 5.2) of the following empirical discussion, we conduct the analysis for the full sample. In the second part (Section 5.3), 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 Section 5.4.

5 Empirical results

5.1 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).

[Insert Table 3 about here]

Human capital A higher lifetime share of unemployment proves to be negatively associated with objective persistence (i.e. business survival). Its significant negative effect on hybrid persistence is not robust to the inclusion of other covariate blocks, and it does not affect the

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[11]Since the number of control variables varies across covariate blocks, we also calculate 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.

motivational persistence of surviving business founders in any significant way. This comparison shows that while a higher share of lifetime unemployment does 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 does not affect hybrid persistence.

Furthermore, we find ambiguous effects of industry-specific experience. First, previous self-employment has no significant effect on the survival indicator of persistence. As our heterogeneity analysis below will reveal, this finding is the result of a negative effect for formerly-unemployed and a positive effect for regular founders, which together yield a net effect in the full sample close to zero. Second, industry-specific experience acquired through former dependent employment has 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 are relatively similar across both persistence measures, with the exception of extraversion, the magnitudes and significances of particular personality items differ. Locus of control has a relatively robust positive impact of similar magnitude on both measures. The comparison across the outcome variables reveals that the personality traits openness and extraversion have a significant impact on business survival, whereas motivational persistence depends more strongly on agreeableness, neuroticism, and risk attitudes.

Business characteristics Formerly-unemployed founders do not show any significant difference in persistence as indicated by business survival after 40 months. With respect to the hybrid persistence measure, unemployed founders show a relatively large and highly significant negative gap in the unconditional specification, albeit which substantially decreases in size and becomes insignificant once we control for all covariate blocks in the full specification. The role of start-up capital is very robust and unambiguous across both persistence measures. A higher start-up capital increases survival chances and hybrid persistence.

5.2 Relative importance of covariate blocks

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

We assess 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 separate by survival (Panel A) and hybrid persistence (Panel B).[12] We again distinguish between unconditional regression results from the simple specifications 1 to 4, where only the respective covariate block X_i is included (cf. equation (1)), and conditional results from the full specification controlling for all other covariate blocks as well (cf. equation (2)).

[Insert Table 4 about here]

Survival   All covariate blocks are individually significant at the 10% level in the simple specifications. The explanatory contributions vary considerably, however, with the highest unconditional contributions coming from human capital (40.3%, column 1) and business characteristics (38.9%, column 3). Personality (column 2) displays a moderate explanatory power of around 15%, while the combined other characteristics explain about 29.6%.[13]

The values for the *partial* regression-R^2 in the full specification controlling for all variables simultaneously are slightly lower than in the unconditional regressions as expected since correlations between covariates across blocks are now controlled for. Nevertheless, we find 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 are confirmed, but now personality is similarly important,

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

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

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

with unconditional R^2 shares around 30% for each of these three blocks. The conditional contributions in the full specification confirm this observation with a notable difference. Human capital is no longer significant, and its predictive power declines 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 have opposing effects on survival and hybrid persistence and cancel 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 is concentrated in business characteristics and human capital, while for hybrid persistence the dominant factors are business characteristics and personality. We can therefore confirm all three hypotheses from Section 2.2.

5.3 Heterogeneity analysis among different types of entrepreneurs

In the second part of our empirical analysis, we conduct a heterogeneity analysis to account for the fact that our full sample comprises of both formerly-unemployed and regular (non-unemployed) founders. As seen in the descriptive statistics, the share of necessity start-ups is significantly higher among unemployed founders, who also suffer from a shortage of industry-specific experience from former self-employment. They also set up smaller businesses, whereby they might exhibit a lower level of business attachment and might be more affected in their persistence by external factors like the local labor market compared to regular founders. Therefore, we split the sample by former employment status and rerun the estimations for both subgroups separately. The conditional explanatory contributions from the full specification (cf. equation (2)) for the two persistence measures are reported in Table 5.[15]

[Insert Table 5 about here]

The separate results for unemployed and regular founders reported in Table 5 show 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

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

pooled sample are confirmed for both unemployed and regular founders (Table 5, Panel A). The most notable difference between the two groups concerns the role of personality. For formerly-unemployed founders personality has only a moderate influence on survival, but carries the largest importance for the hybrid measure (Table 5, Panel B). For regular founders, hybrid persistence is mainly determined by business-related characteristics.

5.4 Robustness analysis

Adjusted R^2   Results of a robustness check applying the adjusted R_a^2, which is corrected for the number of variables in each block, are very similar to the standard regression-R^2 results reported here; see Table A.4 in the Appendix for details.

Estimation Method (Logit vs. OLS)   In order to analyze whether our results are robust to the chosen OLS estimation method, we alternatively apply logit regressions and present the results in Table A.7 in the Appendix. We use 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 is normalized to 100%. 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 is provided by the variables added in this column.[17] The results confirm our findings and our hypotheses.

6   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 and Thatcher, 2014). Based on a representative sample of German start-ups, in this paper, we add to the evidence on entrepreneurial persistence in three important ways.

First, we identify the basic approaches to measure entrepreneurial persistence that have typically been applied in the entrepreneurship literature, and are able to construct two indicators

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[16]Results are qualitatively similar when other pseudo-R^2 statistics (McKelvey and Zavoina's R^2 or Efron's $R'2$) are 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.

– *survival* and *hybrid persistence* – from one single data set and compare results. Second, we compare the *relative* importance of different predictors of entrepreneurial persistence. Based on an extensive literature review, we incorporate a long list of individual-level (human capital and personality) and business-related characteristics, which were previously identified as individually important determinants. Third, we take account of the fact that the population of entrepreneurs is highly diverse and determinants of entrepreneurial persistence might be heterogeneous between formerly-unemployed and regular (non-unemployed) founders.

Our empirical results generally encompass previous findings, although they reveal that the influence of most of the determinants is sensitive to the choice of persistence measure. For the full sample, we find that human capital and business-related characteristics have the highest explanatory contribution to survival, while personality and business characteristics hold similar importance in explaining the hybrid measure. Our findings underline the complex nature of entrepreneurial persistence. Both persistence measures are inevitably approximations, and each one emphasizes different aspects of the construct. Survival indicators reflect the mere continuation of a business venture and do not necessarily imply or capture the psychological commitment to actively engage in the business and to invest physical and/or psychological resources to advance the venture as implied by entrepreneurial persistence. The hybrid measure in our setting combines survival with a subjective measure of entrepreneurial commitment in the presence of a hypothetical offer of similar paid employment. Therefore, it specifically accentuates an entrepreneur's commitment despite the availability of (potentially) attractive alternatives.

In the context of our German sample, which comprises formerly-unemployed founders participating in a start-up subsidy program as well as regular founders, the nature of our hybrid measure also allows us to draw some policy conclusions about the subsidy program. We find descriptive evidence that 40 months after start-up, the share of business owners with a high commitment to their businesses is significantly lower among formerly-unemployed compared to regular founders, whereas we find only a small difference in survival rates. This implies that among the group of formerly-unemployed founders, there is 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 are shown to create fewer jobs, induce less innovation,

and investing less in their businesses, which can only insufficiently be explained by observable characteristics and endowments at business formation or (restricted) access to capital in post start-up phases (see Caliendo *et al.*, 2019b, for a more detailed discussion) and, in turn, reinforces lower levels of entrepreneurial persistence (Zhu *et al.*, 2011; Gimeno *et al.*, 1997). From a policy perspective this needs to be considered when implementing (or re-designing) start-up subsidy programs for unemployed individuals. Additional soft support measures like coaching, counseling, mentoring, or training (accompanying the subsidy) during the pre or early start-up phase (see, e.g. Rotger *et al.*, 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 and 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 and 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 *et al.*, 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 paper.

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Figures and Tables

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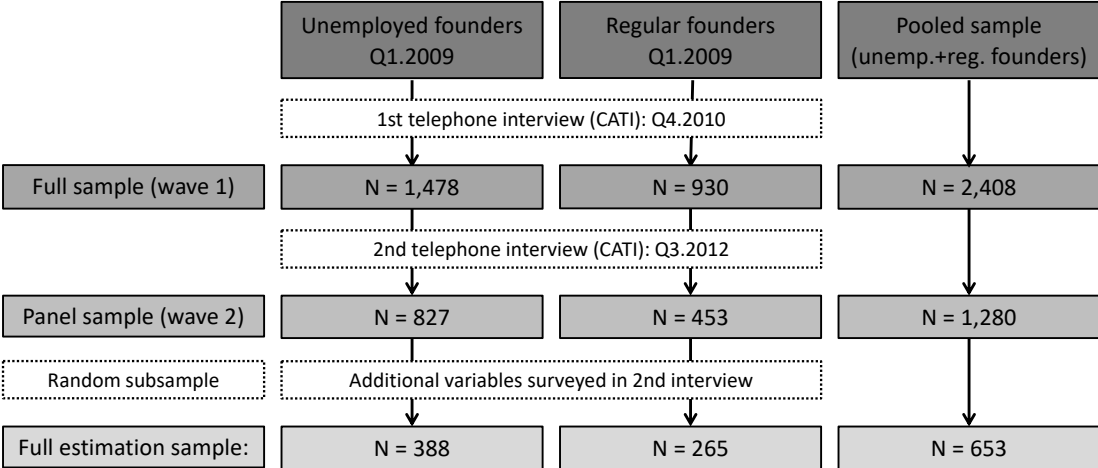
Note: For details, see Caliendo *et al.* (2019b, 2015).

Figure 2: Willingness to stay self-employed

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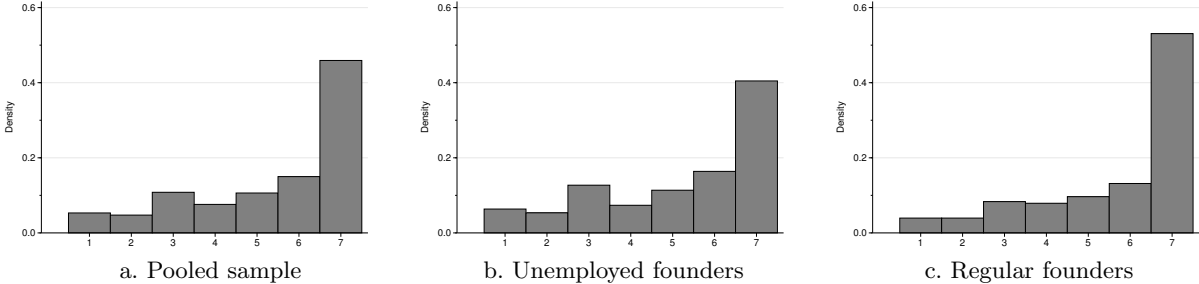
Note: Respondents in the second wave were asked: "Now, I would like to know how satisfied you are overall with your professional self-employment. Assume you were offered a similar job as a dependent employment. Would you terminate your current self-employment and accept the offer of the dependent employment?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

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*		
Start-up 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 *et al.* (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 *et al.* (2015), r. DeTienne *et al.* (2008), s. Holland and Garrett (2015), t. Holland and Shepherd (2013), u. Wu *et al.* (2007)

Table 2: Descriptive statistics

	Pooled	By former emp. status	
	estimation sample (1)	Unemployed founders (2)	Regular founders (3)
Number of obs.	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 start-up[b]			
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 start-up			
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[c]			
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[c]			
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[c]	5.5	5.5	5.5
General self-efficacy[c]	5.3	5.3	5.3
Readiness to take risk[d]	6.2	6.3	6.1
(3) Business characteristics			
Start-up capital			
None or not spec.	0.161	0.160	0.162
<10,000 Euro	0.349	0.379	0.306*
10,000-<50,000 Euro	0.322	0.345	0.287
≥50,000 Euro	0.149	0.108	0.208***
Share of own equity at start-up	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% level.
[b] Measured as share of working time, standardized by age−15.
[c] Measured on a seven-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table A.2 in the Appendix for details.
[d] Measured on an eleven-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 for details.

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 start-up[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*				
Start-up capital				
None or not spec. (ref.)				
<10,000 Euro	-.033	0.015	0.007	0.096
10,000-<50,000 Euro	0.124**	0.133**	0.166**	0.203***
≥50,000 Euro	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
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 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 Section 3.2. ***/**/* indicate significantly different means between subgroups at the 1/5/10% level.

[a] Measured as share of working time, standardized by age−15.

[b] Initially measured on a seven-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table A.2 in the Appendix for details, and then standardized.

[c] Measured on an eleven-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 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 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.

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 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.

A   Appendix

Table A.1: Sample selectivity pattern

	Pooled sample		Unemployed founders		Regular founders	
	Full sample	Estimation sample	Full sample	Estimation sample	Full sample	Estimation sample
	(1)	(2)	(3)	(4)	(5)	(6)
Number of obs.	2,408	653	1,478	388	930	265
Survival (same business)	0.771	0.790	0.805	0.822	0.717	0.743
Age at start-up	41.019	41.908*	40.164	40.861	42.376	43.442
German	0.939	0.956*	0.933	0.951	0.949	0.962
Residence						
North Germany	0.154	0.150	0.160	0.152	0.144	0.147
East Germany	0.175	0.179	0.217	0.209	0.109	0.136
South Germany	0.333	0.346	0.293	0.309	0.397	0.400
West Germany	0.338	0.325	0.329	0.330	0.351	0.317
Married	0.587	0.643***	0.572	0.634**	0.611	0.657
Children in household	0.659	0.646	0.639	0.616	0.690	0.691
Human capital						
Highest schooling certificate						
Upper secondary school	0.474	0.518**	0.478	0.518	0.468	0.517
Professional education						
University education	0.297	0.325	0.309	0.332	0.276	0.313
Unemployment experience						
before start-up[a]						
0 or not specified	0.255	0.248	0.074	0.072	0.543	0.506
>0-2	0.294	0.332*	0.332	0.381*	0.235	0.260
>2-5	0.223	0.225	0.292	0.281	0.114	0.143
>	0.228	0.194*	0.303	0.265	0.108	0.091
Industry-specific experience						
before start-up						
Due to former self-emp.	0.214	0.225	0.194	0.193	0.246	0.272
Due to dependent emp.	0.751	0.784*	0.787	0.812	0.695	0.743
None	0.115	0.093*	0.110	0.082*	0.124	0.109
Intergen. transmission						
Business takeover from parents	0.073	0.100**	0.028	0.039	0.144	0.189*
Parental self-employment	0.382	0.389	0.329	0.332	0.466	0.472
Paternal human capital						
Upper secondary school	0.244	0.254	0.248	0.260	0.238	0.245
University education	0.196	0.214	0.204	0.235	0.183	0.185
Start-up motives[b]						
Opportunity	3.4	3.5	3.5	3.5	3.4	3.4
Career ambition	4.4	4.2**	4.4	4.1***	4.3	4.3
Necessity	2.3	2.3	2.6	2.6	1.8	1.8
Business characteristics						
Start-up capital						
None or not spec.	0.177	0.161	0.179	0.160	0.173	0.162
<10,000 Euro	0.361	0.349	0.403	0.379	0.296	0.306
10,000 -<50,000 Euro	0.322	0.322	0.317	0.345	0.329	0.287
≥50,000 Euro	0.110	0.149**	0.078	0.108*	0.161	0.208*
Share of own equity at start-up	0.549	0.575	0.550	0.589	0.548	0.556
Business sector						
Manufacturing, construction	0.288	0.271	0.265	0.242	0.324	0.313
Retail	0.152	0.152	0.143	0.144	0.167	0.162
Information, financial,						
and IT services	0.162	0.164	0.174	0.183	0.144	0.136
Other services	0.306	0.315	0.316	0.320	0.291	0.309
Other sector	0.091	0.098	0.101	0.111	0.074	0.079

Note: ***/**/* indicate significantly different means at the 1/5/10% level. Missing variables compared to the full list of covariates in our analysis were not surveyed for the full sample and thus cannot be tested.

[a] Reported as share of working time, standardized by age−15.

[b] Measured on a seven-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table A.2 for details.

32

Table A.2: Construction of selected control variables

Skills and knowledge: *How do you rate your skills and knowledge in the following areas?*
Please answer on the basis of a scale ranging from 1 "very poor" to 7 "very good".

Q1. Leading an organization.
Q2. Conduct negotiations.
Q3. Organization and development.
Q4. Accounting.
Q5. Merchandise purchase.
Q6. Customer acquisition.
Q7. Marketing.
Q8. Industry knowledge.

Aggregated skills and knowledge indices scaled from 1 to 7:
Strategy and leadership = [Q1+Q2+Q3]/3
Front office = [Q6+Q7]/2
Back office = [Q4+Q5]/2
Industry knowlegde = [Q8]

Big five: *To what degree do the following statements apply to you personally?*
Please answer on the basis of a scale ranging from 1 "does not apply at all" to 7 "applies entirely".
I see myself as someone who . . .

Q1.   does a thorough job.
Q2.   is communicative, talkative.
Q3.   worries a lot.
Q4.   tends to be lazy.
Q5.   is outgoing, sociable.
Q6.   values artistic experiences.
Q7.   gets nervous easily.
Q8.   does things effectively and efficiently.
Q9.   is considerate and kind to others.
Q10. has an active imagination.

Aggregated big five indices scaled from 1 to 7:
Conscientiousness = [Q1+R(Q4)+Q8]/3
Extraversion = [Q2+Q5]/2
Agreeableness = [Q9]
Neuroticism = [Q3+Q7]/2
Openness = [Q6+Q10]/2

Locus of control: *To what degree do you personally agree with the following statements?*
Please answer on the basis of a scale ranging from 1 "do not agree at all" to 7 "agree completely".

Q1. How my life takes course is entirely dependent on me.
Q2. What one achieves is, in the first instance, a question of destiny and luck.
Q3. I often experience that others make decisions about my life.
Q4. Success is gained through hard work.
Q5. When I encounter difficulties in life, I often doubt my abilities.
Q6. I have little control over things which happen in my life.

Aggregated locus of control index scaled from 1 to 7:
Locus of control = [Q1+R(Q2)+R(Q3)+Q4+R(Q5)+R(Q6)]/6

General self-efficacy: *Now think of your overall professional situation. To what degree do you*
personally agree with the following statements?
Please answer on the basis of a scale ranging from 1 "do not agree at all" to 7 "agree completely".

  Q1.   If someone opposes me, I can find the means and ways to get what I want.
  Q2.   I can always manage to solve difficult problems if I try hard enough.
  Q3.   It is easy for me to stick to my aims and accomplish my goals.
  Q4.   I am confident that I could deal efficiently with unexpected events.
  Q5.   I can remain calm when facing difficulties because I can rely on my coping abilities.
  Q6.   No matter what comes my way/I can usually handle whatever comes my way.
  Q7.   I can solve most problems if I invest the necessary effort.

Aggregated general self-efficacy index scaled from 1 to 7:
  General self-efficacy = [Q1+Q2+Q3+Q4+Q5+Q6+Q7]/7

Readiness to take risks: *To what degree are you ready to take risks in general?*
Please answer on the basis of a scale ranging from 0 "not at all ready" to 10 "perfectly ready".

Start-up motives: *Now, let us talk about your start-up motives. Please rate for each of the*
following start-up motives to what degree it applies to you?
Please answer on the basis of a scale ranging from 1 "does not apply at all" to 7 "applies entirely".

  Q1.   I wanted to be my own boss.
  Q2.   Others recommended me to start a business.
  Q3.   I discovered a market niche.
  Q4.   I wanted to earn more money.
  Q5.   I did not find a job.
  Q6.   I wanted to implement an idea.
  Q7.   I had been subject to discrimination at previous job.

Aggregated motive indices scaled from 1 to 7:
  Opportunity = [Q3+Q6]/2
  Career ambition = [Q1+Q4]/2
  Necessity = [Q2+Q5+Q7]/3

Note: Big five and locus of control are closely related to analog measures in the German "Socio-Economic
Panel" (SOEP, see Wagner *et al.*, 2007, for details) based on John *et al.* (1991) for big five (see Gerlitz and
Schupp, 2005; Dehne and Schupp, 2007) and Nolte *et al.* (1997) for locus of control. General self-efficacy
is based on Schwarzer and Jerusalem (1999). The readiness to take risks is surveyed using the general risk
question with an 11-point scale (Dohmen *et al.*, 2011), which is also implemented in SOEP.

Table A.3: Descriptive statistics for other covariates

	Pooled	By former emp. status	
	estimation sample (1)	Unemployed founders (2)	Regular founders (3)
(4a) *Socio-demographics*			
Age in years	42.9	40.9	43.4***
German	0.956	0.951	0.962***
Residence			
North Germany	0.152	0.149	0.155
East Germany	0.179	0.209	0.136**
South Germany	0.351	0.314	0.404**
West Germany	0.319	0.327	0.306
Married	0.649	0.644	0.657
Children present	0.487	0.428	0.574***
(4b) *Intergen. transmission*			
Business takeover from parents	0.100	0.039	0.189***
Parental self-employment	0.389	0.332	0.472***
Paternal human capital			
Upper secondary school	0.254	0.260	0.245
University education	0.214	0.235	0.185
(4c) *Start-up motives*[a]			
Opportunity	3.5	3.5	3.4
Career ambition	4.2	4.1	4.3
Necessity	2.3	2.6	1.8***
(4d) *Regional econ. context*			
Change in unemployment			
rate (2012 v. 2011)	-1.0	-1.0	-0.9
Unemployment rate (2012)	6.6	6.9	6.1***

Note: Reported are shares and mean values. ***/**/* indicate significantly different means between subgroups at the 1/5/10% level.
[a] Measured on a seven-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table A.2 for details.

Table A.4: Sensitivity analysis: 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
Adjusted R^2	0.17	0.075	0.019	0.077	0.044
Share of adj. R^2 (in %)	100	43.8	11.3	45.3	25.7
Conditional contributions in the full specification					
Joint p-value	0.000	0.000	0.013	0.000	0.0007
Adjusted R^2	0.17	0.063	0.017	0.055	0.024
Share of adj. R^2 (in %)	100	36.9	10.2	32.3	13.9
B. *Outcome:* Hybrid persistence					
Unconditional contributions in the simple specification					
Joint p-value	0.000	0.000	0.000	0.000	0.000
Adjusted R^2	0.143	0.048	0.05	0.049	0.065
Share of adj. R^2 (in %)	100	33.6	34.5	34.1	45.4
Conditional contributions in the full specification					
Joint p-value	0.000	0.264	0.0003	0.0001	0.0002
Adjusted R^2	0.143	0.004	0.036	0.033	0.036
Share of adj. R^2 (in %)	100	2.9	25.2	23.0	25.0
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 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.

36

Table A.5: Sensitivity analysis: Detailed explanatory contributions

	Specification							
	full	(1)	(2)	(3)	(4a)	(4b)	(4c)	(4d)
A. *Outcome variable:* Survival (same business)								
Unconditional contributions in the simple specification								
Joint p-value	0.000	0.000	0.004	0.000	0.039	0.000	0.097	0.799
R^2	0.228	0.092	0.033	0.088	0.022	0.034	0.01	0.0006
Share of R^2 (in %)	100	40.3	14.4	38.9	9.8	15.1	4.4	0.3
Conditional contributions in the full specification								
Joint p-value	0.000	0.000	0.013	0.000	0.444	0.000	0.271	0.351
R^2	0.228	0.08	0.031	0.067	0.01	0.03	0.007	0.003
Share of R^2 (in %)	100	35.2	13.6	29.3	4.3	13.3	2.9	1.3
B. *Outcome variable:* Hybrid persistence								
Unconditional contributions in the simple specification								
Joint p-value	0.000	0.000	0.000	0.000	0.004	0.067	0.000	0.002
R^2	0.203	0.066	0.063	0.061	0.027	0.014	0.031	0.016
Share of R^2 (in %)	100	32.5	30.9	29.9	13.5	6.8	15.4	7.9
Conditional contributions in the full specification								
Joint p-value	0.000	0.264	0.000	0.000	0.017	0.024	0.034	0.064
R^2	0.203	0.023	0.049	0.045	0.025	0.017	0.014	0.009
Share of R^2 (in %)	100	11.1	24.4	22.2	12.5	8.5	6.8	4.6
C. *Control variables:*								
(1) *Human capital*	✓	✓						
(2) *Personality*	✓		✓					
(3) *Business characteristics*	✓			✓				
(4a) *Socio-demographics*	✓				✓			
(4b) *Intergen. transmission*	✓					✓		
(4c) *Start-up motives*	✓						✓	
(4d) *Regional econ. context*	✓							✓

Note: Reported are results from robust 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.

Table A.6: Detailed heterogeneity results by former employment status

	Survival (same business)		Hybrid persistence	
	Unemployed founders cond. (β) (1)	Regular founders cond. (β) (2)	Unemployed founders cond. (β) (3)	Regular founders cond. (β) (4)
(1) *Human capital*				
Highest schooling certificate				
Upper secondary school	0.102*	0.074	0.027	0.02
Professional education				
University education	0.002	0.038	-.012	-.078
Unemployment experience before start-up[a]				
0 (ref.)				
>0-2	-.155**	0.042	-.091	0.103
>2-5	-.107	0.045	-.020	-.083
>5	-.247***	-.145	-.111	-.080
Joint F-stat.	3.5	1.2	1.0	1.6
Industry-specific experience before start-up				
Due to former self-emp.	-.043	0.058	0.072	0.048
Due to dependent emp.	0.1	0.116	-.040	-.037
None	-.116	0.11	0.01	-.003
Joint F-stat.	2.6	1.0	0.7	0.2
Skills and knowledge				
Strategy and leadership	-.031	0.049	-.020	0.001
Back office	0.026	-.045	0.001	-.009
Front office	-.002	-.003	0.04	0.072*
Industry knowledge	0.048*	0.062*	0.028	0.028
(2) *Personality*				
Big five[b]				
Openness	0.043	0.014	0.018	0.036
Conscientiousness	-.002	-.039	0.011	-.030
Extraversion	-.022	-.059**	0.004	-.006
Agreeableness	-.014	0.016	-.048*	-.020
Neuroticism	-.018	-.037	-.030	-.056
Locus of control[b]	0.035	0.041	0.054*	0.067
General self-efficacy[b]	0.005	0.036	0.048*	0.017
Readiness to take risk[c]	-.031	-.070	-.078	-.110
Squared	0.003	0.005	0.006	0.008
Joint F-stat.	0.2	1.0	1.0	1.0
(3) *Business characteristics*				
Start-up capital				
None or not spec. (ref.)				
<10,000 Euro	0.054	-.112	0.091	0.094
10,000-<50,000 Euro	0.123	0.1	0.146*	0.292***
≥50,000 Euro	0.28***	0.023	0.214**	0.237**
Joint F-stat.	6.5	3.5	2.0	4.1
Share of own equity	-.041	0.166**	-.028	0.06
Business sector				
Other sector (ref.)				
Manufacturing, construction	0.097	0.106	-.013	-.178
Retail	-.124	-.0009	-.110	-.111
Information, financial and IT services	-.054	-.196	-.171*	-.246*
Other services	-.116	0.005	-.129	-.124
Joint F-stat.	4.6	2.8	1.7	0.8
Obs.	388	265	388	265
F statistic	3.2	3.5	2.7	4.9
Joint p-value	0.000	0.000	0.000	0.000
R^2	0.255	0.36	0.187	0.29
% of full spec. R^2	100	100	100	100

Note: Reported are robust OLS coefficients (β) using the 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 Section 3.2. ***/**/* indicate statistical significance at the 1/5/10% level.
[a] Reported as share of working time, standardized by age−15.
[b] Initially measured on a seven-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table A.2 in the Appendix for details, and then standardized.
[c] Measured on an eleven-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 for details.

Table A.7: Sensitivity analysis: Comparison of explanatory contributions using OLS/logit

	Specification			
	(1)	(2)	(3)	(4)
A. *Outcome: Survival (same business)*				
OLS Results				
R^2	0.092	0.120	0.189	0.228
% of full model R^2	40.3	52.7	83.1	100
Difference in %-points	40.3	12.4	30.4	16.9
Logit Results				
McFadden's R^2	0.079	0.108	0.184	0.236
% of full model R^2	33.5	45.7	78.2	100
Difference in %-points	33.5	12.2	32.4	21.9
B. *Outcome: Hybrid persistence*				
OLS Results				
R^2	0.066	0.107	0.152	0.203
% of full model R^2	32.5	52.8	75.1	100
Difference in %-points	32.5	20.4	22.3	24.9
Logit Results				
McFadden's R^2	0.053	0.088	0.127	0.175
% of full model R^2	30.4	50.6	72.6	100
Difference in %-points	30.4	20.2	22.0	27.4
C. *Control variables:*				
(1) *Human capital*	√	√	√	√
(2) *Personality*		√	√	√
(3) *Business characteristics*			√	√
(4) *Other characteristics*				√
Number of control variables	12	21	29	46

Note: Reported are results from robust OLS and logit estimations. The estimations subsequently increase the specification. The reported results always refer to the situation in which joint block of indicated control variables in Panel C are added to the specification. 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.