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## Entrepreneurial Career Paths: Occupational Environments and the Propensity to Become Self-Employed

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## **Entrepreneurial Career Paths: Occupational Environments and the Propensity to Become Self- Employed**

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### **Abstract**

We investigate the relationship between characteristics of an occupation-specific environment and the decision of employees to start an own business. A relatively high occupation-specific unemployment risk and high earnings risk are conducive to opt for self-employment. Also, occupations that are characterized by high self-employment rates foster entrepreneurial choice among their employees. The results suggest that career choices of future entrepreneurs are driven by different motivations than those of non-entrepreneurs. In particular, the expectation of a pronounced financial gain is critical for future entrepreneurs when they make their initial occupational choices in paid employment and it is also relevant for a self-employment choice. We also find that when future entrepreneurs enter the labor market they are more likely to choose occupations that require a relatively high variety of skills. Moreover, such occupations may promote entrepreneurship among their employees.

JEL classification: L26, J24, D01

Keywords: Entrepreneurial choice, occupation-specific determinants of entrepreneurship, unemployment risk, earnings risk, skill variety

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## 1. Occupational pathways to entrepreneurship

Human capital is considered to be one of the major drivers of an individual's decision to start and run an own business (Block et al. 2011; Lazear 2004, 2005; Dunn and Holtz-Eaken 2000). It is supposed to enhance the level of entrepreneurial ability and, thus, the quality of emerging start-ups as well as their growth ambitions and chances of survival (Lucas 1978). The focus of previous studies on the role of human capital for entrepreneurial outcomes is primarily on the entrepreneur himself, that is, her or his level of formal education and labor market experience gathered prior to the decision to set up an own business. A recent strand of research goes a step further by regarding entrepreneurship as just one of several steps in an individual's career development, rather than considering it merely as a "final destination" (Fritsch and Storey 2014; Obschonka and Silbereisen 2012). This process perspective to entrepreneurship shifts the focus from studying characteristics of people who eventually become self-employed towards the characteristics of pathways that may lead to entrepreneurship (Burton, Sørensen and Dobrev 2016). Our study takes this career development perspective on entrepreneurial choice into account, and investigates occupational pathways that are likely to lead to entrepreneurship. In particular, it investigates how occupational environments might influence an individual's decision to become self-employed.

The decision to become self-employed does not occur in a vacuum. It is a common observation that many entrepreneurs in developed countries gather some work experience in paid employment prior to setting up their own business (see Fritsch, Kritikos and Rusakova 2012; Mueller 2010; Shane 2000). Previous research has found strong evidence suggesting that certain types of work experience are particularly conducive to fostering entrepreneurship. For instance, it is well known that employees in small firms have a higher propensity to opt for self-employment than those working in larger firms (see, e.g. Parker 2009a;

Elfenbein, Hamilton and Zenger 2010; Wagner 2003, 2006).<sup>1</sup> Work experience in organizations that generate a variety of new ventures also appears conducive to recognizing and seizing entrepreneurial opportunities (Burton, Sørensen and Beckman 2002). People working in occupational environments that have many entrepreneurial role models may become “infected” with the desire to become self-employed (Nanda and Sørensen 2008). Shane (2000, 2008) emphasizes that the knowledge that future entrepreneurs acquire during their work experience in a certain sector not only affects the decision to set-up a business, but is decisive for the type of business opportunity or the choice of the industry where they become active. Indeed, start-up rates vary significantly across occupations and industries. The literature emphasizes that a main reason for this considerable variation of start-up rates across occupations and industries is occupation- and industry-specific entry barriers (Bates 1995; Lofstrom, Bates and Parker 2014).

Occupational choices made by people early in their lives can have a significant influence on their further career development. We argue that the occupational context can influence an individual’s decision to set up a business in different ways. The aim of the present study is, therefore, to shed more light on how occupational environments may influence an individual’s propensity to switch from paid employment into self-employment.

The empirical analysis is based on the micro-level data found in the German Socio-Economic Panel (SOEP) that provides rich information on individuals’ human capital, socio-demographic characteristics, family background, and personality traits. These data are combined with rich occupation-specific information from official statistics on unemployment risk, earnings risk, variety of required skills, and self-employment rates.

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<sup>1</sup> Prominent explanations for this phenomenon are: a) loose hierarchical structures that allow close contact to an entrepreneur who may provide a role model of entrepreneurial career, b) lower level of labor division and specialization in small firms leads to a larger variety of skills and experiences that may be conducive to entrepreneurial thinking, c) relatively low wages, low prospects for internal promotion and relatively low survival chances of smaller firms create an incentive for becoming self-employed, d) self-selection of entrepreneurial persons into small firms, for instance, based on individual risk preferences or taste for variety (Parker 2009a).

Our results suggest that occupations vary strongly with regard to the share of entrepreneurs they generate. We find a particularly high probability of switching into self-employment for people working in occupations that are characterized by relatively high unemployment risks, high earnings risks, and high self-employment rates. We also provide evidence suggesting that future entrepreneurs opt for different types of occupations at the time they enter the labor market as paid employees, as compared to people who do not become entrepreneurs later on.

In Section 2 we present the main arguments developed to explain why certain characteristics of the occupational environment might affect a person's decision to become self-employed, and we derive a set of hypotheses. Section 3 introduces the data sets. The hypotheses are empirically tested in Section 4. The results are discussed in the concluding Section 5.

## **2. Occupational context and entrepreneurship**

We investigate four characteristics of an occupational environment that may stimulate entrepreneurship. These characteristics are occupation-specific unemployment risk (Section 2.1), occupational earnings risk (Section 2.2), variety of required skills (Section 2.3), and occupation-specific role models of self-employment as well as entry barriers (Section 2.4). Based on our investigation we derive a set of hypotheses about the effects of these characteristics bring to bear on a person's probability to switch into self-employment. The hypotheses are then tested in Section 4.

### **2.1 Occupational unemployment risk and entrepreneurship**

There are a number of reasons why the risk of becoming unemployed varies substantially across occupations. For instance, people in low-skill occupations tend to face a persistently higher unemployment risk than people in high-skill occupations. A common explanation for this phenomenon is that low-skill occupations are often composed of routine tasks that are particularly susceptible to automation or offshoring

(Acemoglu and Autor 2011, Frey and Osborne 2017). Moreover, individuals in low-skill occupations have a higher risk of being laid off because the costs of hiring and training these workers are relatively low (Candelon, Dupuy and Gil-Alana 2009; Devereux 2002). Another source of varying unemployment rates is that some occupations have a more diversified portfolio of employment opportunities across industries than others, so that they may be less affected by industry-specific developments. For instance, a manager or an accountant can be employed in virtually all sectors, whereas an earth driller is needed in only a handful of industries (Tristao 2007).

The relationship between the overall level of unemployment and self-employment at the aggregate level has been extensively studied with ambiguous empirical results. Parker (2009b) concludes that there is no clear-cut relationship between entrepreneurship and unemployment, because high unemployment can influence entrepreneurship in at least two opposite ways. On the one hand, high unemployment may foster start-ups out of necessity. On the other hand, high unemployment and uncertain prospects about future development may deter opportunity motivated potential entrepreneurs from switching into self-employment. Conversely, low unemployment may induce relatively few necessity start-ups, but encourage large numbers of opportunity motivated business founders to establish an own business. Recent evidence from Germany, the country for which we perform our empirical analysis, shows no significant increase of new business formation in periods of economic slowdown when unemployment rates are relatively high (Fritsch, Kritikos and Pijnenburg 2015). However, new business formation is found to be significantly lower in boom periods with low unemployment when opportunities for paid employment are easily available (“low unemployment retain effect”).

There are only a few empirical studies that investigate the effect of aggregate unemployment rates on an individual’s decision to switch from paid employment to self-employment. For instance, Fritsch and Sorgner (2014) find a weak effect of regional unemployment rates in Germany on

the probability of an individual to opt for a start-up. The effect of occupation-specific unemployment on the odds of becoming self-employed has been, to the best of our knowledge, left completely unexplored. This is surprising if we assume that an individual's decision to become self-employed is more likely to be affected by personal circumstances, such as employment prospects in one's occupation, rather than by the general level of unemployment.

Based on occupational choice models (Parker 2009b) where individuals choose between paid employment and self-employment, it is plausible to assume that high levels of occupation-specific unemployment are indicative of rather poor employment opportunities, and work as an incentive for switching from paid employment into self-employment. Employees in such occupations face lower opportunity costs of opting for self-employment. Specifically, opportunity costs decrease if wages decrease due to high unemployment, or if they face an increasing risk of losing their jobs. In contrast, a low unemployment rate in an occupation may indicate relatively good employment prospects in this occupation, which may increase the opportunity costs of becoming self-employed.<sup>2</sup>

Psychological theories may also provide helpful insights into the relationship between occupational unemployment risk and the probability of a start-up. People with pronounced preferences for self-employment may have personality characteristics that make them more likely to select occupations with a relatively high risk of unemployment. These characteristics are, for example, a relatively high willingness and ability to bear risks and overoptimism (Caliendo, Fossen and Kritikos 2011, Koellinger, Minniti and Schade 2007). Indeed, it has been shown that more risk-averse persons tend to choose occupations with a low likelihood of becoming unemployed such as employment in the public sector (Pfeifer 2010; Özcan and Reichstein 2009; Bellante and Link 1981). Spinnewijn

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<sup>2</sup> It should be noted that switchers from paid employment into self-employment are commonly regarded as opportunity-driven start-ups, whereas start-ups out of unemployment are commonly regarded as necessity-driven start-ups. Although we only focus on transitions from paid employment into self-employment, in our empirical setting we account for different motives for a start-up as far as the data allow.

(2015) shows that overoptimistic individuals tend to underestimate the risk of unemployment. Based on these considerations, we expect that:

*Hypothesis 1:* The probability of switching from paid employment into self-employment is higher in occupations with a relatively high occupation-specific unemployment level.

## **2.2 Occupational earnings risk and entrepreneurship**

Earnings prospects differ substantially across occupations. An important source of between-occupation wage differences are skill levels and educational requirements (Mouw and Kalleberg 2010). Bonin et al. (2007) show that variation in earnings between occupations can only partly be explained by observed individual differences in human capital stocks. The authors argue that the part of the variation that cannot be explained by skill level and skill structure constitutes the earnings risk that is associated with a particular occupation. They show that earnings risk is an important factor that drives the sorting of individuals with heterogeneous risk attitudes into particular occupations. According to their results individuals with a relatively high willingness to take risks are more likely to choose occupations that are characterized by high earnings risk. Similarly, Guiso, Japelli and Pistaferri (2002) find that risk preferences are a strong predictor of an individuals' earnings risk, that is, less risk-averse people tend to self-select into occupations with a higher earnings risk.

Given that entrepreneurial people tend to be less risk averse (Caliendo, Fossen and Kritikos 2011), they may be attracted to occupations with a higher earnings risk if there is also a chance of achieving relatively high gains. Since entrepreneurship is also characterized by high income risk, people that select occupations with high earnings risk may also have a relatively high propensity to choose



self-employment (Hamilton 2000, Åstebro and Chen 2014; Sorgner, Fritsch and Kritikos 2017).<sup>3</sup>

Berkhout, Hartog and van Praag (2016) demonstrate that individuals are more likely to choose entrepreneurship if they give up a paid occupation with a lower mean wage (lower opportunity costs of entrepreneurship), a higher wage variation (high earnings risk), and a lower probability of ending up in the upper tail of the wage distribution. In general, this suggests that occupation-specific financial incentives are an important predictor of entrepreneurial choice. Employees in occupations with higher expected wage levels are likely to face higher opportunity costs of becoming self-employed and, thus, have a lower propensity of opting for self-employment. While an individual's early occupational choices may be guided by prospects of financial gain, it is uncertain if they will eventually achieve the expected occupation-specific income. This expectation may be dependent on specific abilities that are not fully developed when an individual chooses an occupation. Because the process of learning about and developing one's abilities may require time, an individual's willingness to become an entrepreneur may arise only after a spell of work experience. Hence, failure to achieve an expected occupation-specific income, for whatever reason, may work as an incentive for job mobility and self-employment, particularly because the respective opportunity cost is relatively low.

The above considerations can be summarized in the following hypotheses:

*Hypothesis 2a:* A higher occupational earnings risk increases the probability of entrepreneurial entry.

*Hypothesis 2b:* A higher expected occupation-specific income decreases the probability of entrepreneurial entry

*Hypothesis 2c:* Failure to achieve an expected occupation-specific income increases the probability of entrepreneurial entry.

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<sup>3</sup> Numerous studies show that the possibility of financial gain may be an important motive for becoming self-employed (Katz 1994; Venkataraman 1997; Douglas and Shepherd 2000; Shepherd and DeTienne 2005).

### **2.3 Skill variety and entrepreneurship**

Several analyses confirm Lazear's (2005) hypothesis that entrepreneurs require a more varied skills set than paid employees, i.e., they need to be generalists rather than specialists.<sup>4</sup> In particular, it has been shown that individuals with a diverse skill-set are more willing and likely to set up an own business. There are three commonly used explanations for this. First, skill variety makes people more likely to recognize entrepreneurial opportunities. Second, having a variety of skills is a necessary element of being able to operating an own business successfully. Third, some important characteristics of entrepreneurs, such as innate talent (Silva 2007), low level of risk aversion (Parker 2009a), taste for variety (Astebro and Thompson 2011) or an entrepreneurial personality profile (Stuetzer, Obschonka and Schmitt-Rodermund 2013), make them more likely to make career choices that are conducive to the accumulation of a variety of skills and, thus, to choose self-employment.

Literature identifies two main ways in which individuals may acquire a variety of skills, namely frequent job hopping (Chen and Thompson 2016) and work experience in small firms (Bublitz and Noseleit 2014). Given that skill variety differs considerably across occupations (Fritsch, Bublitz and Rusakova 2014), work experience in occupations that require a strong variety of skills may also foster an individual's entrepreneurial choice. Hence, we propose that:

*Hypothesis 3:* Individuals in occupations that require a relatively high level of skill variety have a relatively high propensity of entrepreneurial entry.

### **2.4 Occupational role models of self-employment and entry barriers**

Observing entrepreneurial role models may increase an individual's awareness about what it means to be an entrepreneur and, thus, provide a more objective picture of this career option. This stimulating effect of entrepreneurial role models in one's immediate work environment is found

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<sup>4</sup> Chen and Thompson (2016), Astebro and Thompson (2011), Bublitz and Noseleit (2014), Stuetzer, Obschonka and Schmitt-Rodermund (2013), Wagner (2003, 2006).

in several empirical studies. For example, Nanda and Sørensen (2010) show that working with peers with entrepreneurial experience increases an individual's propensity to become self-employed. This is confirmed by Bosma et al. (2012), who find that personal contact with entrepreneurial role models is extremely relevant for someone's decision to become self-employed. In particular, they show that the direct contact with entrepreneurial colleagues and peers is a much more important stimulus for self-employment than the influence of distant and high profile role models in the media.

Bosma et al. (2012) also show that involvement in professional networks influences the tendency to opt for self-employment. High numbers of self-employed individuals in an occupational group can also foster the formation of professional networks that are conducive for stimulating entrepreneurship among peers. Such networks may provide would-be entrepreneurs with necessary practical and financial support. Since occupations with high levels of self-employment provide a relatively large number of opportunities for observing entrepreneurial careers in an intimate work environment, one may expect individuals working in such occupations to exhibit a particularly high propensity to start an own business.

High levels of self-employment in an occupation may also indicate relatively low occupation-specific entry barriers. Rostam-Afschar (2014) shows that the deregulation of a number of craft occupations in Germany, specifically the abandonment of the educational entry requirement, resulted in a substantial increase of new business formation. The minimum efficient size of a specific business opportunity may also foster an individual's propensity to start-up in this occupation. Moreover, a number of occupations with high levels of self-employment such as medicine, architecture, and law, are characterized by standard business models (e.g., medical doctors or lawyers running their own office) that may facilitate the recognition of entrepreneurial opportunities and ease the acquisition of required resources (e.g., financing from a bank). This also

reduces barriers of entry into entrepreneurship. Based on these considerations we expect:

*Hypothesis 4:* Individuals in occupations that are characterized by high levels of self-employment have a relatively high propensity of entrepreneurial choice.

### 3. Data and measurement

#### 3.1 Data sources

Our empirical analysis is based on the German Socio-Economic Panel (SOEP), a nationally representative longitudinal study of private households in Germany with about 21,000 participants per annum (for details, see Haisken De-New and Frick 2005; Wagner, Frick and Schupp 2007). This database contains detailed information on the respondents' socio-demographic status, their education, their income and occupational dynamics, as well as their personality traits. The empirical analysis in this paper covers the period between 2004 and 2009.

The SOEP data is combined with rich data on occupation-specific characteristics provided by the Federal Employment Agency (*Bundesagentur für Arbeit, BA*). These data include the following information for different classes of occupations (*Klassifikation der Berufe 1992, KldB'92*): the number of registered short-term unemployed (less than one year) by target occupation, the number of registered long-term unemployed (longer than one year), the number of employees, and median wages in each occupation. Furthermore, we employ data from the BIBB/BAuA employment survey of 20,000 employees in Germany conducted in 2006.<sup>5</sup> These data contain detailed information on occupational skill requirements. We also employ data on occupation-specific self-employment rates at the two-digit level of the national classification of occupations that are based on the German Micro-Census

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<sup>5</sup> This survey was conducted by the German Federal Institute for Vocational Education and Training (*Bundesinstitut für Berufsbildung*) in cooperation with the German Federal Institute for Occupational Safety and Health (*Bundesanstalt für Arbeitsschutz und Arbeitsmedizin*).

of the Federal Statistical Office (*Statistisches Bundesamt*; see Statistisches Bundesamt 2009).

The final sample is restricted to individuals between 18 and 64 years old and excludes persons who were retired, unemployed, non-employed, or engaged in full-time education. We also exclude civil servants, persons in military service, and those in alternative civilian service, as well as persons whose main occupation is helping family members, under the assumption that occupational choices made by these groups may be based on quite different considerations than those of persons working in the private sector. Furthermore, we exclude persons in the extreme percentiles of the wage distribution (the 5<sup>th</sup> and the 95<sup>th</sup> percentile) when calculating occupational wage deviations in order to avoid possible distortions caused by outliers.

The longitudinal structure of the data allows us to identify switches from paid employment into self-employment, which we use as a proxy for new venture creation. The final sample provides us with information for 322 persons who switched from paid employment to self-employment. This is 0.89 percent of the entire sample. For comparison, the average start-up rate for the same period according to the German Micro-Census is 0.91 percent.<sup>6</sup>

### **3.2 Characteristics of occupational environments**

This section describes the variables that we constructed for testing our hypotheses about the role played by the occupational environment in the choice of entrepreneurship.

The *occupation-specific unemployment risk* (Hypothesis 1) is measured by the *occupation-specific unemployment rate*. The occupation-specific unemployment rates are calculated by assigning unemployed individuals to those occupations in which they want to find a job. Since the

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<sup>6</sup> The German Micro-Census is an annual representative survey conducted by the Statistical Office that collects information about the personal, household, and socioeconomic status of approximately 820,000 individuals living in 380,000 households in Germany. For more details about self-employment statistics based on the German Micro-Census, see Fritsch, Kritikos and Rusakova (2012).

unemployment risk may vary based on the level and the type of unemployment that prevails in an occupation, we distinguish between *short-term* and *long-term occupational unemployment rates*. The short-term unemployment rate is the average annual number of registered unemployed persons who are unemployed for less than one year over the total number of employees at the level of *Berufsordnungen*<sup>7</sup> in the national classification of occupations (KldB'92). The long-term unemployment rate refers to individuals who are unemployed for more than one year.

In constructing a measure of occupational earnings risk (Hypothesis 2a), we follow Bonin et al. (2007) by using the variation in monthly income across occupations that cannot be explained by the observed heterogeneity of human capital. In particular, we estimate the following Mincer wage regression for a subsample of paid employed persons (Mincer 1974):

$$\ln(\text{monthly\_income}_t) = \alpha_0 + \beta_1 * \text{yeas\_edu}_t + \beta_2 * \text{experience}_t + \beta_3 * \frac{\text{experience}_t^2}{100} + \beta_4 * \frac{\text{experience}_t^3}{1000} + \beta_5 * \text{tenure}_t + \beta_6 * \frac{\text{tenure}_t^2}{100} + \beta_7 * \text{EastGermany}_t + \beta_8 * \text{regtype}_t + \beta_9 * \text{BigFive}_t + \gamma * \text{occ\_dummies}_t + \varepsilon_t,$$

where occupational dummies are constructed using the *Berufsordnungen* level of the KldB'92. In the above Mincer regression we control for individual endowments of human capital, measured by years spent in formal education, years of work experience and tenure, including possible non-linearities in the effects of these variables. In addition, we include a control variable indicating whether the respondent resides in East Germany and another control variable indicating whether the respondent lives in a rural or urban setting.<sup>8</sup> It could be argued that the residuals in a Mincer regression reflect the variability of workers' innate abilities within an occupation rather than the occupation-specific earnings risk. Hence, we

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<sup>7</sup> The occupation-specific data are classified according to the following aggregation levels of the KldB'92. On the level of *Berufsabschnitte*, there are 33 occupational groups. *Berufsgruppen* contains 88 occupational groups and is the second level of aggregation. *Berufsordnungen* is the third level of aggregation in the KldB'92 and encompasses 369 occupational groups.

<sup>8</sup> These variables are supposed to control for regional differences in income variation.

additionally control for an effect of a person's non-cognitive skills on the level of earnings (see, e.g., Hamilton et al. 2015) by including the Big Five dimensions of personality.<sup>9</sup> The occupation-specific variance of the residuals in the Mincer regression constitutes our measure of earnings risk. An advantage of this measure is that it reveals the uncertainty associated with earnings variability (conditional on being employed), which is independent of an individual's own human capital investments and innate abilities that can be attributed to non-cognitive skills.

The measure for *occupation-specific income* (Hypothesis 2b) is the monthly gross labor income in an occupation at the *Berufsgruppen* level of the KldB'92. The variable *income deviation* reflects the monetary success of a person in an occupation (Hypothesis 2c). It is calculated as the difference between individual monthly gross labor income and the median gross labor income at the *Berufsgruppen* level. We use the median income rather than the mean income in order to avoid distortions due to a possibly skewed distribution of occupation-specific income.

*Average skill variety* (Hypothesis 3) is calculated as the average number of expert skills that individuals use in their occupation at the three-digit level of the national classification of occupations (KldB'92) (*Berufsordnungen*).<sup>10</sup> Although these data were available only for the year 2006, we apply them to the whole period of analysis based on the assumption that occupational skill requirements did not change significantly during this period. Finally, the *self-employment rate*

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<sup>9</sup> The Big Five taxonomy was developed by Costa and McCrae (1992), and is a widely used psychological concept of human personality that includes the following dimensions: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. For the relationship between the Big Five personality traits and entrepreneurship see Obschonka and Stuetzer (2017).

<sup>10</sup> Information on the following skills is available: natural scientific skills, manual/craft skills, pedagogic skills, legal skills, skills in project management, medical or custodial skills, skills in layout, design, and visualizing, mathematical and statistical skills, German-language skills (writing, spelling), computer skills in application software, technical skills, commercial/managerial skills, and foreign-language skills. Although these data are available at the individual level, there is no possibility to match the individual data with the information taken from the SOEP. Hence, we can only use the aggregate information at the level of occupations. By doing so, we do not measure skill variety of potential entrepreneurs, but rather the potential of a particular occupational environment to be conducive for entrepreneurship.

(Hypothesis 4) is measured by the number of self-employed individuals over the number of employees at the *Berufsabschnitte* level in the national classification of occupations.

### 3.3 Individual determinants of entrepreneurship

Previous research reveals a number of individual characteristics that may influence the decision to become an entrepreneur (for an overview, see Parker 2009b). We control for such influences by including a wide set of control variables in our analysis. These variables include the standard demographic characteristics such as age, gender, marital status, and nationality. We also use human capital variables, such as the number of years spent in formal education and its squared value, in order to control for a possibly nonlinear relationship between education and entrepreneurship (see Poschke 2012). The number of years spent in unemployment indicates an important aspect of an individual's labor market experience.

In order to control for "cultural" differences between East and West Germans, we use a binary variable indicating whether an individual's place of residence is in East Germany. Specifically, the willingness to become self-employed might be influenced by 40 years of living under a socialist regime in East Germany (see Fritsch et al. 2014; Fritsch and Rusakova 2012). A further binary variable controls for an intergenerational transfer of entrepreneurship (Chlosta et al. 2012; Fritsch and Rusakova 2012) by indicating self-employment of parents when the respondent was 15 years old. Since transition from paid employment into self-employment is not necessarily voluntary, we additionally control for the self-reported probability of losing the current job in paid employment within the next two years.<sup>11</sup> Since both vocational and entrepreneurial choice may be associated with willingness and ability to bear risk, we employ a variable

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<sup>11</sup> The corresponding question is: "How likely is it that you will lose your job within the next two years?" The respondents could assess this probability on an 11-point scale with 10-point increments ranging from 0 (definitely not) to 100 (definitely).



that measures general risk attitude on an 11-point Likert scale.<sup>12</sup> Table A1 in Appendix presents an overview of variables used in the empirical analysis.

## **4. Results**

We first describe the differences that we find between those persons who start an own business and those who remain in paid employment or switch to another paid employment position (Section 4.1). The multivariate analysis is conducted in two steps. In a first step, we analyze how the characteristics of the occupational environment influence a person's decision to transition into self-employment, remain in paid employment, or change employers (Section 4.2). In a second step, we compare entrepreneurs and non-entrepreneurs with regard to their occupational environments at the time they first entered the labor market (Section 4.3). Finally, we perform the analysis for those individuals in our sample that remained in their first occupation until they set up an own business (Section 4.4).

### **4.1 Descriptive evidence**

Table 1 shows descriptive statistics for all independent variables and Table A2 in the Appendix provides a correlation matrix. We additionally consider a subgroup of employees who have also demonstrated labor market mobility by switching jobs within paid employment, since this group might be regarded more similar to the group of entrepreneurs with respect to unobserved characteristics.

Table 1 about here !

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<sup>12</sup> The question for assessing a person's general risk attitudes is: "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" This question has been included in SOEP every two years starting in 2004. For waves when this question was not asked, we impute the values from the previous year under the assumption that willingness to take risk remains constant over short periods of time.

The descriptive evidence suggests that the short- and long-term unemployment rates of the occupations where founders were previously employed are, on average, significantly higher than in the occupations of those who remained in paid employment (8.2 and 4.9 percent, respectively; see Table 1) supporting Hypothesis 1. Former occupations of founders tend to be associated with a higher earnings risk than occupations of non-entrepreneurs (Hypothesis 2a). The median wages in the occupations from which the founders came are somewhat higher than those of persons who stayed in paid employment (Hypothesis 2b), but the difference is only slightly significant when compared to those who switched between positions in paid employment.

Incomes earned by business founders in their previous paid employment were significantly less than the occupation-specific median wage of the incomes of those who remained in paid employment (Hypothesis 2c). Remarkably, this difference is even larger—although not statistically significant—for job changers in paid employment. On average, business founders are more likely to come from occupations that require a relatively large number of skills (Hypothesis 3). Finally, the average self-employment rate in the occupations of future entrepreneurs is 11.6 percent, which is significantly higher than the average self-employment rate of 9.6 percent in the occupations of paid employees (Hypothesis 4). Table A3 in the Appendix reveals strong differences with regard to unemployment risk, earnings risk, and self-employment rates across occupations.

With regard to individual characteristics, the differences we find between business founders and employees, as well as between business founders and job switchers, are in line with previous evidence (see Parker 2009b). Founders have a higher level of skill variety, more years of formal education, tend to be male, are more likely to have self-employed parents, are characterized by a higher willingness to take risk, and have also experienced more years of unemployment. Those who switch between jobs in paid employment or become self-employed report a significantly higher probability of job loss. Remarkably, the reported probability of job

loss is significantly higher for those who changed to another position in paid employment as compared to those who became founders (Table 1).

#### **4.2 The role of occupational environments for the decision to set up an own business**

We test our hypotheses by employing a random effects probit model for the panel data. A random effects estimator is applied due to the time-invariant character of a number of control variables, such as demographic characteristics that have been found to significantly affect the start-up decision (for an overview, see, e.g., Parker 2009b). The dependent variable equals 1 if a transition from paid employment into self-employment took place in the current wave of the panel, it is 0 if an individual remained in paid employment.

Table 2 about here!

Table 2 shows the results of regressions for explaining the probability of becoming self-employed. The independent variables are the characteristics of occupational environments in which individuals worked as paid employees in the previous year. As these occupation-specific variables are highly correlated (see Table A2 in the Appendix), they enter the model separately.<sup>13</sup> Moreover, the models include a set of individual-level control variables that may also have an effect on the propensity of becoming a founder (see Section 3.3). In line with Hypothesis 1, the results reveal a statistically significant positive coefficient for the short-term unemployment rate in paid employment (column I). This suggests that an occupational environment with a high level of frictional unemployment that may indicate frequent job changes has a positive effect on the propensity

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<sup>13</sup> Including the occupation-specific variables separately into the model may result in an omitted variable bias. Hence, in column VIII of Table 2 we report results of an estimation that includes all occupation-specific characteristics at the same time, with the exception of long-term unemployment and average skill variety, since both variables are highly correlated with the short-term unemployment rate. Compared to the models with only one of the occupation-specific variables the main results remain largely unchanged. However, the effect sizes of the short-term unemployment rate and the self-employment rate decrease. It should be noted that this model may suffer from a multicollinearity problem. We, thus, abstain from interpreting the results of this model.

to start an own business. A statistically significant effect is also observed for the long-term unemployment rate, indicating that some of the switches into self-employment may be due to poor employment opportunities (column II).<sup>14</sup> The occupation-specific risk of unemployment may be alleviated if individuals have a relatively large number of opportunities for switching to related occupations with better employment prospects.<sup>15</sup> To address this issue, we repeat the analysis with the unemployment rates (both short-term and long-term) defined at a much broader level of occupational classification (*Berufsabschnitte*). In this case, the degree of similarity between the broadly defined occupational fields is considerably lower, thus, reducing the probability of individuals switching to other occupations as a response to bad employment prospects in their own occupation. As expected, we find that the positive effect of unemployment rates on the probability to become self-employed is considerably larger when unemployment rates are defined at a broader level of occupational classification (Table A4 in the Appendix).<sup>16</sup> This indicates that low opportunity costs of becoming self-employed, in conjunction with limited alternative opportunities on the labor market, are an important predictor of entrepreneurial choice.

In accordance with Hypothesis 2a, business founders are more likely to come from occupations with high earnings risk (column III). Although the occupation-specific median wage is not statistically significant (column IV), we find, in line with Hypothesis 2c, that individuals with incomes in the lower percentiles of the occupation-specific income distribution are more

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<sup>14</sup> One might argue that unemployment risk affects necessity and opportunity founders differently. Although we only observe new businesses out of paid employment, which can be regarded as opportunity-driven start-ups, we distinguish between business founders who report high risks of losing their job in previous paid employment, which may be at least partly regarded as necessity entrepreneurs. However, the effects of unemployment risk do not differ between necessity and opportunity entrepreneurs distinguished in this way. The results are available from the authors upon request.

<sup>15</sup> The incentive to switch into self-employment may be especially pronounced if the cost of switching occupations in terms of requalification is high. It has been shown that switches between occupations can be rather costly in terms of redundancy of previously acquired occupation-specific skills and the necessity to acquire new skills (Gathmann and Schönberg 2010; Nedelkoska and Neffke 2010).

<sup>16</sup> The effect of short-term unemployment rate increases by the factor of 1.6 and the effect of long-term unemployment increases by the factor of 2.2.

likely to switch from paid employment into self-employment than those whose income is in higher percentiles of the distribution (column V). This result suggests that entrepreneurs might be hoping to increase their incomes by founding an own business or, alternatively, that opportunity costs of entrepreneurship for these individuals are rather low.

In contrast to the Hypothesis 3, we do not observe a significant effect of the indicator for occupational skill variety (column VI of Table 2). However, this variable has a highly significant and positive effect if we omit variables that measure a respondent's formal education level.<sup>17</sup> This result suggests that more highly educated individuals are more commonly found in occupations that require a higher variety of skills. Finally, we find that a higher self-employment rate in the previous occupation increases the probability of entrepreneurial entry, thus, supporting Hypothesis 4 (column VII). The individual-level control variables all show the expected signs confirming the conventional hypotheses. In particular, individual willingness to take risks is statistically significantly and positively related to the probability of switching from paid employment into self-employment.

Based on these results, it is, however, unclear whether the conditions in the occupation-specific labor market have a general impact on job mobility, be it into self-employment or into paid employment, or whether these conditions particularly induce transitions into self-employment. Hence, we test whether occupation-specific characteristics affect the probability of job switches within paid employment and into self-employment differently (Table 3). In this analysis, the dependent variable equals 1 if a person has a transition from paid employment into self-employment and it equals 0 if a person has changed her or his job, but still remained a paid employee. Vanishing significance of the effect of an independent variable in this model specification as compared to estimations in Table 2, would mean that this variable does not have a particular impact on entry into self-employment, but that it rather influences general job switching behavior.

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<sup>17</sup> The results are available from the authors upon request.

Table 3 about here !

We find that the main results for the occupation-specific determinants of self-employment remain largely unchanged, thus, emphasizing the importance of the occupational context, particularly for the decision to become self-employed. There are, however, some differences between both models with regard to individual determinants of entrepreneurship. The significance of the self-reported probability of losing the job within the next two years has a significantly positive effect in the full sample (Table 2), but vanishes in the analysis of job switchers (Table 3). Moreover, the effect of time spent in unemployment also loses statistical significance in this model specification. This suggests that entrepreneurs and job switchers are quite similar with regard to their necessity-driven motivations for changing jobs. The insignificance of the effect of foreigners indicates that foreigners are, in general, more likely than natives to switch into both self-employment and into paid employment. Business founders differ from job switchers who remain in paid employment with regard to their more pronounced willingness to take risks and the presence of parental role models of self-employment.

#### **4.3 Entrepreneurial choice and occupational characteristics at the time of labor market entry**

To this point we have analyzed the characteristics of the occupation that a founder was working in the year before he or she reported being self-employed. This was based on the assumption that the most recent experiences have the strongest influence on current decision making. However, this approach does not allow us to make any inferences with regard to an individual's self-selection into occupations based on their preferences because the most recent occupational choice might have been affected by previous career choices (e.g., due to the accumulated profession-specific human capital), work experience and individual characteristics that may also be conducive to entrepreneurial choice. If there is self-selection of entrepreneurial individuals into certain

occupational environments, this selection process should be best observed at the time of labor market entry since the first vocational choice is unaffected by work experience and, therefore, more likely be based on individual preferences, attitudes, and expectations. Particularly, the level of occupation-specific human capital should be relatively low at the time of labor market entry.<sup>18</sup> For these reasons, we analyze whether the occupations chosen by individuals who become entrepreneurs at the time of labor market entry are distinctively different than the occupations chosen by individuals who remain paid employees.

We analyze a subsample of individuals for whom we have information about their occupation at the time of labor market entry. Due to data constraints,<sup>19</sup> this analysis is restricted to those individuals who entered the labor market between 2004 and 2009. Thus, we can observe employment histories of respondents up to 6 years after they started their careers. We distinguish between individuals who experienced at least one spell in self-employment during the period of analysis and those who have never been self-employed. During the observation period, about 4.9 percent of the individuals in the sample reported being self-employed at least once. This analysis is somewhat constrained in that it covers only cohorts of rather young respondents and it is known from previous research that business founders are, on average, in their mid-30s or early 40s (Fritsch, Kritikos and Rusakova 2012; Parker 2009b). Since these relatively young founders could accumulate only rather limited work experience, their decision to set up a business is more likely to be driven by entrepreneurial attitudes and preferences than by characteristics of their occupations.

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<sup>18</sup> Some individuals may, however, have specialized in their education before entering the labor market, e.g., by choosing a certain curriculum at university, providing them with considerable profession-specific human capital when entering the labor market for the first time.

<sup>19</sup> For instance, the variable measuring individual risk attitudes was for the first time available in 2004.

Table 4 about here!

Table 4 sets out descriptive statistics of the characteristics of entry-level occupations of individuals with and without a later spell of self-employment. In contrast to the analysis of the last occupation before switching into self-employment (Table 1), the first occupations of persons with a spell of self-employment are characterized by, on average, significantly lower short-term and long-term unemployment rates compared to those of individuals who do not report self-employment during the observation period. Moreover, first occupations of the future self-employed have, on average, significantly higher earnings risk, and a median wage that is about 700 Euros higher when compared to the occupations of persons without a spell of self-employment. Future entrepreneurs are more likely to have first occupations that require greater skill variety than non-entrepreneurs. Quite remarkably, there is no significant difference between the groups with regard to the occupation-specific self-employment rate.

Next, we conduct a multivariate analysis to test whether early career choices pre-determine future self-employment, that is, whether individuals who decide to become self-employed in the future choose different occupations at the time of labor market entry. To this end, we run a probit regression where the dependent variable equals 1 if a respondent has, at least once, reported a spell of self-employment during the observation period, and 0 otherwise (Table 5).

Table 5 about here!

As in the previous analysis (Section 4.2), the characteristics of the occupations at the time of labor market entry are included separately into the model, whereas all individual-level control variables are contained in all specifications. According to this analysis, the unemployment rates of the first occupation (short or long term) has no significant effect on the



propensity to be self-employed in the future. This suggests that high occupational unemployment risk does not affect early vocational choices of future entrepreneurs. Hence, the motivation for becoming self-employed may mainly stem from bad employment prospects in the occupation-specific labor market that are not foreseeable at the time of labor market entry, and it may be due to decreasing opportunity costs of becoming self-employed.

That future entrepreneurs prefer occupations with higher median wages suggests that financial motivation plays an important role throughout the careers of entrepreneurs. Future entrepreneurs are also more likely to choose occupations with relatively high earnings risk even at the beginning of their careers, probably in the hope of achieving higher incomes. Quite interestingly, a high average skill variety in an occupation appears to be an important characteristic of their first occupation. This suggests that entrepreneurial persons may have a pronounced taste for variety (in line with Åstebro and Thompson 2011), and make their early vocational choices based on the variety of skills that can be acquired in an occupation.

Finally, we do not find a significant effect of a higher self-employment rate in the first occupation on the likelihood of becoming self-employed later on (Hypothesis 4). Given our previous finding that transitions into self-employment are more likely for individuals in occupations with high self-employment rates (Section 4.2), this result suggests that a considerable part of the taste for entrepreneurship emerges over time as a treatment effect, for instance, from observing entrepreneurial career models in one's occupation or due to relatively low entry barriers.

#### **4.4 Results for occupational non-switchers**

A further concern arises from the conjecture that future entrepreneurs may have a 'taste for variety' and are, therefore, more likely to switch occupations than non-entrepreneurs (Åstebro and Thompson 2011). Hence, our results regarding entrepreneurial choice may indicate preferences of entrepreneurs for certain occupational environments rather

than the effect of a continuous work experience in an occupation. To capture such an effect, we perform our baseline analysis for a subsample of those respondents who did not change their occupation since labor market entry.<sup>20</sup> For these respondents, the likelihood of becoming self-employed should be less affected by previous experiences in a variety of occupations.

Table 6 about here!

Table 6 reveals that the basic results of the baseline model (Table 2) do also hold for this group of respondents, however, with two exceptions. First, there is no significant effect of wage deviation on the probability of transition into self-employment. Hence, financial incentives may be less important as a motivation to become self-employed for individuals with a continuous tenure in one occupation. Second, and more interestingly, there is a significant and positive effect of occupational skill variety on the propensity of a start-up, conditional on a set of other individual characteristics, including formal education. This suggests that occupational skill variety promotes entrepreneurship even among those individuals who are less likely to accumulate a balanced skill set by more or less frequently switching their occupations.

## 5. Discussion and conclusions

This paper empirically investigated whether the specific characteristics of an occupation exert an influence on entrepreneurial tendencies of individuals working in them and, if so, which occupation-specific determinants of entrepreneurial choice can be identified. In particular, the focus was on the relationship between occupation-specific unemployment

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<sup>20</sup> We restrict the sample to those individuals who are in the same occupational group (*“Berufsabschnitt”*) in the period  $t$  and at the time of labor market entry. About 45 percent of all respondents with available information on the first and last occupation currently work in the same occupation as at the time of labor market entry.

risk, earnings risk, occupational skill requirements, the occupation-specific level of self-employment and the probability of switching from paid employment to self-employment. Table 7 summarizes the hypotheses and the results of the empirical testing.

Table 7 about here!

One challenge of our analysis was to distinguish between the influence of occupational environments and the effect of possible self-selection of individuals into certain occupations that fit their preferences. Although our analysis accounts for a wide set of control variables, including a person's willingness to take risks, which is a potential driver of self-selection into certain occupational environments (Parker 2009a; Caliendo et al. 2011), we further investigated this issue. In particular, we analyzed differences between future entrepreneurs and non-entrepreneurs regarding their first occupational choices when they enter the labor market. Two results are noteworthy in this respect. First, would-be entrepreneurs are more likely than non-entrepreneurs to choose occupations with high earnings risk early in their career. This suggests that a financial motivation, as well as the willingness to take risk, is more strongly developed in future entrepreneurs than in non-entrepreneurs, and plays an important role in their career choices. Second, would-be entrepreneurs are likely to choose a first occupation that requires a relatively high variety of skills. This result also reflects that pro-entrepreneurial individuals are more likely to have a pronounced taste for variety (Astebro and Thompson 2011) early in their careers. This taste for variety may be particularly responsible for frequent job changes and accumulation of an entrepreneurship-relevant skill set. Moreover, we show that occupational environments with high skill variety may also promote entrepreneurial choice. Hence, such occupations may be a further source of an entrepreneurship-relevant balanced skill set, in addition to frequent job hopping and work experience in small firms.

Another important implication of our study is that financial motivation can be regarded as an important factor driving career choices of entrepreneurial individuals. The desire to earn more money makes entrepreneurs more willing to bear occupational earning risk early in their careers when they make their first occupational choices in paid employment. Failure to achieve the expected occupation-specific income can then be an important factor that influences the decision to become self-employed. Although self-employment offers a chance to earn high incomes, there is a rather pronounced risk of earning less than working in paid employment (see Sorgner, Fritsch and Kritikos, 2017).

Last but not least, our results show that entrepreneurial individuals are not particularly likely to self-select into occupations with high self-employment rates. At the same time, experience working in an occupation with pronounced self-employment rates increases the probability of an individual to set up an own business. This suggests that a pro-entrepreneurial attitude may emerge during work experience in occupations that are conducive to entrepreneurship, be it in terms of a variety of role models or due to relatively low entry barriers.

This study is not without limitations that partly result from data availability. For instance, in our analysis of first career choices of future entrepreneurs as compared to non-entrepreneurs, we were able to follow respondents only over a time period of 6 years. As a consequence, the sample was restricted to relatively young individuals in the early stages of their careers. It is, however, known from previous research that individuals are more likely to become entrepreneurs in their mid-career lives. Hence, we cannot exclude the possibility that less experienced but probably more over-optimistic individuals are overrepresented in this sample, which may imply that preferences and attitudes towards entrepreneurship may play an important role.

Another limitation of our study is that we cannot distinguish between necessity- and opportunity-driven entrepreneurs. Our analysis is restricted to transitions out of paid employment, commonly regarded as opportunity-driven entrepreneurship. We do not consider transitions into self-

employment out of unemployment (necessity entrepreneurship).<sup>21</sup> Hence, it was not possible to analyze the potential differences of the effect of the occupational environment on different types of entrepreneurs. Particularly, high unemployment risk may motivate individuals to set up businesses out of necessity when the probability of job loss is high. We addressed this issue by including a variable indicating the self-reported probability of job loss within the next two years. Moreover, the data do not allow us to determine the specific mechanism that drives our finding that high occupation-specific self-employment rates are conducive to entrepreneurial choice. Hence, future research should investigate in how far this relationship is driven by a variety of entrepreneurial role models, a pronounced occupation-specific culture of entrepreneurship, relatively low entry barriers, or other factors.

To conclude, this paper sheds light on the role that the occupational environment plays in the entrepreneurial process. The findings suggest that entrepreneurship should be regarded a dynamic process that partly evolves from previous career choices. The diverse employment histories of entrepreneurs and, particularly, their choices of particular occupational environments that satisfy their tastes, appear to be a part of their preference-based career strategy. However, the importance of occupation-specific experiences, opportunities, role models, and economic conditions should not be ignored. Hence, future research should adopt a dynamic perspective focusing on the development of entrepreneurial careers and, particularly, on how working environments transmit entrepreneurship-related skills, values, and attitudes to individuals employed in them.

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<sup>21</sup> The reason for this is that there is no information on the occupation of unemployed individuals.

## Tables

Table 1: Descriptive statistics

Variable	Business founders		Employees		Employees with job change	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Short-term unemployment rate (t-1)	0.099	0.065	0.082***	0.059	0.088***	0.061
Long-term unemployment rate (t-1)	0.057	0.049	0.049***	0.044	0.052*	0.044
Occupational earnings risk (t-1)	0.656	0.189	0.559***	0.182	0.594***	0.188
Occupational median wages (t-1)	2,941.344	989.289	2,872.049	830.8037	2,814.25*	892.2897
Average deviation of individual wages from occupational median wages (t-1)	-840.126	1,406.721	-520.805***	1,086.494	-903.772	1,131.317
Average skill variety (t-1)	3.171	1.314	2.962***	1.239	2.928***	1.264
Self-employment rate (t-1)	0.116	0.090	0.096***	0.061	0.101***	0.065
Years of formal education	13.354	2.748	12.744***	2.653	12.991**	2.710
Age	40.581	10.317	42.697***	10.571	35.739***	10.332
Male (1 = yes, 0 = no)	0.590	0.493	0.497***	0.500	0.496***	0.500
Married (1 = yes, 0 = no)	0.565	0.497	0.634**	0.482	0.457***	0.498
Foreigner (1 = yes, 0 = no)	0.065	0.247	0.041**	0.198	0.054	0.225
East Germany (1 = yes, 0 = no)	0.233	0.423	0.240	0.427	0.242	0.428
Either parent self-employed (1 = yes, 0 = no)	0.180	0.385	0.081***	0.272	0.100***	0.299
Experienced years of unemployment	0.667	1.500	0.394***	1.107	0.618	1.277
Probability of job loss (t-1)	27.267	31.405	21.350***	24.465	32.516***	31.128
Willingness to take risk	5.714	2.275	4.644***	2.144	5.011***	2.175
Number of observations	322		35,916		3,546	

Notes: *t*-test of equal means as compared to the reference group of business founders. \*\*\*: statistically significant at the 1% level; \*\*: statistically significant at the 5% level; \*: statistically significant at the 10% level.

Table 2: Determinants of a switch from paid employment to self-employment—results for the full sample

	I	II	III	IV	V	VI	VII	VIII
<i>Characteristics of occupational environment</i>								
Short-term unemployment rate (t-1)	2.172*** (0.564)							1.595** (0.617)
Long-term unemployment rate (t-1)		2.288*** (0.813)						-
Occupational earnings risk (t-1)			1.463*** (0.178)					1.301*** (0.181)
Occupational median wages (t-1)				-0.00001 (0.000)				0.00001 (0.000)
Average deviation of individual wage from occupation-specific median wage (t-1)					-0.0002*** (0.000)			-0.0002*** (0.000)
Average skill variety (t-1)						0.0425 (0.0358)		-
Self-employment rate (t-1)							1.767*** (0.487)	0.866** (0.439)
<i>Individual characteristics</i>								
Years of formal education	0.438*** (0.168)	0.417** (0.175)	0.348** (0.153)	0.371** (0.176)	0.322* (0.173)	0.352** (0.178)	0.359** (0.171)	0.365** (0.150)
Years of formal education, squared	-0.013** (0.006)	-0.013** (0.006)	-0.010* (0.005)	-0.011* (0.006)	-0.009 (0.006)	-0.011* (0.006)	-0.011* (0.006)	-0.011** (0.005)
Age	0.044 (0.028)	0.046 (0.029)	0.042 (0.026)	0.051* (0.030)	0.076** (0.031)	0.052* (0.030)	0.051* (0.029)	0.070*** (0.026)
Age, squared	-0.001* (0.000)	-0.001* (0.000)	-0.001* (0.000)	-0.001* (0.000)	-0.001** (0.000)	-0.001* (0.000)	-0.001* (0.000)	-0.001*** (0.000)

Table 2 (continued)

Male (1 = yes, 0 = no)	0.176**	0.192**	0.272***	0.206**	0.316***	0.190**	0.200**	0.369***
	(0.079)	(0.084)	(0.075)	(0.086)	(0.092)	(0.086)	(0.083)	(0.082)
Married (1 = yes, 0 = no)	-0.035	-0.038	-0.025	-0.044	-0.056	-0.049	-0.044	-0.035
	(0.084)	(0.087)	(0.079)	(0.089)	(0.088)	(0.090)	(0.087)	(0.077)
Foreigner (1 = yes, 0 = no)	0.283*	0.304*	0.265*	0.332*	0.338*	0.349**	0.328*	0.250*
	(0.165)	(0.171)	(0.153)	(0.175)	(0.173)	(0.177)	(0.170)	(0.149)
East Germany (1 = yes, 0 = no)	-0.125	-0.126	-0.110	-0.111	-0.148	-0.102	-0.109	-0.162*
	(0.091)	(0.095)	(0.086)	(0.097)	(0.096)	(0.098)	(0.094)	(0.085)
Either parent self-employed (1 = yes, 0 = no)	0.607***	0.631***	0.549***	0.652***	0.635***	0.654***	0.614***	0.522***
	(0.122)	(0.137)	(0.111)	(0.130)	(0.136)	(0.131)	(0.127)	(0.106)
Experienced years of unemployment	0.100***	0.101***	0.084***	0.112***	0.098***	0.117***	0.108***	0.066***
	(0.027)	(0.029)	(0.025)	(0.029)	(0.029)	(0.029)	(0.028)	(0.024)
Willingness to take risk	0.118***	0.122***	0.117***	0.126***	0.127***	0.126***	0.123***	0.114***
	(0.018)	(0.019)	(0.017)	(0.019)	(0.019)	(0.019)	(0.018)	(0.017)
Probability of job loss (t-1)	0.005***	0.005***	0.005***	0.006***	0.005***	0.006***	0.006***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	-8.816***	-8.738***	-8.667***	-8.506***	-8.829***	-8.488***	-8.461***	-9.549***
	(1.422)	(1.603)	(1.290)	(1.479)	(1.590)	(1.496)	(1.458)	(1.284)
Number of observations	36,238	36,238	36,231	36,238	36,238	36,238	36,238	36,231
Log likelihood	-1,709	-1,712	-1,680	-1,716	-1,704	-1,715	-1,709	-1,660
Chi2	96.93***	68.33***	131.3***	89.62***	73.56***	86.69***	90.78***	148.4***



*Notes:* Random effects probit regression for panel data. The dependent variable equals 1 if a switch from paid employment into self-employment occurred in the current wave; it is 0 if a respondent remained in paid employment. Standard errors in parentheses. \*\*\*: statistically significant at the 1% level; \*\*: statistically significant at the 5% level; \*: statistically significant at the 10% level.

Table 3: Determinants of a switch from paid employment into self-employment—results for job-switchers

	I	II	III	IV	V	VI	VII
<i>Characteristics of occupational environment</i>							
Short-term unemployment rate (t-1)	2.981*** (0.761)						
Long-term unemployment rate (t-1)		2.399** (1.018)					
Occupational earnings risk (t-1)			1.238*** (0.230)				
Occupational median wages (t-1)				0.00003 (0.000)			
Average deviation of individual wage from occupation-specific median wage (t-1)					-0.0001*** (0.000)		
Average skill variety (t-1)						0.0587 (0.0420)	
Self-employment rate (t-1)							1.844*** (0.597)
<i>Individual characteristics</i>							
Years of formal education	0.389* (0.202)	0.331 (0.202)	0.290 (0.190)	0.276 (0.204)	0.259 (0.203)	0.256 (0.203)	0.290 (0.198)
Years of formal education, squared	-0.012* (0.007)	-0.011 (0.007)	-0.009 (0.007)	-0.009 (0.007)	-0.009 (0.007)	-0.009 (0.007)	-0.009 (0.007)
Age	0.109*** (0.036)	0.111*** (0.037)	0.112*** (0.035)	0.115*** (0.037)	0.132*** (0.038)	0.116*** (0.037)	0.114*** (0.036)
Age, squared	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)
Male (1 = yes, 0 = no)	0.219** (0.098)	0.229** (0.099)	0.295*** (0.096)	0.224** (0.102)	0.297*** (0.106)	0.208** (0.101)	0.232** (0.098)
<i>Table 3 (continued)</i>							

Married (1 = yes, 0 = no)	-0.011 (0.108)	-0.023 (0.109)	-0.012 (0.103)	-0.031 (0.110)	-0.035 (0.110)	-0.041 (0.110)	-0.029 (0.107)
Foreigner (1 = yes, 0 = no)	0.22 (0.202)	0.259 (0.203)	0.236 (0.192)	0.297 (0.207)	0.29 (0.206)	0.313 (0.207)	0.283 (0.201)
East Germany (1 = yes, 0 = no)	-0.072 (0.114)	-0.063 (0.115)	-0.038 (0.109)	-0.035 (0.117)	-0.056 (0.117)	-0.028 (0.116)	-0.038 (0.113)
Either parent self-employed (1 = yes, 0 = no)	0.607*** (0.148)	0.619*** (0.150)	0.560*** (0.140)	0.625*** (0.153)	0.631*** (0.153)	0.619*** (0.152)	0.571*** (0.147)
Experienced years of unemployment	-0.031 (0.037)	-0.029 (0.037)	-0.032 (0.035)	-0.019 (0.038)	-0.032 (0.038)	-0.017 (0.037)	-0.024 (0.037)
Willingness to take risk	0.119*** (0.024)	0.121*** (0.024)	0.117*** (0.023)	0.125*** (0.024)	0.126*** (0.024)	0.124*** (0.024)	0.124*** (0.024)
Probability of job loss (t-1)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.001)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Intercept	-8.588*** (1.689)	-8.094*** (1.676)	-8.337*** (1.589)	-7.726*** (1.681)	-8.019*** (1.703)	-7.626*** (1.672)	-7.845*** (1.640)
Number of observations	3,868	3,868	3,867	3,868	3,868	3,868	3,868
Log likelihood	-1,015	-1,021	-1,008	-1,023	-1,020	-1,022	-1,019
Chi2	68.36***	64.81***	79.4***	61.23***	61.55***	62.15***	67.11***

*Notes:* Random effects probit regression for panel data. The dependent variable equals 1 if a switch from paid employment into self-employment occurred in the current wave, and it equals 0 if a respondent changed jobs but remained in paid employment. Standard errors in parentheses. \*\*\*: statistically significant at the 1% level; \*\*: statistically significant at the 5% level; \*: statistically significant at the 10% level.

Table 4: Characteristics of first occupations of persons with and without a spell of self-employment

	Without a spell of self-employment		With a spell of self-employment	
	Mean	Standard deviation	Mean	Standard deviation
<i>Characteristics of occupational environment at time of labor market entry</i>				
Short-term unemployment rate	0.104**	0.062	0.076	0.045
Long-term unemployment rate	0.054**	0.034	0.038	0.023
Occupational earnings risk	0.592**	0.148	0.662	0.194
Occupational median wages	2485.625***	734.344	3,166.956	689.317
Average skill variety	2.657***	1.174	3.602	0.917
Self-employment rate	0.105	0.075	0.113	0.087
<i>Individual characteristics</i>				
Years of formal education	12.932***	2.566	14.750	1.809
Age	27.492**	4.189	29.433	4.049
Male (1 = yes, 0 = no)	0.463*	0.499	0.300	0.466
Married (1 = yes, 0 = no)	0.292	0.455	0.400	0.498
Foreigner (1 = yes, 0 = no)	0.065	0.247	0.033	0.183
East Germany (1 = yes, 0 = no)	0.209***	0.407	0.500	0.509
Either parent self-employed (1 = yes, 0 = no)	0.178**	0.383	0.333	0.479
Experienced years of unemployment	0.497	1.060	0.230	0.759
Willingness to take risk	5.031	2.103	5.433	2.373
Number of observations	585		30	

Notes: *t*-test of equal means as compared to the reference group of persons with at least one spell in self-employment. \*\*\*: statistically significant at the 1% level; \*\*: statistically significant at the 5% level; \*: statistically significant at the 10% level.

Table 5: Occupational characteristics at the time of labor market entry and the probability of future self-employment

	I	II	III	IV	V	VI
<i>Characteristics of occupational environment at time of labor market entry</i>						
Short-term unemployment rate	-0.105 (0.092)					
Long-term unemployment rate		-0.211 (0.163)				
Occupational earnings risk			0.0495* (0.030)			
Occupational median wages				1.85e-05** (0.000)		
Average skill variety					0.0124** (0.005)	
Self-employment rate						0.0219 (0.066)
<i>Individual characteristics</i>						
Years of formal education	0.0631** (0.026)	0.0656*** (0.024)	0.0649*** (0.023)	0.0632*** (0.022)	0.0575** (0.023)	0.0734*** (0.023)
Years of formal education, squared	-0.00202** (0.001)	-0.00211** (0.001)	-0.0021*** (0.001)	-0.0022*** (0.001)	-0.00194** (0.001)	-0.0024*** (0.001)
Age	-0.00584 (0.008)	-0.00692 (0.009)	-0.00252 (0.007)	-0.00426 (0.007)	-0.00853 (0.007)	-0.00737 (0.009)
Age, squared	0.000122	0.00014	6.92E-05	9.97E-05	0.00016	0.000144

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male (1 = yes, 0 = no)	-0.0121	-0.0117	-0.00921	-0.0130*	-0.0115*	-0.0124
	(0.009)	(0.009)	(0.008)	(0.007)	(0.007)	(0.008)
Married (1 = yes, 0 = no)	0.0291*	0.0288*	0.0291*	0.0224*	0.0217	0.0301*
	(0.017)	(0.017)	(0.017)	(0.013)	(0.014)	(0.017)
Foreigner (1 = yes, 0 = no)	-0.0111	-0.0102	-0.00983	-0.0111	-0.00854	-0.0123
	(0.011)	(0.012)	(0.011)	(0.007)	(0.007)	(0.011)
East Germany (1 = yes, 0 = no)	0.0602**	0.0602**	0.0538**	0.0506**	0.0504**	0.0599**
	(0.028)	(0.028)	(0.025)	(0.023)	(0.023)	(0.027)
Either parent self-employed (1 = yes, 0 = no)	0.00838	0.00761	0.0107	0.00426	0.00198	0.00972
	(0.012)	(0.012)	(0.013)	(0.008)	(0.007)	(0.013)
Experienced years of unemployment	-0.00254	-0.00228	-0.00244	-0.00198	-0.000134	-0.00394
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)
Willingness to take risk	0.00277	0.00263	0.00178	0.00172	0.00198	0.0024
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Number of observations	615	615	615	615	615	615
Log likelihood	-94.46	-94.34	-93.5	-88.66	-88.52	-95.02
Chi2	46.23***	47.42***	46.86***	61.19***	53.69***	44.09***
Pseudo R2	0.212	0.213	0.22	0.26	0.262	0.207

*Notes:* Marginal effects of probit regressions. Robust standard errors in parentheses. The dependent variable equals 1 if at least one spell of self-employment observed in the first 6 years after labor market entry; 0 otherwise. \*\*\*: statistically significant at the 1% level; \*\*: statistically significant at the 5% level; \*: statistically significant at the 10% level.

Table 6: Determinants of a switch from paid employment into self-employment—results for respondents who did not change occupation since labor market entry

	I	II	III	IV	V	VI	VII
<i>Characteristics of occupational environment</i>							
Short-term unemployment rate (t-1)	3.033** (1.351)						
Long-term unemployment rate (t-1)		3.978* (2.186)					
Occupational earnings risk (t-1)			2.041*** (0.429)				
Occupational median wages (t-1)				0.000 (0.000)			
Average deviation of individual wage from occupation-specific median wage (t-1)					-0.0001 (0.000)		
Average skill variety (t-1)						0.170* (0.100)	
Self-employment rate (t-1)							2.745** (1.290)
<i>Individual characteristics</i>							
Years of formal education	0.212 (0.458)	0.192 (0.452)	0.101 (0.383)	-0.0555 (0.453)	0.109 (0.382)	0.0330 (0.454)	0.000686 (0.452)
Years of formal education, squared	-0.00547 (0.0162)	-0.00474 (0.0159)	-0.002 (0.014)	0.00208 (0.0160)	-0.00236 (0.0135)	0.000260 (0.0161)	0.00134 (0.0160)
Age	0.167 (0.102)	0.167 (0.102)	0.139 (0.090)	0.184* (0.105)	0.136 (0.0905)	0.185* (0.105)	0.185* (0.106)

Age, squared	-0.00192*	-0.00193*	-0.002	-0.00214*	-0.00158	-0.00212*	-0.00215*
	(0.00114)	(0.00114)	(0.001)	(0.00118)	(0.00102)	(0.00117)	(0.00119)
Male (1 = yes, 0 = no)	0.352*	0.384**	0.532***	0.345*	0.543***	0.548**	0.388*
	(0.196)	(0.194)	(0.185)	(0.200)	(0.188)	(0.222)	(0.200)
Married (1 = yes, 0 = no)	0.0471	0.0414	0.046	-0.00506	0.0510	-0.0142	0.0318
	(0.212)	(0.210)	(0.183)	(0.213)	(0.182)	(0.216)	(0.216)
Foreigner (1 = yes, 0 = no)	0.626	0.616	0.497	0.716*	0.494	0.674	0.664
	(0.427)	(0.422)	(0.374)	(0.425)	(0.374)	(0.430)	(0.436)
East Germany (1 = yes, 0 = no)	-0.0672	-0.0581	-0.012	-0.0184	-0.00831	-0.0797	-0.0373
	(0.233)	(0.231)	(0.200)	(0.235)	(0.199)	(0.239)	(0.237)
Either parent self-employed (1 = yes, 0 = no)	0.481	0.486	0.353	0.505*	0.353	0.477	0.486
	(0.299)	(0.296)	(0.261)	(0.301)	(0.261)	(0.305)	(0.306)
Experienced years of unemployment	0.119**	0.116**	0.096*	0.132**	0.0943*	0.115*	0.125**
	(0.0578)	(0.0575)	(0.051)	(0.0593)	(0.0510)	(0.0607)	(0.0592)
Willingness to take risk	0.131***	0.133***	0.130***	0.137***	0.130***	0.140***	0.133***
	(0.0404)	(0.0402)	(0.037)	(0.0409)	(0.0373)	(0.0411)	(0.0410)
Probability of job loss (t-1)	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Intercept	-11.25***	-11.00***	-10.137***	-9.735**	-10.21***	-10.30***	-10.19***
	(3.841)	(3.823)	(3.459)	(3.811)	(3.510)	(3.833)	(3.824)
Number of observations	11,538	11,538	11,535	11,538	11,538	11,538	11,538
Log likelihood	-433.5	-434.4	-423.8	-434.4	-421.9	-434.5	-433.7
Chi2	34***	31.13***	37.88***	30.21***	36.62***	30.24***	32.14***

*Notes:* Random effects probit regression for panel data. The dependent variable equals 1 if a switch from paid employment into self-employment occurred in the current wave, and it equals 0 if a respondent changed jobs but remained in paid employment. Standard errors in parentheses. \*\*\*: statistically significant at the 1% level; \*\*: statistically significant at the 5% level; \*: statistically significant at the 10% level.



Table 7: Results of hypotheses testing in different types of samples

<i>Hypotheses</i>	Sample			
	Full sample	Job-switchers	First occupation	No occupational change since labor market entry
1: The probability of switching from paid employment to self-employment is higher in occupations with a relatively high occupation-specific unemployment level.	***	***	n.s.	***
2a: A higher occupational earnings risk increases the probability of entrepreneurial entry.	***	***	*	***
2b: A higher expected occupation-specific income decreases the probability of entrepreneurial entry	n.s.	n.s.	n/a	n.s.
2c: Failure to achieve an expected occupation-specific income increases the probability of entrepreneurial entry.	***	***	n/a	n.s.
3: Individuals in occupations that require a high level of skill variety have a relatively high propensity of entrepreneurial entry.	n.s.	n.s.	**	*
4: Individuals in occupations that are characterized by high levels of self-employment have a relatively high propensity of entrepreneurial choice.	***	***	n.s.	**

*Notes:* \*\*\*: statistically significant at the 1% level; \*\*: statistically significant at the 5% level; \*: statistically significant at the 10% level; n.s.: not statistically significant; n/a: not applicable.

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## Appendix

Table A1: Definition of variables

<i>Variable</i>	<i>Definition</i>
Short- and long-term unemployment rate	Annual average number of registered short/long-term unemployed in 'BO' over the number of employees in 'BO' <sup>a</sup>
Occupational earnings risk	Occupation-specific variance of the residuals in Mincer wage regression in 'BO' <sup>b</sup>
Occupational median wages	Median values of monthly gross wages in 'BG' <sup>a</sup>
Average deviation of individual wages from occupational median wages	Deviation of individual wages from the monthly median wages in 'BG' <sup>a, b</sup>
Average skill variety	Average number of expert skills that individuals use in 'BO' <sup>c</sup>
Self-employment rate	Number of self-employed in 'BA' over the number of employees in 'BA' <sup>d</sup>
Years of formal education	Number of years spent in formal education <sup>b</sup>
Age	A respondent's age <sup>b</sup>
Male	A respondent's gender: equals 1 if male and 0 if female <sup>b</sup>
Married	Marital status: equals 1 if married and 0 otherwise <sup>b</sup>
Foreigner	Nationality: equals 1 if non-German and 0 otherwise <sup>b</sup>
East Germany	Respondent's residence: equals 1 if East Germany and 0 otherwise <sup>b</sup>
Either parent self-employed	A dummy variable which equals 1 if either parent was self-employed as the respondent was 15 years old <sup>b</sup>
Experienced years of unemployment	Number of years spent in unemployment in the past <sup>b</sup>
Probability of job loss	An 11-point Likert scale measuring the probability of a job loss within the next two years <sup>b</sup>
Willingness to take risk	An 11-point Likert scale measuring general willingness to take risks as a response to the question "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" <sup>b</sup>

Data sources: a) Federal Employment Agency; b) Socio-Economic Panel Data; c) BIBB/BAuA employment survey 2006; d) Microcensus of the Federal Statistical Office, 2004-2009.

*Notes:* BO = Berufsordnung, three-digit level of KldB'92, 369 occupational groups; BG = Berufsgruppe, two-digit level of KldB'92, 88 occupational groups; BA = Berufsabschnitt, aggregated two-digit level of KldB'92, 33 occupational groups

Table A2: Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Short-term unemployment rate (t-1)	1															
2 Long-term unemployment rate (t-1)	0.857*	1														
3 Average skill variety (t-1)	-0.412*	-0.497*	1													
4 Self-employment rate (t-1)	0.153*	0.093*	-0.377*	1												
5 Occupational earnings risk (t-1)	0.283*	0.337*	-0.315*	0.132*	1											
6 Occupational median wages (t-1)	-0.497*	-0.521*	-0.001	0.026*	-0.289*	1										
7 Income deviation (t-1)	0.122*	0.114*	0.117*	-0.007	-0.107*	-0.216*	1									
8 Years of formal education	-0.243*	-0.288*	0.489*	0.089*	-0.138*	0.494*	0.052*	1								
9 Age	-0.087*	-0.029*	0.041*	-0.028*	-0.052*	0.091*	0.225*	0.069*	1							
10 Male (1=yes, 0=no)	0.055*	0.026*	0.156*	-0.026*	-0.233*	0.153*	0.323*	-0.032*	-0.015*	1						
11 Married (1=yes, 0=no)	-0.037*	-0.015*	0.027*	-0.018*	-0.056*	0.054*	0.097*	0.013*	0.409*	0.025*	1					
12 Foreigner (1=yes, 0=no)	0.071*	0.070*	-0.089*	-0.020*	0.030*	-0.076*	0.014*	-0.098*	-0.088*	0.032*	0.025*	1				
13 East Germany (1=yes, 0=no)	0.029*	0.031*	-0.003	0.025*	0.017*	-0.026*	-0.114*	0.088*	0.024*	-0.015*	-0.01	-0.108*	1			
14 Either parent self-employed (1=yes, 0=no)	-0.008	-0.031*	0.046*	0.035*	0.013*	0.044*	-0.019*	0.074*	-0.007	-0.021*	-0.019*	-0.012*	-0.064*	1		
15 Experienced years of unemployment	0.102*	0.137*	-0.151*	-0.002	0.117*	-0.129*	-0.097*	-0.107*	0.040*	-0.047*	-0.020*	0.051*	0.078*	-0.027*	1	
16 Probability of job loss	0.099*	0.082*	-0.062*	0.017*	0.098*	-0.046*	-0.122*	-0.054*	-0.138*	-0.009	-0.071*	-0.012*	0.180*	-0.041*	0.106*	1
17 Willingness to take risk	0.041*	0.012*	0.054*	0.019*	-0.037*	0.035*	0.054*	0.022*	-0.121*	0.177*	-0.080*	0.013*	0.013*	0.024*	-0.009	-0.000

Note: \* denotes significance at the 5% level.





Table A4: Effect of occupation-specific unemployment rate (defined at the level of ‚Berufsabschnitte‘) on the probability of switching into self-employment

	I	II
Short-term unemployment rate (t-1)	3.588*** (0.733)	-
Long-term unemployment rate (t-1)	-	5.111*** (1.153)
Years of formal education	0.463*** (0.168)	0.454*** (0.170)
Years of formal education, squared	-0.0139** (0.00592)	-0.0136** (0.00598)
Age	0.0456 (0.0278)	0.0452 (0.0283)
Age, squared	-0.0006* (0.000)	-0.0006* (0.000)
Male (1 = yes, 0 = no)	0.162** (0.0793)	0.174** (0.0808)
Married (1 = yes, 0 = no)	-0.0420 (0.0841)	-0.0423 (0.0849)
Foreigner (1 = yes, 0 = no)	0.295* (0.164)	0.305* (0.166)
East Germany (1 = yes, 0 = no)	-0.129 (0.0911)	-0.129 (0.0922)
Either parent self-employed (1 = yes, 0 = no)	0.600*** (0.122)	0.607*** (0.127)
Experienced years of unemployment	0.101*** (0.0266)	0.100*** (0.0273)
Willingness to take risk	0.117*** (0.0179)	0.118*** (0.0183)
Probability of job loss (t-1)	0.00509*** (0.00138)	0.00528*** (0.00141)
Intercept	-9.154*** (1.441)	-9.080*** (1.509)
Number of observations	36,238	36,239
Log likelihood	-1704	-1706
Chi2	98.73***	84.69***

*Notes:* Random effects probit regression for panel data. The dependent variable equals 1 if a switch from paid employment into self-employment occurred in the current wave; it is 0 if a respondent remained in paid employment. Standard errors in parentheses. \*\*\*: statistically significant at the 1% level; \*\*: statistically significant at the 5% level; \*: statistically significant at the 10% level.