Necessity and Opportunity Entrepreneurs in Germany: Characteristics and Earnings Differentials

Block, Joern and Wagner, Marcus

1 April 2006

Necessity and Opportunity Entrepreneurs:
Characteristics and Earnings Differentials*

Joern H. Block**

Marcus Wagner***

This version: April 2006

Comments very welcome!

Abstract

Our paper uses data from the German Socio Economic Panel Study (GSOEP) to analyze how necessity and opportunity entrepreneurs differ in kind and in earnings and what the determinants of the latter are. We estimate probit and random effects panel data models in order to address these questions. We find that the two types of entrepreneurs differ as concerns age, gender and other characteristics, but not with regard to education levels. Furthermore, opportunity entrepreneurs earn significantly more in our sample and the determinants of earnings levels differ to some degree. We conclude that our findings indicate a need to distinguish between the two groups in entrepreneurship policy-making. The results also show that commonly used specifications of earnings equations in labour economics seem to work better for opportunity than for necessity entrepreneurs.

** Technical University of Munich, Schöller Chair in Technology and Innovation Management, Arcisstr. 21, D-80333 Munich, Germany, telephone: +498928925746, e-mail: block@wi.tum.de.

*** Technical University of Munich, Schöller Chair in Technology and Innovation Management, Arcisstr. 21, D-80333 Munich, Germany, telephone: +498928925747, e-mail: wagner@wi.tum.de.

1. Introduction

Since 2001, the Global Entrepreneurship Monitor (GEM) has discussed two rather different types of entrepreneurship, notably necessity and opportunity entrepreneurship (e.g. Reynolds et al., 2002; Sternberg et al., 2006). The differentiation focuses on the motivation of the entrepreneur to start his or her venture. In line with Kirzner (1979), opportunity entrepreneurs are viewed as entrepreneurs who start a business in order to pursue an opportunity, whilst necessity entrepreneurship is more requirement-based (e.g. Reynolds et. al, 2005). A large part of the discussion is about each group's impact on economic growth and job creation. In Germany, as we will describe below, the situation is peculiar in that the entrepreneurship policy differs with respect to each group. Amongst academics and policy makers, there is an intense discussion about the merits of this differentiation (e.g. Sternberg, 2005). Given the lack of longitudinal data, however, the discussion regarding the economic performance of each group remains incomplete (Wagner, 2005). With this paper, we aim to address this gap in the research.

Using data from the German Socio Economic Panel Study (GSOEP), a longitudinal household survey, we address three research questions in relation to the two groups: what are the respective characteristics of each group ? Which group is on average more successful in that it reports higher earnings and what factors determine the respective level of earnings ? In order to determine the specific characteristics of each group, we estimate a binary probit model and in order to find out about the earnings level and its determinants, we estimate random and fixed effects panel data models.

Our findings carry some interesting policy implications: the two groups are found to differ with respect to age, gender, region and risk to become unemployed, suggesting a different treatment by entrepreneurship policy. On the other hand, to our surprise, no difference regarding the level of education is found. Opportunity entrepreneurs are found to earn significantly more, thereby suggesting a stronger impact on economic growth. The determinants of the respective group's level of earnings are also found to differ. The most widely-used specification in labour economics, the Mincer equation (section 2.3), seems to fit better with opportunity than with necessity entrepreneurs. The latter result is of particular interest from a research perspective. It seems that the earnings of the two groups are on a different level and that they are determined in a different way. If not controlled for this, comparisons of entrepreneurial earnings as well as their explanatory factors (e.g. labour market experience) with wages of paid employees are likely to produce misleading results. Prior research reporting entrepreneu-

rial wages being significantly below those of paid employees (e.g. Hamilton, 2000) should be interpreted in a more cautious way.

The remainder of the paper is organized as follows. Section 2 reviews the literature on necessity and opportunity entrepreneurship, the literature on new venture creation out of unemployment and the literature on wage equations. Section 3 motivates our empirical study and gives arguments why necessity and opportunity entrepreneurs might differ with respect to our research questions. Section 4 introduces the data. Section 5 describes the empirical model and section 6 reports the results, which are discussed in section 7. Finally, section 8 points out policy implications and gives ideas for further research.

2. Literature review

In this section, we review research from the GEM about necessity and opportunity entrepreneurship. Furthermore, we summarize some of the literature about venture creation out of unemployment and introduce the reader to the considerable body of literature on earnings or wage equations.

2.1 Definitions and findings from the Global Entrepreneurship Monitor (GEM)

The GEM project defines entrepreneurs as "people who are active as adults in the process of setting up a business they will (partly) own and/or currently owning and managing an operating young business" (Reynolds et al., 2005).[1] The terms necessity and opportunity entrepreneur were introduced in 2001, when pointing out that a distinction should be made between "entrepreneurship reflecting the voluntary pursuit of opportunity and that reflecting a necessity to engage in entrepreneurship when there is an absence of employment opportunities" (Reynolds et. al., 2002). They clarify: "Each respondent was asked to indicate whether he was starting and growing his business to take advantage of a unique market opportunity (opportunity entrepreneurship) or because it was the best option available (necessity entrepreneurship)" (Reynolds et al., 2002). This distinction has led to some interesting new insights into the entrepreneurial process:

- A significant relationship between national levels of opportunity entrepreneurship and their projected economic growth is found (Acs et al, 2005; Acs and Varga, 2005; Reynolds et al., 2002). Countries with a low ratio of opportunity to necessity entrepreneurs also have a low GDP per capita.

---

[1] See Reynolds et al. (2005) for a description of the Global Entrepreneurship Monitor (GEM), in particular data collection and measurement issues.

- The average opportunity entrepreneurship prevalence rate across the GEM countries is about 6%, whilst that of necessity entrepreneurship is only about 2% (Acs et al., 2005). The pattern of necessity and opportunity entrepreneurship, however, varies considerably across GEM countries in that those with more supportive social welfare programmes tend to have a lower rate of necessity entrepreneurship (Acs et al., 2005; Reynolds et al., 2002). The two extremes are Japan with 1.1% and Uganda with 14.4% (Acs et al., 2005). The prevalence rate for necessity entrepreneurship varies considerable more than that of opportunity entrepreneurship (Reynolds et al., 2002).

- The correlation between a country's necessity entrepreneurship prevalence rate and its opportunity entrepreneurship prevalence rate is low (r=0.27) and statistically insignificant, indicating different causal mechanisms underlying each type of entrepreneurship (Reynolds et al., 2002).

- A higher proportion of opportunity entrepreneurship is related to business services (21%) than is the case for necessity entrepreneurship (5%) and the share of male necessity entrepreneurs is slightly higher than the share of female necessity entrepreneurship (Reynolds et al., 2002).

- Necessity and opportunity entrepreneurs differ in their growth aspirations in that opportunity entrepreneurs want to grow faster. In GEM 2001, 14% of opportunity entrepreneurs expected to create more than 20 jobs, whereas only 2% of necessity entrepreneurs had these expectations (Reynolds et al., 2002).

In Germany, some peculiarities prevail. The ratio of necessity to opportunity entrepreneurs (1 to 2.43) is higher than in other western countries (e.g. the US with 1 to 7.2) (Sternberg et al, 2006). Data from the Regional Entrepreneurship Monitor (REM), a project closely linked to the GEM, but with focus on German regions, suggest strong differences in the level of necessity entrepreneurship between German regions. Furthermore, an overall increase in the level of necessity entrepreneurship over the last years has been reported (e.g. Lückgen and Oberschachtsiek, 2004; Wagner and Sternberg, 2002). Relying on German REM data, Wagner (2005) finds risk aversion to be higher with necessity than with opportunity entrepreneurs. Also, necessity entrepreneurs are less likely to have parents who were self-employed than opportunity entrepreneurs. Finally, the share of former unemployed is higher with necessity than with opportunity entrepreneurs. Yet, Wagner (2005) also shows some similarities between the groups in that they do not differ with respect to the number of fields of professional experience and the number of professional degrees obtained.

2.2   Unemployment and entrepreneurship

We identified two strands of literature concerning the relationship between unemployment and entrepreneurship: firstly, studies discussing the impact of national and regional unemployment levels on self-employment rates at a macro-economic level and, secondly, studies with a more micro-economic perspective focussing on the propensity of an unemployed person to engage in business formation or address her entrepreneurial success in terms of business survival and employment growth. For examples of macro-economic studies, refer to Evans and Leighton (1989a), Keeble and Walker (1994) or Reynolds et al. (1994).[2] Since those studies are of lesser relevance for our paper, we do not review them in detail, but focus on studies with a micro-economic perspective: Ritsilä and Tervo (2002) discuss the effects of unemployment on entrepreneurship based on Finish data. They define a "push-entrepreneur" as an individual who in the absence of personal unemployment would not start a business, which conceptually is at least very similar, if not identical to the notion of a necessity entrepreneur. Regarding the occupational decision, they find a positive but non-linear effect of personal unemployment on the propensity of an individual to become self-employed.

For Germany, the empirical findings are as follows: Pfeiffer and Reize (2000) find that for West German regions that, in terms of employment growth and survival probability, start-ups out of unemployment do not perform worse than other start-ups. The contrary is however the case in East Germany: start-ups out of unemployment are shown to have a significant lower survival probability than other start-ups. According to Brüderl et al. (1996), business start-ups by unemployed persons are smaller and require less capital than other start-ups. Hinz and Jungbauer-Gans (1999) confirm these results. They see a deficit in financial resources as a great obstacle of start-ups out of unemployment. Interestingly, their study does not reveal a deficit in human capital, indicating that unemployed founders come from a very specific subgroup of all unemployed persons. Finally, start-ups by unemployed persons are found to have a slower pace of employment growth. Niefert and Tchouvakhina (2006) provide empirical support for the idea of unemployment being a push factor leading to self-employment. They also show that start-ups by unemployed individuals more often than other start-ups occur in industries with low market entry barriers and low capital requirements. Furthermore, these ventures are characterized by a lower number of employees. In their study, about 70% of all

---

[2]   Most of these studies rely on aggregate time series data. Two possible though contrary views prevail. On the one hand, a high unemployment rates reflects missing opportunities in the labour market and pushes unemployed persons into self-employment, and, on the other hand, an economy in a good state with a low level of unemployment creates opportunities and pulls people into self-employment. Empirical studies produce mixed results of which Storey (1991) provides an overview.

start-ups by unemployed individuals were one-person start-ups. Reize (2000) uses data from the German Socio Economic Panel (GSOEP) data from 1983 to 1996 and compares those unemployed persons finding a new job in paid employment with those entering self-employment. In his study, the latter are characterized by a higher educational degree. Furthermore, the results of a duration analysis suggest that the risk of becoming unemployed again is lower than if they had entered paid employment.

2.3 Earnings equations and their determinants

In the field of labour economics, wage and earnings equations received and still receive a lot of interest, with early key contributions being e.g. "Schooling, Experience and Earnings" by Mincer (1974), which was based on prior research by Becker and Chiswick (1966). The most widely used wage equation includes log earnings on the left-hand and years of education as well as a quadratic function of labour market experience on the right-hand side of the equation.[3] In principle, one could use this widely accepted equation to estimate the earnings of self-employed individuals. However, theoretical considerations and empirical evidence suggest the distribution and the coefficients to differ from those using a sample of paid employees.[4]

Some scholars argue that formal education matters less in the context of entrepreneurship resulting in a lower rate of return compared to paid employees (e.g. Brown and Sessions, 1998). The argument goes even further in that formal education might foster attitudes contradicting the very essence of entrepreneurship (Parker, 2004). Another line of argument, however, predicts the opposite. If employers demand a high level of formal education from their workers e.g. for the purpose of screening, then, would-be entrepreneurs, not facing this requirement, should leave full-time education at an earlier point. If we assume decreasing marginal returns to education, the rate of return to education of self-employed should then be higher compared to that of paid employees (Riley, 1979). Another discussion concerns the self-employed earnings-age profile. On the one hand, it is argued that the profile is steeper, since the self-employed do not need to share the returns from their human and/or physical capital investments with their employer. On the other hand, they do not have the possibility of shirking on the job, since no principal-agent relationship exists (Lazear and Moore, 1984; Parker, 2004).

---

[3] See Lemieux (2003) for a review of the empirical performance of the Mincer equation.
[4] See Parker (2004) for a survey of earnings equations in entrepreneurship research.

Empirically, Hamilton (2000) finds entrepreneurs to have lower initial earnings as well as lower earnings growth than paid employees. He seeks to explain this difference with a variety of factors, but finds none providing a convincing explanation. Therefore, he concludes that self-employment offers important non-pecuniary benefits. Van der Sluis et. al. (2003) review studies regarding the impact of schooling on entrepreneurial earnings in industrialised countries and find a lower average rate of return for entrepreneurs compared to employees, which one could interpret as support for the idea that formal education matters less in the context of entrepreneurship. This result, however, has to be interpreted cautiously, as it is difficult to disentangle the impact of (attained) formal education from that of (inherited) entrepreneurial ability. To deal with this endogeneity problem, Van der Sluis et al. (2004) use instrumental variables, and, somewhat surprising in this case, found the average return to schooling to be higher with entrepreneurs.[5] Evans and Leighton (1989b) find that wage experience (years of wage experience) has a significantly smaller return in self-employment, whilst the rate of return to business experience (years in a wage job) does not differ between self-employment and paid employment. It should be said that self-employed earnings equations often show poor goodness-of-fit compared to wage equations from paid employee samples (Parker, 2004).

3.   Definitions, theory and research questions

We define a necessity entrepreneur as someone who has been in paid employment before, but was either laid off by her employer or her place of work was closed. Vice versa, we define an opportunity entrepreneur as someone having left paid employment voluntarily. These definitions differ from the GEM definition (see section 2.1) in various ways, but, as the descriptive statistics show, at least for Germany, they do not result in qualitatively different samples (see section 4). Our operationalization differs from the GEM in at least four dimensions: Firstly, we do not ask people about their motivation, but instead infer their type of entrepreneurship from the way they left paid employment. Secondly, our sample includes only those who were successful in reaching self-employment status. Those who try to establish a venture, but give-up before entering self-employment are not considered. Our sample might therefore be a positive selection of all would-be entrepreneurs. Thirdly, we consider only those entrepreneurs who have been in paid employment before. Fourthly and finally, we do not include part-time ventures.

---

[5] In another paper, they try to find explanations for this finding. See Van der Sluis et al. (2006).

In the following section, we develop a conceptual framework for our paper. We focus on three issues with respect to differences between necessity and opportunity entrepreneurs: What determines each group's decision to become self-employed ? Which group receives a higher monetary return ? What are the determinants of this return ?

3.1   The decision to become self-employed

The decision to set up one's own business is often a choice between two alternatives, namely being self-employed or working as a paid employee (e.g. Campbell, 1992; Wagner, 2005). The economic considerations underlying this decision can be framed in the notion of the discounted expected life-cycle utility (DELU) (e.g. Pfeiffer and Reize, 2000; Wagner and Sternberg, 2002; Wagner, 2005). A potential entrepreneur compares his or her DELU of self-employment with that of paid employment and makes a decision to start a business accordingly. The DELU includes monetary and non-monetary returns, which in turn depend on factors such as human capital, motivation or degree of risk aversion. Figure 1 and Figure 2 illustrate the main features of this decision from the perspective of a necessity or an opportunity entrepreneur. We argue that the determinants of the DELU and therefore the decision to become self-employed are qualitatively rather different. The greater complexity of the necessity entrepreneur's occupational decision is illustrated by the following:

-        Often, the state provides monetary incentives to engage in start-ups. Some of these subsidies are open for every kind of start-up, some only for particular types. In Germany, for example, the state owned SME bank (*KfW Mittelstandsbank*) offers subsidized financing for all kinds of start-ups, irrespective of whether they are necessity or opportunity.[6] Yet, the federal employment agency (*Bundesagentur für Arbeit*) hands out subsidies exclusively for entrepreneurs who have been unemployed before, e.g. payments under the so-called "*Ich-AG*" or "me plc".[7] An entrepreneur who has been unemployed before can therefore benefit from both the programmes offered by the SME bank and the programmes offered by the federal employment agency, whereas other entrepreneurs only qualify for subsidies offered by the SME bank.

---

[6] An example of such a KfW-programme is "*Mikro-Darlehen*" (Micro-loan), which provides financing for start-up investments of up to 25,000 € (March 2006). More detailed information can be found at http://www.existenzgruender.de.

[7] Under the "*Ich-AG*" programme, a start-up entrepreneur who has been unemployed before is granted a monthly subsidy of 600 € in the 1st year, of 360 € in the 2nd year and of 240 € in the 3rd year of the start-up. So called "bridging allowances" constitute another subsidy designed exclusively for start-ups out of unemployment. See Hinz and Jungbauer-Gans (1999) or Pfeiffer and Reize (2000) for a detailed description of "bridging allowances". In 2004, more than half of all German start-ups were supported by such programmes of active labour market policy (Niefert and Tchouvakhina, 2006). The importance has increased over the last years.

-       A potential necessity entrepreneur compares the monetary returns of self-employment not only with those of paid employment, but also includes payments from social welfare in the decision making process. In addition, in order to make the decision, she has to form expectations about the probability to find a new job in paid employment.

[Insert Figure 1 and Figure 2 about here]

3.2   Necessity or opportunity entrepreneur: who earns more ?

Our next issue concerns the level of the entrepreneurial wage. Does one group earn significantly more than the other ? Arguments for either necessity or opportunity entrepreneurs earning significantly more are presented below.

Since, in our definition, opportunity entrepreneurs are more successful on the labour market, one is tempted to say that they should also earn more. Furthermore, since they have planned their decision to start a business, they might have invested more in their human and social capital necessary to start a business, which then might lead to higher earnings. These two arguments focus on differences between the two groups' personal characteristics. Another line of argument considers the situation in which the start-up occurs. An opportunity entrepreneur is more likely to have spotted an apparent opportunity for making profits, whilst the necessity entrepreneur may simply have had no better choice. Another argument concerns a general hypothesis from labour market economics: job search theory.[8] The longer an individual is unemployed, the more her reservation wage, i.e. the minimum wage she is willing to accept, might decrease. Following this logic, necessity entrepreneurs seem to be more likely than opportunity entrepreneurs to accept self-employment in low-income sectors.

Arguments from psychological research motivate the opposite, i.e. the necessity entrepreneur earning significantly more than the opportunity entrepreneur. Firstly, a potential opportunity entrepreneur might evaluate the non-monetary benefits of the occupational decision such as independence in the workplace higher than a potential necessity entrepreneur[9]. Hence, they might be willing to accept an entrepreneurial wage below that which a necessity entrepreneur would accept. Secondly, entrepreneurs are found to have a systematic tendency to be over-optimistic (e.g. Arabsheibani et al., 2000; Cooper et al., 1988). If, as one might argue, the op-

---

[8] See Devine and Kiefer (1993) for a survey of the literature.
[9] Hamilton (2000) explains earnings differentials between self-employment and paid employment this way. Frey and Benz (2003) showed self-employed persons to be more satisfied with their job than wage workers.

portunity entrepreneur resembles more the typical entrepreneur, she might also suffer more from over-optimism and consequently overestimate her future entrepreneurial earnings.

3.3. What determines each group's entrepreneurial wage ?

Another interesting question concerns the determinants of the entrepreneurial wage. Do some explanatory variables have a different impact depending on the type of entrepreneurship concerned ?

We argue that labour market experience should have a greater return with opportunity than with necessity entrepreneurs. Firstly, opportunity entrepreneurs are more likely to have started their venture in an area of their expertise, which then should lead to a greater monetary return. Secondly, they might have carefully prepared their step into self-employment and undertaken considerable investments into their human and social capital necessary to start a business (e.g. they might have used their time in paid employment to look for future clients or potential business partners). A similar argument goes for education. Opportunity entrepreneurs are more likely than necessity entrepreneurs to have spent their time in education in a way from which they benefit as an entrepreneur, e.g. taking courses in entrepreneurial finance or business planning. Moreover, if they have planned their later start-up already at that stage, the argument of Riley (1979) applies which states that entrepreneurs to a lesser extent need to use education as a signalling device which results in a higher marginal rate of return (see section 2.3).

4. Data Source, sample construction and descriptive statistics

The data set we collected is an unbalanced panel data set. The data used were made available by the German Socio Economic Panel Study (GSOEP) at the German Institute for Economic Research (DIW), Berlin. [10] The GSOEP is a longitudinal household survey conducted annually. It gives amongst others detailed information about the participant's occupational status (e.g. employee or self-employed). The first wave in the year 1984 included 12,245 individuals. Since then, the GSOEP expanded its sample size in several steps, interviewing 22,019 individuals in 2004 (Table 1). In order to construct our estimation sample, we made use of all waves available (1984-2004), selected those who were once self-employed and collected information about how they got into self-employment. Those who reported to have left their job in paid employment on their own were classified as opportunity entrepreneurs, whereas those

---

[10] For more detailed information about the GSOEP, refer to Wagner et al. (2003), Haisken-DeNew and Frick (2003) or Frick (2005).

who were either dismissed by their employer or laid off because their place of work closed down are classified as necessity entrepreneurs. We constrained our sample to those cases where the termination of the last job, voluntarily or involuntarily, occurred a maximum of two years before moving into self-employment. Serial entrepreneurs were only considered with their first entrepreneurial activity.[11] Family workers who work in a business run by a self-employed were excluded completely.[12]

[Insert Table 1 about here]

Our sample comprises 256 necessity entrepreneurs (853 person-year observations) and 613 opportunity entrepreneurs (2,575 person-year observations) (Table1). The share of necessity entrepreneurs, 29.46% of all persons or 24.88% of all person-year observations is consistent with survey data from other data sources, and in particular the GEM or the REM (e.g. Lückgen and Oberschachtsiek, 2004; Sternberg et al., 2006; Wagner, 2005). Also, the descriptive statistics indicate a rather similar sample composition. Table 2 describes the variables used and Table 3 gives descriptive statistics.

[Insert Table 2 and Table 3 about here]

With both types of entrepreneurship, the proportion of men is higher than that of women (70% or 65%), which is in line with other research (e.g. Fairlie and Meyer, 1996; Wagner, 2004). However, the share of men is not significantly higher among either necessity or opportunity entrepreneurs. In line with Wagner (2005), we find necessity entrepreneurs to be significantly older than opportunity entrepreneurs (38.11 years vs. 35.52 years with p<0.001). The share of persons living in East Germany is significantly higher for necessity entrepreneurs than for opportunity entrepreneurs (39% vs. 21%), which might be the result of worse macro-economic conditions (e.g. von Hagen et al., 2002).[13] Contrary to Wagner (2005), we do not find a significantly lower share of individuals whose fathers were also self-employed among necessity entrepreneurs than among opportunity entrepreneurs (11% vs. 12%). In addition, the proportion of those who start a business in the job they learnt is lower with necessity

---

[11] We excluded 239 person-year observations. See Alsos and Kolvereit (1999) for a discussion of start-ups by serial entrepreneurs.

[12] 1,050 person-year observations were excluded. See Parker (2004) for a problematization of unpaid family workers.

[13] The high share of East Germans in our sample is also a result of deliberate oversampling in GSOEP (Haisken-DeNew and Frick, 2003).

entrepreneurs than with opportunity entrepreneurs (36% vs. 47%). No significant difference between the data of the two groups could be found in terms of schooling, nationality, actual working time, marital status, children and handicap.

Two particular findings can be interpreted as support of the way we operationalized necessity and opportunity entrepreneurship: firstly, necessity entrepreneurs are significantly less satisfied with their occupational situation than opportunity entrepreneurs (7.10 vs. 7.79 with $p<0.001$)[14], and, secondly, they have been significantly longer unemployed than opportunity entrepreneurs before they moved into self-employment (8.89 months vs. 4.44 months with $p<0.001$).

5. Method

This section will present the estimation method pursued to answer our research questions. The analysis is based on a number of variables from the GSOEP described above. Table 2 describes the variables used, their construction and the way they were entered into our econometric models.

In order to find out about the determinants for being a necessity or opportunity entrepreneur, we estimate a binary probit model (Greene, 2000). The model is estimated using maximum likelihood. The predictors used in the model are based on Wagner (2005) and other data available in the GSOEP. The probability that an individual i with characteristic vector $\mathbf{W}_i$ being an opportunity entrepreneur is

$$\Pr(y_i = 1) = \Pr(y_i^* > 0) \tag{1}$$

with $$y_i^* = \alpha + \beta' \mathbf{W}_i + v_i, \tag{2}$$

where y_i is a dummy variable (0 = necessity entrepreneur; 1 = opportunity entrepreneur), β' is a vector of coefficients, α is an intercept and v_i is a disturbance term with a normal distribution.

In order to investigate possible earnings differentials between necessity and opportunity entrepreneurs and in order to compare each groups' determinants of the entrepreneurial wage,

---

[14] The GSOEP asks the participants to report job satisfaction on a scale from 1(totally unhappy) to 10 (totally happy). Frey and Benz (2003) discuss the scale in more detail.

we estimate several earnings equations using random and fixed effects panel data models (Johnston and DiNardo, 1997).[15] The random effects model has the specification

$$s_{it} = \alpha + \beta' \mathbf{X}_{it} + u_{it}, \tag{3}$$

where $i = 1, \ldots, N$ units under observation, and $t = 1, \ldots, T$ time periods for which data were collected. S_{it} denotes log gross earnings per hour for an individual i in period t (dependent variable), $\mathbf{X}_{it}$ represents a set of independent variables, β' a vector of coefficients and u_{it} a normally distributed disturbance term. We assume no correlation between u_{it} and $\mathbf{X}_{it}$. We also estimated a fixed effects panel data model,

$$s_{it} = \alpha + \beta' \mathbf{X}_{it} + u_{it} \tag{4}$$

with
$$u_{it} = \mu_i + \varepsilon_{i.t} \tag{5}$$

The disturbance term u_{it} is composed of μ_i, reflecting the variables omitted which are considered time-persistent (in the sense that for each individual i these remain broadly the same over time), and the idiosyncratic error ε_{it}. U_i is assumed to correlate with $\mathbf{X}_{it}$.

In order to decide, which of the two models (random or fixed effects) is more appropriate, we use the Hausman test. This test rejects the null hypothesis that the difference in coefficients is not systematic. If the null hypothesis can be rejected, the fixed effects model should be used. In the opposite case, the random effects model is more appropriate. To also test for the existence of random effects, the Breusch-Pagan test is additionally involved. A significant test statistic implies the existence of random effects.

6. Results from multivariate analysis

In this section, we report the results from the estimation models described above.

6.1 Probit model

Table 4 provides the results of the probit model, which is estimated to find out about the differences in the characteristics of the two groups.

---

[15] We do not use Ordinary Least Squares (OLS) estimation because ignoring the panel structure of the data can be problematic for two reasons. Firstly, even though the pooled model yields consistent estimates of the regression coefficients, standard errors will be under- and significance levels hence overstated. Secondly, compared to General Least Squares (GLS) regression, the use of OLS does not result in efficient estimates of the regression coefficients (Johnston and DiNardo, 1997).

[Insert Table 4 about here]

The probit analysis reveals that a number of characteristics are strongly associated with the probability of an individual being an opportunity entrepreneur. The period of unemployment prior to becoming self-employed is significantly negatively associated with the likelihood of being an opportunity entrepreneur, as is labour market experience, whereas the squared term of experience has a significant positive effect (the minimum is at 30 years). Gender exercises an influence in that males are significantly less likely to be an opportunity entrepreneur, whereas being of German nationality is positively related to opportunity entrepreneurship. Finally, opportunity entrepreneurship is significantly negatively associated with an individual being located in East Germany (or conversely: East German entrepreneurs have a much higher likelihood of necessity type).

6.2   Earnings equations

Table 5 reports descriptive statistics and correlations for the variables entered into our multi-variate regression models. Table 6 provides the results of an earnings equation with both necessity and opportunity entrepreneurs included.

[Insert Table 5 and Table 6 about here]

The coefficients of most variables are as expected. Labour market experience has a significant positive association with earnings in its linear term and a significant negative association in its squared term (the maximum is 43.5 years). Schooling has a significant positive effect. Gender has a significant influence in that males report significantly higher earnings. Being educated in the profession later pursued as an entrepreneur has no significant effect on earnings. The novel introduced dummy variable whether an individual is an opportunity entrepreneur or not has a strong significant positive effect.

[Insert Table 7 about here]

The results of the sub-sample regressions (sample 1: necessity entrepreneurs; sample 2: opportunity entrepreneurs) point to interesting differences between necessity and opportunity entrepreneurs: the dummy variable whether an individual is educated in the profession she pursues as an entrepreneur has a significant positive impact on the earnings of necessity en-

trepreneurs, whereas no such impact is found for opportunity entrepreneurs. Gender has a significant positive association with both, necessity and opportunity entrepreneurs, but the effect on the latter is greater: being male increases the wage of opportunity entrepreneurs by 40%, whereas it increases that of necessity entrepreneurs by only approx. 20%. In other words: gender has only half of the effect for necessity as compared to opportunity entrepreneurs. Being German has no effect on the earnings of either necessity or opportunity entrepreneurship. The coefficients of schooling, labour market experience and labour market experience squared are significant and behave as expected only for the sub-sample of opportunity entrepreneurs. We conclude that necessity and opportunity entrepreneurs show clear differences as regards the determinants of their respective entrepreneurial wage. It seems that the standard Mincer equation (see section 2.3) works better in case of opportunity entrepreneurs. The next section will discuss the meaning and implications of these differences, as well as what can be learnt from the other results of the multivariate analyses.

Some limitations, however, restrict the generalizability of our results. Amongst the more important are the non-availability of variables about the entrepreneur's personal wealth (often used as a proxy for financial constraints) and industry codes that are only 2-digit.

7.   Discussion

In this section, we discuss our findings and thereby refer to the literature review as well as our research questions about the characteristics of necessity or opportunity entrepreneurs and about their respective level of earnings and its determinants.

Regarding the characteristics of necessity and opportunity entrepreneurs three aspects are particularly noteworthy. [16] Firstly, the probit analysis indicates that schooling does not have an effect on an individual being a necessity or an opportunity entrepreneur. Both groups seem to have the same level of education. This is surprising, as it is often argued that opportunity entrepreneurs are more productive and therefore more desirable (e.g. Sternberg et al., 2006). Secondly, we find that the effect of labour market experience on the propensity to be an opportunity entrepreneur is inversely U-shaped. This finding is consistent with the results produced by Wagner (2005). Furthermore, our findings fit well with the DELU framework (see section 3.1). A later move of an individual into opportunity entrepreneurship would imply a

---

[16]The 2005 GEM report on Germany compares necessity and opportunity entrepreneurs by means of a logit regression. Opportunity entrepreneurship is positively associated with a higher degree of education and negatively associated with living in East Germany as well as with a planned usage of public funding (Sternberg et al., 2006).

lower DELU, since the time period for the venture to generate profits is shorter. Opportunity entrepreneurs should therefore be more likely to enter at an earlier point in time than necessity entrepreneurs. A later move into opportunity entrepreneurship would also imply higher opportunity costs to this individual given that a longer time in paid employment usually correlates with higher salary levels. Finally, our probit model shows that living in East Germany is strongly associated with a higher likelihood of being a necessity entrepreneur. As laid out in section 2 and 3, macro-economic as well as personal conditions can matter in this respect. Given that East Germany is a region characterized by high unemployment levels, this finding lends support to the hypothesis that high levels of unemployment pushes unemployed individuals into self-employment due to missing alternatives, as e.g. suggested by Ritsilä and Tervo (2002). In addition to this macro-level effect, it is also known that the success chances of self-employment are considered as being lower and the fear of failure is considered as being higher in East Germany (e.g. Sternberg et al., 2006). This factor relating to personal attributes or perceptions is a second aspect which might help to explain our findings. Due to greater fear and lower success perceptions, fewer people venture voluntarily venture into self-employment, thereby reducing the number of opportunity entrepreneurs.

In relation to our second research question on the earnings levels of necessity versus opportunity entrepreneurs, we find that opportunity entrepreneurs report significantly higher incomes than necessity entrepreneurs. This finding enables us to confirm and put into question some of the various theoretical propositions discussed above (section 3.2). The finding that opportunity entrepreneurs earn more is consistent with the argument that they are more productive or more prepared (because of higher human capital investments prior to becoming self-employed) than necessity entrepreneurs. However, we cannot easily distinguish which of these two factors is of higher relevance for our result. Also, our finding is consistent with job search theory in that it can be explained by a lower reservation wage of necessity entrepreneurs compared to opportunity entrepreneurs. Finally, the result that opportunity entrepreneurs earn more is also in-line with a view of entrepreneurs as profiteers who simply take advantage of arbitrage opportunities as has been proposed by Kirzner (1973). Our findings cast doubt on arguments for necessity entrepreneurs earning more than opportunity entrepreneurs. This generally concerns more psychological explanations of opportunity entrepreneurship which propose strong non-monetary benefits of self-employment for certain individuals (e.g. because of a preference for independence). Whilst we cannot rule out that these benefits in fact exist, they at least do not "crowd out" monetary benefits in that an opportunity entrepreneur trades off one against the other, since this would make it much less likely that earn-

ings of opportunity entrepreneurs are significantly higher than those of necessity entrepreneurs. In addition, the literature on over-optimism which seems to be more relevant in the case of opportunity entrepreneurship cannot be easily reconciled with our result of clearly superior earnings of opportunity entrepreneurs.

Finally, with regard to the determinants of earnings levels, we find generally, that some factors are very similar in their explanatory relevance for both groups of entrepreneurs (e.g. gender), but even in this case, the effect of a one unit change differs at least to some degree. Notably, a number of factors that have high explanatory value for opportunity entrepreneurship (such as schooling and labour market experience) have little relevance for explaining the earnings level of necessity entrepreneurs (where e.g. education in the profession later pursued as an entrepreneur and time dummies relating to recession or boom phases of the economy have significantly higher power to explain earnings). This result can be explained twofold: Firstly, it might be that necessity entrepreneurs have less influence on their earnings, and, secondly, necessity entrepreneurs might be a less homogeneous group, thereby reducing significance levels.

8.   Policy implications and further research

Business start-ups play a prominent role in several fields of policy, e.g. SME, innovation and technology policy. Our findings carry some interesting implications for policy-makers:

-        We find evidence that concerning their characteristics (e.g. with age and risk to become unemployed) as well as their earnings levels necessity and opportunity entrepreneurs are rather different, thereby lending support for tailor-made policies that suit each groups' respective needs (such as the "Ich-AG" programme described above). From a purely economic viewpoint, opportunity entrepreneurs seem to be more desirable, since they create more income than necessity entrepreneurs. Their impact on economic growth should therefore be higher. One should, however, be cautious to conclude that a stronger focus on promoting opportunity entrepreneurship is the correct policy: we know little about the marginal effects of money spent on promoting either necessity or opportunity entrepreneurship. It might be the case that the marginal effects are higher with necessity entrepreneurship as opportunity entrepreneurs might be better able to start a business without support from the state. A policy promoting exclusively opportunity entrepreneurship might then create considerable windfall gains.

-　　　Our results also indicate that necessity entrepreneurs are a rather heterogeneous group as can be seen amongst others from their distribution of earnings.[17] This finding lends support to the proposal of integrating mechanisms identifying individual strengths and weaknesses of the respective founder in programmes designed for necessity entrepreneurs. Otherwise, considerable inefficiencies might be the result. Not every necessity entrepreneur needs support from the state to start his or her business.

From a policy perspective, further research would be desirable concerning the impact of necessity or opportunity entrepreneurship on job creation as well as the marginal effects of entrepreneurial policy regarding the two groups. In order to carry out the latter, however, more micro-data on founders receiving state-support is needed. From a research perspective, we deem further research in the area of earnings equations to be a subject worthy of further investigation. It seems that the earnings of necessity and opportunity entrepreneurs are determined in a different way. If not controlled for this, comparisons of the earnings of entrepreneurs with wages of paid employees are likely to produce misleading results.

---

[17] In the first year of self-employment, necessity entrepreneurs earn in average 1,877 € (standard deviation: 1,730 €). (Table 3). The coefficient of variation (standard deviation/mean) is 0.92, skewness is 2.3 and kurtuosis is 9.9.

References

Acs, Z. J., Arenius, P., Hay, M. and M. Minniti, 2005, Global Entrepreneurship Monitor. 2004 Executive Report, Babson College, London Business School.

Acs, Z. J. and A. Varga, 2005, 'Entrepreneurship, Agglomeration and Technological Change', *Small Business Economics* **24** (3), 323-334.

Alsos, G. A. and L. Kolvereid, 1998, 'The Business Gestation Process of Novice, Serial, and Parallel Business Founders', *Entrepreneurship Theory and Practice* **22** (4), 101-114.

Arabsheibani, G. D., De Meza, J., Maloney, J. and B. Pearson, 2000. 'And a Vision Appeared unto them of a Great Profit: Evidence of Self-deception among the Self-employed', *Economics Letters* **67** (1), 35-41.

Brüderl, J., Preisendörfer, P. and R. Ziegler, 1992, 'Survival Chances of newly founded Business Organizations', *American Sociological Review* **57** (2), 227-241.

Becker, G. S., and B. Chiswick, 1966, 'Education and the Distribution of Earnings', *American Economic Review* **56** (2), 258-369.

Brown, S and J. G. Sessions, 1998, 'Education, Employment Status and Earnings: A Comparative Test of the Strong Screening Hypothesis', *Scottish Journal of Political Economy* **45** (5), 586-591.

Campbell, C. A., 1992, 'A Decision Theory Model for Entrepreneurial Acts', *Entrepreneurship Theory and Practice* **17** (1), 21-27.

Cooper, A. C., Woo, Y. and W. C. Dunkelberg, 1988, 'Entrepreneurs' Perceived Chances for Success', *Journal of Business Venturing* **3** (2), 97-108.

Devine, T. J. and N. M. Kiefer, 1993, 'The Empirical Status of Job Search Theory', *Labour Economics* 1 (**1**), 3-24.

Evans, D. S. and L. S. Leighton, 1989a, 'The Determinants of Changes in US Self Employment, 1968-1987', *Small Business Economics* **1** (2), 111-119.

Evans, D. S. and L. S. Leighton, 1989b, 'Some Empirical Aspects of Entrepreneurship', *American Economic Review* **79** (3), 519-535.

Fairlie, R. W. and B. D. Meyer, 1996, 'Ethnic and Racial Self employment: Differences and Possible Explanations', *Journal of Human Resources* **31** (3), 757-793.

Frey, B. S. and M. Benz, 2003, 'Being Independent is a Great Thing: Subjective Evaluations of Self-employment and Hierarchy', CESifo Working Paper No. 959, Munich.

Frick, J. R., 2005, 'A General Introduction to the German Socio Economic Panel Study (SOEP) - Design, Contents and Data Structure [waves A-U, 1984-2004]', DIW Berlin.

Greene, W. H., 2000, *Econometric Analysis*, London: Prentice-Hall.

Hagen, J. von, Strauch, R. R. and G. B. Wolff, 2002, East Germany: Transition with Unification: Experiments and Experiences, University of Bonn, Centre for European Integration Studies Working Paper B02-19.

Haisken-DeNew, J. P. and J. R. Frick, 2003, 'Desktop Companion to the German Socio-Economic Panel', Manual, DIW Berlin.

Hamilton, B. H., 2000, 'Does Entrepreneurship Pay ? An Empirical Analysis of the Returns to Self-employment', *Journal of Political Economy* **108** (3), 604-631.

Hinz, T. and M. Jungbauer-Gans, 1999, 'Starting a Business after Unemployment: Characteristics and Chances of Success (Empirical Evidence from a Regional German Labour Market)', *Entrepreneurship and Regional Development* **11** (4), 317-333.

Johnston, J. and J. DiNardo, 1997, *Econometric Methods*, New York: McGraw-Hill.

Keeble D. and S. Walker, 1994, 'New Firms, Small Firms and Dead Firms: Spatial Patterns and Determinants in the United Kingdom', *Regional Studies* **28** (4), 411-427.

Kirzner, I., 1973, *Competition and Entrepreneurship*, Chicago: University of Chicago Press.

Lazear, E. P. and R. L. Moore, 1984, 'Incentives, Productivity, and Labour Contracts', *Quarterly Journal of Economics* **99** (2), 275-296.

Lemieux, T., 2003, 'The "Mincer Equation" Thirty Years after Schooling, Experience, and Earnings', University of California, Berkeley, Center for Economics of Labour Working Paper No. 62.

Lückgen, I. and D. Oberschachtsiek, 2004, Regionaler Entrepreneurship Monitor. Zur Dynamik von Gründungsaktivitäten in Deutschland: Ausmaß und Ursachen, Universität zu Köln, Universität Lüneburg.

Mincer, J., 1974, *Schooling, Experience and Earnings*, New York: Columbia University Press.

Niefert, M. and M. Tchouvakhina, 2006, 'Gründungen aus der Arbeitslosigkeit – Besondere Merkmale und Unterschiede zu anderen Gründungen', *Mittelstands- und Strukturpolitik* **35**, 109-123.

Parker, S. C., 2004, *The Economics of Self-employment and Entrepreneurship*, New York: Cambridge University Press.

Pfeiffer, F. and F. Reize, 2000, 'Business Start-ups by the Unemployed – an Econometric Analysis based on Firm Data', *Labour Economics* **7** (5), 629-663.

Reize, F., 2000, 'Leaving Unemployment for Self-employment. A Discrete Duration Analysis of Determinants and Stability of Self-employment among Former Unemployed', ZEW Discussion Paper No. 00-26.

Reynolds P. D.,Storey, D. J. and P. Westhead, 1994, 'Cross-national Comparison of the Variation in New Firm Formation Rates', *Regional Studies* **28** (4), 443-456.

Reynolds, P. D., Bosma, N., Autio, E., Hunt, S, Bono, N. de, Servais, I., Lopez-Garcia, P. and N. Chin, 2005, 'Global Entrepreneurship Monitor: Data Collection Design and Implementation 1998-2003', *Small Business Economics* **24** (3), 205-231.

Reynolds, P. D.,Camp, S. M., Bygrave, W. D., Autio, E. and M. Hay, 2002, Global Entrepreneurship Monitor. 2001 Executive Report, Babson College, London Business School.

Riley, J., 1979, 'Testing the Educational Screening Hyothesis', *Journal of Political Economy* **87** (5), S227-S252

Ritsila, J. and H. Tervo, 2002, 'Effects of Unemployment on new Firm Formation: Micro Level Panel Data Evidence from Finland', *Small Business Economics* **19** (1), 31-40.

Sluis, J. van der, Praag, M. van and W. Wijverberg, 2003, 'Entrepreneurship Selection and Performance: A Meta-Analysis of the Impact of Education in Industrialised Countries', Working Paper, University of Amsterdam.

Sluis, J. van der, Praag, M. van and A. J. Witteloostuijn, 2004, 'The Returns to Ecucation: A Comparative Study between Entrepreneurs and Employees', Working Paper, University of Amsterdam.

Sluis, J. van der, Praag, M. van and A. J. Witteloostuijn, 2006, 'Why are the Returns for Education higher for Entrepreneurs than for Employees', Working Paper, University of Amsterdam.

Sternberg, R., 2005, 'Business Start-Ups: Hope for Future Regional Development in Germany?', *German Journal of Urban Studies* **44** (1).

Sternberg, R., Brixy, U. and J. F. Schlapfner, 2006, Global Entrepreneurship Monitor. Länderbericht Deutschland 2005. Universität Hannover and IAB.

Storey, D. J., 1991, 'The Birth of New Firms – Does Unemployment matter ? A Review of the Evidence', *Small Business Economics* **3** (3), pp. 167-178.

Wagner, J. and Sternberg, R., 2002, 'Personal and Regional Determinants of Entrepreneurial Activities: Empirical Evidence from the REM Germany', IZA Discussion Paper No. 624.

Wagner, J., 2004, 'What a Difference a Y Makes – Female and Male Entrepreneurs in Germany', IZA Discussion Paper No. 1134.

Wagner, J., 2005, 'Nascent Necessity and Opportunity Entrepreneurs in Germany: Evidence from the Regional Entrepreneurship Monitor (REM)', University of Lüneburg Working Paper Series in Economics No. 10.

Wagner, G., Burkhauser, R. V and F. Behringer, 1993, 'The English Language Public Use File of the German Socio-economic Panel Study', *The Journal of Human Resources* **28** (2), 429-433.

Figure 1: Alternatives for opportunity entrepreneur

	DELU ₍Self-employment₎	DELU ₍Paid employee₎	
	Entrepreneurial wage - **Start-up subsidies** **(eligible for all potential entrepreneurs)**	**Wage as paid employee**	
	Non-monetary benefits	**Non-monetary benefits**	

Notes: This individual would decide to enter self employment.

□ Monetary benefits of decision

■ Non-monetary benefits of decision

Figure 2: Alternatives for necessity entrepreneur

|	DELU ₍Self-employment₎	DELU ₍Paid employee₎	
	Entrepreneurial wage - **Start-up subsidies** **(eligible for all potential entrepreneurs)** - **Start-up subsidies** **(only eligible for unemployed founders)**	**p * Wage as paid employee** **(1-p) * Social welfare benefits**	
	Non-monetary benefits	**p * Non-monetary benefits** **(paid employee)** **(1-p) * Non-monetary benefits** **(social welfare)**	

Notes: This individual would decide to enter self employment.

□ Monetary benefits of decision

■ Non-monetary benefits of decision

P gives the probability to find a new job in paid employment.

Table 1: Observations per year

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total	in %
Necessity entrepreneurs	1	2	10	10	14	13	20	30	36	47	38	46	52	57	53	63	65	60	66	73	97	853	24.88
Opportunity entrepreneurs	7	15	31	39	44	44	65	95	114	141	155	153	162	168	175	170	195	194	210	201	197	2,575	75,12
∑	8	17	41	49	58	57	85	125	150	188	193	199	214	225	228	233	260	254	276	274	294	3,428	100

Note: The GSOEP has increased its sample size since its first survey in 1984. The number of successfully interviewed persons by sample were 12,245 (1984), 11,090 (1985), 10,646 (1986), 10,516 (1987), 10,023 (1988), 9,710 (1989), 13,972 (1990), 13,669 (1991), 13,397 (1992), 13,179 (1993), 13,417 (1994), 13,768 (1995), 13,511 (1996), 13,283 (1997), 14,670 (1998), 14,085 (1999), 24,586 (2000), 22,351 (2001), 23,892 (2002), 22,592 (2003) and 22,019 (2004) (Frick, 2005).

Data source: GSOEP 1984-2004

Table 2: Description of variables

Variable	Description
	Categorial variables
Opportunity entrepreneur	Dummy for entrepreneur who quitted her last job on her own
Educated in this profession	Dummy for individual who is self-employed in the profession she has learnt; generated by GSOEP
Male	Dummy for individual who is male
German	Dummy for individual who is German by nationality
Father self-employed	Dummy for individual whose father was self-employed
Married	Dummy for individual who is married
Handicapped	Dummy for individual who is handicapped
Children	Dummy for individual who has at least one child under age 16
East Germany	Dummy for individual who lives in East Germany
Industry	Industry dummies (agriculture, construction, car sale, wholesale, retailing, hotel and restaurant, transportation, banking and insurance, real estate, databases, consulting, education sector, health sector, culture and sports, other industry, other)
Region	Region dummies (Berlin West, Schleswig Holstein, Hamburg, Lower Saxony, Bremen, North Rhine-Westphalia, Hesse, Rhineland-Palatinate, Baden-Wuerttemberg, Bavaria, Berlin East, Mecklenburg-Western Pomerania, Brandenburg, Saxony Anhalt, Thuringia, Saxony)
Year	Dummies for each year
	Continuous variables
Gross earnings	Monthly gross earnings from self-employment (in €); generated by GSOEP
Working time	Actual working time per week (in hours); generated by GSOEP
Log gross earnings	Log gross earnings per hour (in €)
Job satisfaction	Job satisfaction on a scale from 1 (totally unhappy) to 10 (totally happy)
Age	Current age of individual in years
Schooling	Years of schooling; generated by GSOEP
Labour market experience	Current age minus age at first job
Months unemployed before self-employed	Months that individual has been unemployed in her entire working life before entering self-employment.

Table 3: Necessity vs. opportunity entrepreneurs

	Earnings (€/month)	Working hours	Job satisfaction (0= totally unhappy, 10 = totally happy)	East Germany (dummy; 1= yes)	German (dummy; 1= yes)	Age at time of entry (years)	Father self-employed ? (dummy; 1=yes)	Male (dummy; 1=male)
				mean (standard deviation)				
Necessity entrepreneurs	1,877 (1,730)	46.62 (17.63)	7.10 (2.25)	0.39 (0.49)	0.85 (0.36)	38.11 (9.36)	0.11 (0.31)	0.70 (0.46)
Opportunity entrepreneurs	2,269 (2,061)	46.53 (19.21)	7.79 (1.96)	0.21 (0.41)	0.87 (0.33)	35.52 (8.87)	0.12 (0.33)	0.65 (0.48)
				p-values for test of H_0: difference in means = 0				
Necessity vs. opportunity entrepreneurs	0.0043	0.9526	0.0000	0.0000	0.4037	0.0001	0.7832	0.1910

Note: A p-value of less than 0.05 means that the null-hypothesis of equal means can be rejected at an error level of less than 5 percent; Calculations are based only on first year observations of self-employment.

Data source: GSOEP 1984-2004

Table 3: Necessity vs. opportunity entrepreneurs (continued)

	Schooling (years)	Educated in this pro-fession ? (dummy; 1= yes)	Labour market experience at time of entry (years)	Months unemployed before self-employed	Handicapped (dummy; 1= yes)	Married (dummy; 1= yes)	Children (dummy; 1=yes)
			mean (standard deviation)				
Necessity entrepreneurs	12.49 (2.81)	0.36 (0.48)	18.13 (9.23)	8.89 (12.23)	0.03 (0.17)	0.62 (0.49)	0.50 (0.50)
Opportunity entrepreneurs	12.61 (2.84)	0.47 (0.50)	15.29 (9.17)	4.44 (10.65)	0.02 (0.15)	0.64 (0.48)	0.51 (0.50)
			p-values for test of H_0: difference in means $= 0$				
Necessity vs. opportunity entrepreneurs	0.5736	0.0046	0.0000	0.0000	0.5287	0.4762	0.6315

Note: A p-value of less than 0.05 means that the null-hypothesis of equal means can be rejected at an error level of less than 5 percent; Calculations are from first year observations in self-employment; Estimates obtained using STATA

Data source: GSOEP 1984-2004

Table 4: **Estimated probability of being opportunity entrepreneur**
Dependent variable: Opportunity entrepreneur

Variable	Probit estimates
Months unemployed before self-employed	-0.012 *
	(0.005)
Labour market experience (years)	-0.05 *
	(0.021)
Labour market experience squared	0.001 *
	(0.001)
Schooling (years)	-0.003
	(0.020)
East Germany (dummy; 1=yes)	-0.69 ***
	(0.13)
Male (dummy; 1=yes)	-0.21 [†]
	(0.11)
German (dummy; 1=yes)	0.39 *
	(0.16)
Handicapped (dummy; 1=yes)	-0.04
	(0.33)
Married (dummy; 1=yes)	0.13
	(0.13)
Children (dummy; 1=yes)	0.17
	(0.12)
Year dummies	17 categories
No. of individuals	724
Wald Chi²	89.63
p-value	< 0.001
McFadden R²	0.11
Percent correctly classified	71.28%
Log pseudolikelihood	-397.73

Significance levels: [†] $p < 0.1 < 0.05$; * $p < 0.05 < 0.01$; ** $p < 0.01 < 0.001$; *** $p < 0.001$

Notes: Heteroskedasticity-robust standard errors in parentheses; Estimates obtained using STATA

Data source: GSOEP 1984-2004

Table 5: Descriptive statistics and correlations

	Variables	Mean	Std. Dev.	Min.	Max.	1	2	3	4	5
1	Opportunity entrepreneur	0.751	0.432	0	1					
2	Male	0.711	0.453	0	1	-0.016				
3	German	0.877	0.329	0	1	-0.026	-0.078 ***			
4	Schooling	12.764	2.862	7	18	0.055 **	-0.084 ***	0.312 ***		
5	Educated in this profession	0.512	0.500	0	1	0.104 ***	0.001	0.111 ***	0.231 ***	
6	Labour market experience	19.515	9.310	0	54	0.077 ***	-0.003	0.016	-0.094 ***	0.025

Significance levels: † p < 0.1 < 0.05; * p < 0.05 < 0.01; ** p < 0.01 < 0.001; *** p < 0.001
N: 3,428

Data source: GSOEP 1984-2004

Table 6: **Results of full-sample regression**
     Dependent variable: log gross earnings (€ per hour)

Variables	Random effects estimates
Opportunity entrepreneur (dummy; 1=yes)	0.304 ** (0.109)
Educated in this profession (dummy; 1=yes)	0.044 (0.035)
Male (dummy; 1=yes)	0.357 *** (0.053)
German (dummy; 1=yes)	-0.008 (0.077)
Schooling (years)	0.028 *** (0.008)
Labour market experience (years)	0.026 ** (0.009)
Labour market experience squared	-0.0003 * (0.0002)
Labour market experience * opportunity entrepreneur	-0.008 (0.005)
Industry dummies	16 categories
Region dummies	15 categories
Year dummies	20 categories
Constant	1.360 *** 0.283
R^2 within	0.089
R^2 between	0.262
R^2 overall	0.278
No. of observations (individuals)	2,794 (763)
Wald Chi² p-value	522.08 < 0.001
Hausman specification test Chi² p-value	41.26 0.8792
Breusch-Pagan test for random effects Chi² p-value	1088.66 <0.001

Significance levels: [†] $p < 0.1 < 0.05$; * $p < 0.05 < 0.01$; ** $p < 0.01 < 0.001$; *** $p < 0.001$

Notes: Heteroskedasticity-robust standard errors in parentheses; Estimates obtained using STATA; Some observations had to be excluded due to missing values.

Data source: GSOEP 1984-2004

Table 7:   Results of sub-sample regressions
Dependent variable: log gross earnings (€ per hour)

Variables	Sub-sample necessity entrepreneurs Random effects estimates	Sub-sample opportunity entrepreneurs Random effects estimates
Educated in this profession (dummy; 1=yes)	0.151 [†] (0.078)	0.016 (0.038)
Male (dummy; 1=yes)	0.193 [†] (0.113)	0.398 *** (0.057)
German (dummy; 1=yes)	0.045 (0.152)	-0.103 (0.091)
Schooling (years)	0.025 (0.017)	0.032 *** (0.009)
Labour market experience (years)	0.008 (0.016)	0.023 ** (0.008)
Labour market experience squared	0.0002 (0.0003)	-0.0004 * (0.0002)
Industry dummies	16 categories	16 categories
Region dummies	15 categories	15 categories
Year dummies	20 categories	20 categories
R^2 within	0.135	0.101
R^2 between	0.295	0.299
R^2 overall	0.267	0.297
No. of observations (individuals)	697 (225)	2,097 (538)
Wald Chi^2	699.98	467.23
p-value	< 0.001	< 0.001
Hausman specification test		
Chi^2	55.27	26.96
p-value	0.0823	0.9968
Breusch-Pagan test for random effects		
Chi^2	77.52	931.95
p-value	<0.001	<0.001

Significance levels: [†] $p < 0.1 < 0.05$; * $p < 0.05 < 0.01$; ** $p < 0.01 < 0.001$; *** $p < 0.001$

Notes: Heteroskedasticity-robust standard errors in parentheses; Estimates obtained using STATA; Some observations had to be excluded due to missing values

Data source: GSOEP 1984-2004