

# Risk attitudes of nascent entrepreneurs—new evidence from an experimentally validated survey

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**Abstract** The influence of risk aversion on the decision to become self-employed is a much discussed topic in the entrepreneurial literature. Conventional wisdom asserts that being an entrepreneur means making risky decisions; hence more risk-averse individuals are less likely to become entrepreneurs. In contrast to previous research, we are able to examine empirically whether the decision of *starting* a business is influenced by objectively measurable risk attitudes *at the time* when this decision is made. Our results show that in general, individuals with lower risk aversion are more likely to become self-employed. Sensitivity analysis reveals, however, that this is true only for people

coming out of regular employment, whereas for individuals coming out of unemployment or inactivity, risk attitudes do not seem to play a role in the decision process.

**Keywords** Entrepreneurship · Risk attitudes · Self-employment

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## 1 Introduction

The idea that entrepreneurs are willing to take higher risks than employees is intuitively appealing. Previous theoretical and part of the empirical research (see inter alia Kihlstrom and Laffont 1979; Rees and Shah 1986; Stewart et al. 1999; Wagner 2003; Müller 1999; Ekelund et al. 2005, where the latter two approaches make use of psychometric data) support the conventional wisdom that being an entrepreneur means making risky decisions and that hence, more risk-averse individuals are less likely to become entrepreneurs. From this point of view, a person's risk attitude is one of the crucial variables in their choice between entrepreneurship and a salaried job.

Recent theoretical discussions cast serious doubt on the validity of this assumption. Psychological theory has pointed out that the individual's risk attitude is only one of numerous personal variables possibly influencing the decision to become an entrepreneur (cf. Rauch and Frese 2000). Even more important, it has shown that the perception of risk connected with certain decisions may differ widely from person to person. Thus, people with more experience, higher abilities or greater knowledge in the field of potential self-employment tend to perceive the risks connected with certain decisions as lower (cf. Gifford 2003).

In accordance with these objections, some of the empirical research has produced mixed results (see, e.g., Schiller and Crewson 1997) showing that risk aversion cannot be easily separated from other influences. Rosen and Willen (2002) came to the conclusion that the willingness of a nascent entrepreneur to accept risks is not a dominant factor in his/her decision to start a business; Barsky et al. (1997) reported that higher risk tolerance has a positive and quantitatively large, but statistically not significant effect on the probability of selecting into self-employment; and Cramer et al. (2002) did not feel confident enough to conclude anything concerning the causality between risk aversion and entrepreneurial selection, although their empirical results support the conventional wisdom that the choice to become an entrepreneur is positively correlated with the person's risk attitude. Furthermore, Blanchflower and Oswald (1998) found that there is a positive correlation between the wealth status of a person and his/her risk attitude.

This discussion shows that the measurement of risk attitudes and the impact of differing levels of risk aversion on the choice of entrepreneurship is a more elusive concept than it seemed to be initially. A crucial point in this discussion is that entrepreneurial decisions under risk also depend on the abilities of the decision-maker. This means, more specifically, that the higher the skills and/or the experience of the entrepreneur in the field of potential self-employment, the lower the probability of an unprofitable outcome (a bad risk). As a result, the risk of failure might be completely different for two persons who have the *same risk attitudes* and who are opening the same kind of business at the same location if one has more skills and/or working experience in the selected branch or trade than the

other.<sup>1</sup> On that score, the decision-maker might have a direct impact on the probability distribution of certain outcomes in a risky environment. Hence, it is important to draw a distinction between subjectively perceived and objectively measurable risks, as we will do in this analysis. We define objectively measurable risks in the sense that the probabilities of all outcomes connected with a certain risky decision are exogenously given and cannot be influenced by the decision-maker, while risky environments where the actions of a certain person have (or are supposed to have) an impact on the probability distribution of each outcome, are defined as non-objectively measurable risks.

Furthermore, almost all previous empirical approaches have been unable to test the risk attitudes of a person at the time of his/her transition to self-employment. Instead, they compared the risk attitudes of successful entrepreneurs with employed persons and estimated ex-post whether the observed attitudes could have had an impact on the probability that an individual became self-employed earlier in life. Thus, these approaches rested on two assumptions, namely: (i) that risk attitudes are stable over time and (ii) that the chosen data set is representative for the situation at the moment of the decision to become self-employed, which is unlikely since failed entrepreneurs are by definition excluded.

In this article, we thus concentrate on the question whether the decision of *starting* a business is positively influenced by the willingness to bear higher *objectively* measurable risks *at the time* when this significant decision is made. It is possible to analyze the impact of such risk attitudes by making use of an experimentally validated questionnaire. In this survey, persons currently undergoing a transition from a particular employment/unemployment status to self-employment are asked whether they would invest a certain amount of money in a safe or a risky asset, where the payoffs and probability distributions of all outcomes are exogenously given.

<sup>1</sup> Interestingly, nascent entrepreneurs are not immune to overconfidence when they are making a self-assessment of their entrepreneurial skills and experience. Recent findings by Köllinger et al. (2005b) suggest that a perception bias exists in particular among nascent entrepreneurs. Unfortunately, it is not yet clear to what extent subjectively perceived skills are correlated with objectively measurable skills. For more information on this topic, see also Köllinger et al. (2005a) and Arenius and Minniti (2005).

Moreover, our data set allows us to explicitly control for the previous labor market status of the persons, i.e., whether they were employed or unemployed/inactive before deciding to become self-employed. There is very little empirical evidence on the question of whether differences in risk-taking behavior should be expected between these two groups. Hinz and Jungbauer-Gans (1999) found that formerly unemployed entrepreneurs run significantly smaller businesses, while Steward et al. (1999) report that there is a positive correlation between risk-taking behavior and the size of the small businesses. Combining both observations leads to the hypothesis that entrepreneurs starting businesses out of unemployment are more risk-averse than those starting businesses out of employment.

The rest of the article is organized as follows. In Sect. 2, we describe the data used in the analysis, focusing on the measures of risk aversion employed. In Sect. 3 we discuss the results, and in Sect. 4, we present our conclusions unfolding that our results partly support conventional wisdom. We show that less risk-averse persons are indeed more likely to become self-employed, however only if they are coming out of regular employment. For individuals coming out of unemployment or inactivity, risk attitudes seem to have no impact on this decision.

## 2 Data set and risk measurement

We base our analysis on the German Socio-Economic Panel (SOEP), an established representative panel survey containing detailed information regarding the socio-economic situation of about 22,000 individuals living in 12,000 households in Germany.<sup>2</sup> We use

<sup>2</sup> The SOEP was started in 1984 as a longitudinal survey of private households and persons in West Germany and was expanded to the territory of East Germany in June 1990. The central aim of this panel study is to collect representative micro-data on persons, households and families. It is similar to the BHPS for the UK and the PSID for the US. A rather stable set of core questions is asked every year covering the most essential areas such as ‘population and demography’, ‘education, training, and qualification’, ‘labor market and occupational dynamics’, ‘earnings, income and social security’, ‘housing’, ‘health’, ‘household production’ and ‘basic orientation’. For a more detailed data description, see Haisken De-New and Frick (2005).

individuals observed in both waves of 2004 and 2005 as the population base for our analysis.

As in most empirical studies on entrepreneurial choice, we use self-employment as a measurable proxy for the concept of entrepreneurship. The classification of individuals as self-employed is based on a survey question about the occupational status of the respondents. If respondents are employed or self-employed in more than one position, they are asked to report their status in their primary activity. We restrict the sample to individuals between 18 and 65 years of age and exclude farmers, civil servants, and those currently in education, vocational training, or military service. The individuals excluded presumably have a limited occupational choice set, or at least they have different determinants of occupational choice that could distort our analysis. We also exclude family members working for a self-employed relative from the data set because these individuals are not entrepreneurs in the sense of running their own business.

We can identify a transition into self-employment if an individual was not self-employed in the 2004 wave (i.e., he/she was dependently employed, unemployed or inactive) but was in the 2005 wave. Of the 8708 individuals in our sample who were not self-employed in 2004, 147 became self-employed between the 2004 and 2005 interviews.<sup>3</sup> Considering population weights, this corresponds to 1.6%.

Key to our analyses are new measures of risk attitudes that were added to the SOEP in the 2004 wave. Several questions dealt with attitudes towards risk in general and within specific contexts, including financial matters and occupation, which are relevant domains for the decision to enter self-employment. Respondents indicated their willingness to take risks on an 11-point scale ranging from 0 (complete unwillingness) to 10 (complete willingness). We consolidate answers 0–2 in a “low risk”, 3–7 in a “medium risk” and 8–10 in a “high risk” category.<sup>4</sup> Another question corresponded more closely to conventional lottery measures. Respondents were asked to state how much (in categories of fifths) of 100 thousand Euros, which they had hypothetically won in a lottery, they would invest in a risky asset. Respondents were

<sup>3</sup> Individuals who had missing values in one of the variables used in the latter estimations were excluded from the sample.

<sup>4</sup> Our results are not sensitive to this classification, see footnote 8 in Sect. 3.

**Table 1** Pairwise correlation coefficients between different measures of risk attitudes

|            | Risk parameter |          |          |            |
|------------|----------------|----------|----------|------------|
|            | Lottery        | General  | Finance  | Occupation |
| Lottery    | 1.000          |          |          |            |
| General    | 0.235***       | 1.000    |          |            |
| Finance    | 0.358***       | 0.465*** | 1.000    |            |
| Occupation | 0.186***       | 0.596*** | 0.465*** | 1.000      |

*Note:* Willingness to take risk in general, in financial matters and in occupation are coded on an 11-point scale from 0 (complete unwillingness) to 11 (complete willingness). The lottery question indicates the amount the respondent would invest in a risky asset (six choice possibilities from EUR 0 to 100 thousand). The numbers are the pairwise correlation coefficients. \*\*\*/\*\*/\* indicates significance at the 0.1%/5%/10% level

told that there were equal chances to double the amount invested or lose half of it.<sup>5</sup> In contrast to the other risk questions, which potentially incorporate both risk preference and risk perception, the lottery question holds perceptions of the riskiness of a decision constant across individuals by giving explicit stakes and probabilities. Again, we summarize the answers to this question in three categories, “no investment”, “medium investment” (20, 40 or 60 thousand Euros) and “high investment” (80 or 100 thousand Euros). From the lottery question, we also infer an approximate Arrow–Pratt coefficient of relative risk aversion (RRA, see Pratt 1964) for each individual, allowing for an additional, more structural analysis, which also serves as a robustness test with respect to the functional form specification of the influence of risk attitudes (see Appendix A for the derivation of the coefficient).

Dohmen et al. (2005) validated the reliability of these survey measures of risk attitudes with a field experiment. A representative sample of 450 adults had the opportunity to make risky choices with real money at stake, and also answered the general risk question from the SOEP. The authors found that answers to the general risk question were good predictors of actual risk-taking behavior in the experiment. Furthermore, the answers to the lottery question were strongly correlated with responses to the general risk question. These findings support the use of the observed risk measures for the underlying objectively measurable risk attitudes.

Our primary analysis is based on the lottery question because it meets our requirement of measuring objective risk preferences and not subjective perception of risk. The other risk measures, i.e.,

attitudes towards risks in general, in financial matters and in occupation, are used to test the robustness of our findings. The correlations between these four different measures are moderate (see Table 1), so they inform about partly different aspects of risk attitudes that might be relevant for the decision to become self-employed. Dohmen et al. (2005) provide a more detailed analysis of the correlation of these measures of risk attitudes in different contexts, including a principal component analysis, which confirms that each of them captures some specific content.

Table 2 provides weighted mean values of the characteristics of the individuals in our 2004 sample and their responses to the risk questions separately for individuals in self-employment, in dependent employment, and those currently unemployed/inactive.<sup>6</sup>

The table reveals important differences between individuals in the three different employment states (significant differences in comparison to the group of the self-employed are indicated with stars). Self-employment seems to remain a male-dominated domain in Germany: Only 31% of the self-employed are female, in comparison to 50% of the employees and as much as 70% of the unemployed or inactive population. The self-employed are better educated: 39% completed higher secondary school (Fachhochschulreife or Abitur), whereas only 26% of employees and 16% of those not working did; similarly, 32% of the self-employed received a university degree, whereas only 20% of employees and 13% of the unemployed and inactive people did. Additionally, self-employed people have more work experience than the other groups (on average

<sup>5</sup> See Table B.1 in the Appendix for the original phrases of the risk measures.

<sup>6</sup> See Table B.1 in the Appendix for a detailed description of the used variables.

**Table 2** Weighted mean characteristics by employment state (SOEP 2004) and *t*-test of equal means

| Variable                  | Employment status in 2004 |                    |             |
|---------------------------|---------------------------|--------------------|-------------|
|                           | Self-employed             | Regularly employed | Not working |
| Female                    | 0.307                     | 0.502***           | 0.699***    |
| East                      | 0.168                     | 0.190              | 0.226**     |
| Highschool                | 0.392                     | 0.260***           | 0.163***    |
| Apprenticeship            | 0.412                     | 0.503**            | 0.466       |
| Highertechnicol           | 0.280                     | 0.249              | 0.208**     |
| University                | 0.320                     | 0.203***           | 0.125***    |
| Age (in years)            | 45.04                     | 42.076***          | 42.087***   |
| Workexp (in years)        | 19.43                     | 17.77**            | 12.12***    |
| Unemexp (in years)        | 0.59                      | 0.56               | 2.44***     |
| Disabled                  | 0.036                     | 0.066**            | 0.077**     |
| German                    | 0.938                     | 0.944              | 0.893**     |
| Nchild                    | 0.608                     | 0.561              | 0.829***    |
| Married                   | 0.586                     | 0.552              | 0.585       |
| Separated                 | 0.030                     | 0.024              | 0.023       |
| Divorced                  | 0.115                     | 0.099              | 0.132       |
| Fatherse                  | 0.133                     | 0.076**            | 0.075**     |
| Capitalinc (1000 Euro)    | 3.804                     | 1.159***           | 0.996***    |
| Duration (in years)       | 8.402                     | 10.372***          |             |
| <i>Risk measures</i>      |                           |                    |             |
| Medinvest                 | 0.385                     | 0.422              | 0.331*      |
| Highinvest                | 0.036                     | 0.024              | 0.010**     |
| Medrisk                   | 0.675                     | 0.735**            | 0.643       |
| Highrisk                  | 0.209                     | 0.094***           | 0.103***    |
| Medriskfin                | 0.496                     | 0.464              | 0.334***    |
| Highriskfin               | 0.050                     | 0.023**            | 0.017**     |
| Medriskocc                | 0.644                     | 0.618              | 0.517***    |
| Highriskocc               | 0.189                     | 0.075***           | 0.086***    |
| RRA (absolute value)      | 2.879                     | 2.830              | 3.149**     |
| Observations              | 906                       | 6979               | 1729        |
| Entries from 2004 to 2005 | 147                       | 78                 | 69          |

*Note:* The numbers give the fractions in the sample where the variable is true (if not stated otherwise). Stars indicate whether the mean is significantly different from the mean in the self-employed sample (two-sample *t*-test with equal variances):

\*\*\*/\*\*/\* indicates significance at the 0.1%/5%/10% level. See Tables B.1 and B.2 for a detailed description of the used variables

19.4 years). Furthermore, intergenerational links can be inferred from the fact that 13% of the self-employed have a father who is also self-employed, but only 8% of the other groups' members. Capital income is also unequally distributed: the self-employed earned on

average 3804 Euros on interest and dividends in 2003 (the year prior to the first interview), whereas employees collected 1159 Euros and those not working 996 Euros.

The answers to the risk-related questions also differ among the three groups: the share of individuals in the highest risk category is always higher for the self-employed, and in all but one case significantly higher. This is an indication of the relevance of the risk attitude for occupational choice. For example, high general willingness to take risks was reported by 21% of the self-employed but only 9% of employees and 10% of those not working. Similarly, high willingness to take occupational risks was reported by 19% of the self-employed but less than 9% of the other respondents. The average RRA parameter does not differ significantly between the self-employed and the employed, but it is significantly higher for the unemployed and inactive.

### 3 Estimation results

The aim of our empirical analysis is to identify the role of risk attitudes of nascent entrepreneurs. To do so, we model the transition probabilities into self-employment from 2004 to 2005. Our dichotomous left-hand side variable  $y_i$  takes the value 1 if the individual becomes self-employed between the 2004 and 2005 interviews and 0 otherwise. The underlying equation can be specified as:

$$y_i^* = \beta * \text{Risk}_i + \gamma' X_i + \epsilon_i, \quad (1)$$

where  $y_i^*$  is a latent variable such as the propensity to make a transition into self-employment between 2004 and 2005.  $\text{Risk}_i$  are different risk measures as described above and the vector  $X_i$  summarises different control variables which we will describe below.  $\beta$  and the vector  $\gamma$  include the respective coefficients where we are particularly interested in  $\beta$  measuring the influence of risk preferences on the transition probabilities. Since we do not observe the latent variable  $y_i^*$ , but the binary outcome variable  $y_i$ , we will estimate Eq. 1 using a logit model. As already reported, we observe 147 transitions into self-employment in this period, which corresponds to only 1.64% of all observations. Thereof, 78 transitions were made out of regular employment, and 69 out of unemployment or inactivity. King and Zeng

(2003) highlight that using a standard logistic regression in this “rare events” setting can lead to a significant bias, as the finite sample bias is magnified by the rare events and can be a problem even in sizable data sets. They also show that this leads to an underestimation of the probability of the rare events. Their suggested procedure estimates the same logit model as the standard logit procedure, but uses an estimator that gives a lower mean squared error, corrects the bias and is more efficient than the standard logit estimator in the presence of rare events.<sup>7</sup>

Since we want to check whether the influence of risk attitudes differs depending on former employment status, we run three separate regressions. The results (coefficients and marginal effects) can be found in Table 3. Column (1) refers to all transitions, whereas columns (2) and (3) contain the results for the individuals coming from regular employment and unemployment/inactivity, respectively. In this first set of regressions, we use the “lottery question” described above as one (of many) explanatory variable(s). Additionally, we include some obvious socio-demographics (education, gender, region, age, (un)employment experience, etc.) and two variables that previous research has shown to influence the decision to become self-employed: first, the amount of start-up capital available to the potential founder (cf. Blanchflower and Oswald 1998; Johannson 2000). Since we do not have a direct measure of individual wealth, we use capital income from the year 2003 (reported in 2004) as a proxy for capital endowment. Second, we include a dummy indicating whether the father of the person who aims to become self-employed was also an entrepreneur. There is some evidence of a positive correlation between the occupational choices of parents and their children (see e.g., Lentz and Laband 1990; Dunn and Holtz-Eakin 2000).

Before looking at the influence of risk attitudes, we briefly discuss the effects of other variables on the transition into self-employment. Looking at all transitions into self-employment, we see that a high school

degree has a significant positive influence on the probability to become self-employed. It increases the probability to become self-employed by 1% point, which is economically very significant considering that the overall weighted transition probability in the sample is only 1.6%. Whereas, we do not find a significant effect of this variable on those individuals who were in regular employment before becoming self-employed (column (2)), at 2.7% points the marginal effect is even higher for those individuals who were previously unemployed or inactive (column (3)).

A self-employed father has a significant influence on all transitions and transitions out of regular employment, increasing the likelihood of becoming an entrepreneur by 0.8% points and 0.7% points, respectively. Capital income in 2004 has the expected positive effect on all transitions, regardless of the former employment status. Those individuals with higher capital income—our proxy for capital endowment—have a higher probability of becoming self-employed.

Furthermore, employed people are not as likely as unemployed or inactive people to enter self-employment, as indicated by the strong negative effect of the employment dummy (indicating whether an individual was employed in 2004 or not) in column (1). This state dependence in regular employment increases strongly with tenure, i.e., the duration in regular employment; the longer individuals stay in a salaried job, the more unlikely they are to give it up.

We now turn to the influence of our risk measure. As already discussed in Sect. 2, we included the answer to the “lottery question” in three categories. Using “no investment” as the base category, we can see the influence of “medium investment” and “high investment” in the first two lines of the table. Whereas individuals who decide to make a “medium investment” do not have a higher probability of becoming self-employed, the less risk-averse individuals choosing a high investment have a much higher probability of doing so. Looking at all transitions, we see a significant increase of 3.0% points, whereas for individuals coming from regular employment the increase is a bit lower at 2.3% points. However, for formerly unemployed or inactive individuals, risk attitudes, do not seem to play a role in the decision to become self-employed.<sup>8</sup>

<sup>7</sup> It should be noted, that the differences between the standard logit and the rare events logit model turn out to be negligible in our setting since the general results stay unchanged. Standard logit results are available on request by the authors. Estimations are done using the RELOGIT Stata ado package by King and Zheng.

<sup>8</sup> We tested the sensitivity of our results with respect to the chosen risk categories. When we included all possible answers

**Table 3** Rare events logit estimation results: probability of entry into self-employment

| Employment status in 2004:  | (1) All     |              | (2) Regularly employed |              | (3) Not working |              |
|-----------------------------|-------------|--------------|------------------------|--------------|-----------------|--------------|
|                             | Coefficient | Marg. effect | Coefficient            | Marg. effect | Coefficient     | Marg. effect |
| Medinvest <sup>a</sup>      | 0.212       | 0.003        | 0.286                  | 0.002        | 0.233           | 0.008        |
| Highinvest <sup>a</sup>     | 1.246**     | 0.030**      | 1.532***               | 0.023**      | 1.043           | 0.049        |
| Female <sup>a</sup>         | 0.088       | 0.001        | 0.116                  | 0.001        | −0.406          | −0.013       |
| East <sup>a</sup>           | 0.292       | 0.004        | 0.460*                 | 0.003*       | 0.138           | 0.004        |
| Highschool <sup>a</sup>     | 0.671**     | 0.010**      | 0.528                  | 0.004        | 0.678**         | 0.027**      |
| Apprenticeship <sup>a</sup> | −0.037      | −0.001       | 0.012                  | 0.000        | −0.211          | −0.007       |
| Highertechncol <sup>a</sup> | 0.150       | 0.002        | 0.064                  | 0.000        | 0.167           | 0.006        |
| University <sup>a</sup>     | 0.439*      | 0.006        | 0.380                  | 0.003        | 0.565           | 0.022        |
| Age                         | 0.098       | 0.001**      | 0.095                  | 0.001**      | 0.295**         | 0.010**      |
| Agesq                       | −0.001*     | −0.000**     | −0.001                 | −0.000**     | −0.004**        | −0.000**     |
| Workexp10                   | 0.158       | 0.002**      | −0.074                 | −0.000**     | 0.598**         | 0.025**      |
| Unemexp10                   | −0.005      | 0.000**      | −0.353                 | −0.002**     | −0.749          | −0.016**     |
| Disabled <sup>a</sup>       | −0.122      | −0.002       | −0.24                  | −0.001       | 0.026           | 0.001        |
| German <sup>a</sup>         | −0.060      | −0.001       | −0.447                 | −0.004       | 0.352           | 0.010        |
| Nchild                      | −0.056      | −0.001**     | −0.177                 | −0.001**     | 0.010           | 0.000**      |
| Married <sup>a</sup>        | 0.264       | 0.003        | 0.273                  | 0.002        | 0.463           | 0.014        |
| Separated <sup>a</sup>      | 0.549       | 0.009        | 0.899                  | 0.010        | 0.285           | 0.008        |
| Divorced <sup>a</sup>       | 0.391       | 0.006        | 0.423                  | 0.004        | 0.55            | 0.021        |
| Fatherse <sup>a</sup>       | 0.535**     | 0.008*       | 0.768**                | 0.007*       | −0.196          | −0.005       |
| Capitalinc                  | 0.007**     | 0.000**      | 0.010***               | 0.000**      | 0.012**         | 0.000**      |
| Empl <sup>a</sup>           | −1.604***   | −0.036**     |                        |              |                 |              |
| Duration                    |             |              | −0.287***              | −0.002       |                 |              |
| Dursq                       |             |              | 0.006***               | 0.000***     |                 |              |
| Cons                        | −5.409***   |              | −5.580**               |              | −9.443***       |              |
| Chi2–value                  | 137.37      |              | 88.44                  |              | 143.27          |              |
| Log-likelihood              | −671.89     |              | −365.18                |              | −266.55         |              |
| Entries from 2004 to 2005   | 147         |              | 78                     |              | 69              |              |
| Observations                | 8708        |              | 6979                   |              | 1729            |              |

\*\*\*/\*\*/\* indicates significance at the 0.1%/5%/10% level. See Tables B.1 and B.2 for a detailed description of the used variables

<sup>a</sup> Marginals for discrete change of dummy variable from 0 to 1

Footnote 8 continued

to the hypothetical investment question as separate dummies, the category indicating investment of the full 100,000 Euros had a positive and highly significant coefficient. The marginal effects of the other (statistically not significant) dummies monotonically increased with the size of invested amounts, from a 1% point higher entry probability when the individual invests 20,000 Euros (in comparison to investing nothing) to 7.6% points when he/she invests the full amount. The other risk measures presented a similar picture, with the effects of the highest willingness to take risks being largest and most significant. In summary, our finding that less risk-averse individuals are more likely to enter self-employment seems to be driven to a large extent by those individuals who have the lowest risk aversion. Full results are available upon request.

Since the “lottery question” was just one of several possible measures of risk aversion, we re-estimated the models (with the same set of other explanatory variables) with four different risk measures. The results can be found in Table 4. We focus on the coefficients and marginal effects of the risk measures.<sup>9</sup> Column (1) contains the “general willingness to take risks”, whereas columns (2) and (3) refer to the willingness to take risks in “financial matters” and “occupational choices”. Finally,

<sup>9</sup> Full estimation results are available on request.

column (4) contains the results for the relative risk aversion parameter  $\rho_{\text{RRA}}$ . Once again, we run the regression for all transitions first and then for those coming out of regular employment and out of unemployment or inactivity.

If we concentrate on all transitions first, it becomes clear that individuals who report a high willingness to take risks have a higher probability of becoming self-employed, regardless of the kind of risk measure. The largest increase in probabilities can be found for the willingness to take “occupational risks”, where we find an increase of 4.1% points. Moreover, this is the only measure where even individuals who report a medium willingness to take risks also have a higher probability of becoming self-employed when compared to individuals who are willing to take low risks. The parameter  $\rho_{\text{RRA}}$  has the expected negative sign and shows that individuals with higher risk aversion are less likely to become self-employed. Whereas the separate regression for the individuals coming out of

regular employment support these findings, we do not find any significant effects of any of the risk measures for individuals coming out of unemployment or inactivity (except for medium willingness to take occupational risks).

Hence, we can conclude that risk attitudes have a significant impact on transitions from regular employment to self-employment, but matter little for transitions from unemployment or inactivity to self-employment.

To test the sensitivity of our results and explore gender differences, we estimated the regressions separately for men and women, as well. Clearly, what has to be kept in mind is that by further differentiating the sample, we run into problems of small sample size. To be specific, we observe 89 transitions into self-employment for females (43 out of regular employment and 46 out of unemployment or inactivity) and 58 transitions for males (35/23). Table 5 shows the distribution of the risk measures in

**Table 4** Rare events logit estimation results: probability of entry into self-employment with varying risk measures

| Risk parameter                                            | (1) General risk |              | (2) Finance risk |              | (3) Occupational risk |              | (4) Relative risk aversion |              |
|-----------------------------------------------------------|------------------|--------------|------------------|--------------|-----------------------|--------------|----------------------------|--------------|
|                                                           | Coefficient      | Marg. effect | Coefficient      | Marg. effect | Coefficient           | Marg. effect | Coefficient                | Marg. effect |
| <i>Employment status in 2004: not self-employed</i>       |                  |              |                  |              |                       |              |                            |              |
| Medium <sup>a</sup>                                       | 0.078            | 0.001        | 0.101            | 0.001        | 0.652**               | 0.007**      |                            |              |
| High <sup>a</sup>                                         | 0.952**          | 0.018**      | 1.377***         | 0.034**      | 1.597***              | 0.041**      |                            |              |
| RRA                                                       |                  |              |                  |              |                       |              | −0.131**                   | −0.002*      |
| Chi2-value                                                | 150.21           | 150.21       | 143.17           | 143.17       | 198.95                | 198.95       | 128.99                     | 128.99       |
| Log-likelihood                                            | −670.07          | −670.07      | −671.67          | −671.67      | −660.72               | −660.72      | −673.82                    | −673.82      |
| <i>Employment status in 2004: regularly employed</i>      |                  |              |                  |              |                       |              |                            |              |
| Medium <sup>a</sup>                                       | −0.044           | −0.001**     | 0.137            | 0.001        | 0.650*                | 0.004*       |                            |              |
| High <sup>a</sup>                                         | 1.060**          | 0.011**      | 1.818***         | 0.031**      | 1.979***              | 0.032**      |                            |              |
| RRA                                                       |                  |              |                  |              |                       |              | −0.203**                   | −0.002**     |
| Chi2-value                                                | 93.57            | 93.57        | 88.83            | 88.83        | 134.43                | 134.43       | 78.04                      | 78.04        |
| Log-likelihood                                            | −364.20          | −364.20      | −362.98          | −362.98      | −353.58               | −353.58      | −366.78                    | −366.78      |
| <i>Employment status in 2004: not working<sup>b</sup></i> |                  |              |                  |              |                       |              |                            |              |
| Medium <sup>a</sup>                                       | 0.139            | 0.004        | 0.185            | 0.006        | 0.543*                | 0.016        |                            |              |
| High <sup>a</sup>                                         | 0.495            | 0.018        |                  |              | 0.491                 | 0.019        |                            |              |
| RRA                                                       |                  |              |                  |              |                       |              | −0.077                     | −0.003       |
| Chi2-value                                                | 49.19            | 49.19        | 45.01            | 45.01        | 47.64                 | 47.64        | 43.31                      | 43.31        |
| Log-likelihood                                            | −266.52          | −266.52      | −266.00          | −266.00      | −265.08               | −265.08      | −266.77                    | −266.77      |

\*\*\*/\*\*/\* indicates significance at the 0.1%/5%/10% level. See Tables B.1 and B.2 for a detailed description of the used variables

<sup>a</sup> Marginals for discrete change of dummy variable from 0 to 1

<sup>b</sup> The variable ‘high risk in financial matters’ had to be dropped for the sample of not employed individuals, since there were no observations with transitions

**Table 5** Weighted mean characteristics differentiated by gender and employment status (SOEP 2004) and *t*-test of equal means

| Variable                  | Men                       |                    |             | Women                     |                    |             |
|---------------------------|---------------------------|--------------------|-------------|---------------------------|--------------------|-------------|
|                           | Employment status in 2004 |                    |             | Employment status in 2004 |                    |             |
|                           | Self-employed             | Regularly employed | Not working | Self-employed             | Regularly employed | Not working |
| Risk measures             |                           |                    |             |                           |                    |             |
| Medinvest                 | 0.403                     | 0.452              | 0.352       | 0.344                     | 0.392**            | 0.322       |
| Highinvest                | 0.051                     | 0.034              | 0.016       | 0.001***                  | 0.014***           | 0.007       |
| Medrisk                   | 0.640                     | 0.747              | 0.670       | 0.754**                   | 0.723              | 0.631       |
| Highrisk                  | 0.245                     | 0.125              | 0.159       | 0.128**                   | 0.064***           | 0.079**     |
| Medriskfin                | 0.537                     | 0.528              | 0.392       | 0.404**                   | 0.400***           | 0.310**     |
| Highriskfin               | 0.069                     | 0.038              | 0.025       | 0.008***                  | 0.009***           | 0.014       |
| Medriskocc                | 0.640                     | 0.647              | 0.538       | 0.654                     | 0.590**            | 0.508       |
| Highriskocc               | 0.208                     | 0.086              | 0.144       | 0.146                     | 0.064**            | 0.061**     |
| RRA (absolute)            | 2.772                     | 2.706              | 3.084       | 3.122**                   | 2.953***           | 3.177       |
| Observations              | 597                       | 3,551              | 488         | 309                       | 3,428              | 1,241       |
| Entries from 2004 to 2005 |                           | 35                 | 23          |                           | 43                 | 46          |

*Note:* The numbers give the fractions in the sample where the variable is true (if not stated otherwise). Stars indicate whether the mean for females is significantly different from the mean for males (two-sample *t*-test with equal variances): \*\*\*/\*\*/\* indicates significance at the 0.1%/5%/10% level. See Tables B.1 and B.2 for a detailed description of the used variables

both samples differentiated by employment status in 2004 and shows that women are on average more risk-averse than men (stars indicate statistically significant differences). Table 6 contains the relevant estimation results. When looking at the influence of risk aversion on the transition into self-employment, results are remarkably stable, i.e., for both men and women—who were not formerly unemployed or inactive—we find a negative effect of risk aversion on the probability to enter self-employment even though three of the risk measures are not significant for women (“lottery question”, “financial risk” and “ $\rho_{RRA}$ ”) and one measure (“general risk”) is insignificant for men.

#### 4 Conclusions

By making use of an experimentally validated questionnaire embedded in the 2005 wave of the SOEP, we empirically analyzed whether risk attitudes have an impact on the decision to become self-employed. All persons had to evaluate their own inclination towards risk (where the validity of these answers was tested in a field experiment with real money) and had to make the decision on how much to

invest of a fixed amount in a binary lottery. Thus, we have a well-designed test whether the objectively measurable risk attitudes observed at the time of the transition to self-employment are a crucial variable in the decision-making process of a person who wants to start his or her own business. Interestingly—and much in contrast to recent research—our data supports the conventional wisdom that persons with a higher inclination towards risk have a significantly higher probability of becoming entrepreneurs. However, sensitivity analysis reveals that this result holds only for those individuals who were previously employed. For previously unemployed or inactive persons, we find no significant influence of risk attitudes, indicating that other variables drive their decision towards self-employment.

Therefore, the present approach is able to close an essential gap which existed in the previously conducted empirical research. Cramer et al. (2002) and Van Praag and Cramer (2001) found differences in risk attitudes for persons who had been either in entrepreneurial or employed positions for a number of years. Their data set had a “big timing problem” as they used variables with a time span of more than 40 years. Accordingly, they had to base their analysis

**Table 6** Rare events logit estimation results: probability of entry into self-employment with varying risk-classifications differentiated by gender

| Risk parameter:     | Men                                                       |         |          |          |              | Women                         |         |         |         |              |
|---------------------|-----------------------------------------------------------|---------|----------|----------|--------------|-------------------------------|---------|---------|---------|--------------|
|                     | (1)                                                       | (2)     | (3)      | (4)      | (5)          | (6)                           | (7)     | (8)     | (9)     | (10)         |
|                     | Lottery                                                   | General | Finance  | Occup.   | $\rho_{RRA}$ | Lottery                       | General | Finance | Occup.  | $\rho_{RRA}$ |
|                     | Coefficient (first line)                                  |         |          |          |              | Coefficient (first line)      |         |         |         |              |
|                     | Marginal effect (second line)                             |         |          |          |              | Marginal effect (second line) |         |         |         |              |
|                     | <i>Employment status in 2004: not self-employed</i>       |         |          |          |              |                               |         |         |         |              |
| Medium <sup>a</sup> | 0.193                                                     | 0.245   | 0.169    | 0.785    |              | 0.233                         | 0.002   | 0.082   | 0.607** | 0.600        |
|                     | 0.002                                                     | 0.002   | 0.001    | 0.006    |              | 0.004                         | 0.000   | 0.001   | 0.009** |              |
| High <sup>a</sup>   | 1.478**                                                   | 0.946   | 1.742*** | 1.981*** |              | 1.089                         | 0.987** | 0.509   | 1.240** | 1.263        |
|                     | 0.029**                                                   | 0.013   | 0.036*   | 0.040**  |              | 0.029                         | 0.023*  | 0.011   | 0.032** |              |
| RRA                 |                                                           |         |          |          | −0.147       |                               |         |         |         | −0.129       |
|                     |                                                           |         |          |          | −0.002       |                               |         |         |         | −0.003       |
|                     | <i>Employment status in 2004: regularly employed</i>      |         |          |          |              |                               |         |         |         |              |
| Medium <sup>a</sup> | 0.489                                                     | 0.102   | 0.263    | 1.238    |              | 0.115                         | −0.161  | −0.033  | 0.435   |              |
|                     | 0.002                                                     | 0.000   | 0.001    | 0.004    |              | 0.001                         | −0.002  | −0.000  | 0.004   |              |
| High <sup>a</sup>   | 1.770***                                                  | 1.031   | 1.891*** | 2.830**  |              | 1.163                         | 1.210** | 1.416   | 1.375** |              |
|                     | 0.020**                                                   | 0.007   | 0.024**  | 0.042*   |              | 0.021                         | 0.022*  | 0.030   | 0.028*  |              |
| RRA                 |                                                           |         |          |          | −0.286**     |                               |         |         |         | −0.116       |
|                     |                                                           |         |          |          | −0.003**     |                               |         |         |         | −0.002       |
|                     | <i>Employment status in 2004: not working<sup>b</sup></i> |         |          |          |              |                               |         |         |         |              |
| Medium <sup>a</sup> | −0.159                                                    | −0.081  | −0.044   | 0.208    |              | 0.437                         | 0.116   | 0.248   | 0.593   |              |
|                     | −0.006                                                    | −0.001  | −0.001   | 0.006    |              | 0.013                         | 0.004   | 0.008   | 0.018*  |              |
| High <sup>a</sup>   |                                                           | 0.110   |          | 0.059    |              | 1.266                         | 0.685   |         | 0.803   |              |
|                     |                                                           | 0.006   |          | 0.001    |              | 0.070                         | 0.026   |         | 0.036   |              |
| RRA                 |                                                           |         |          |          | 0.090        |                               |         |         |         | −0.173       |
|                     |                                                           |         |          |          | 0.002        |                               |         |         |         | −0.008       |

\*\*\*/\*\*/\* indicates significance at the 0.1%/5%/10% level. First line reports the estimated coefficient, the second line the marginal effect. See Tables B.1 and B.2 for a detailed description of the used variables

<sup>a</sup> Marginals for discrete change of dummy variable from 0 to 1

<sup>b</sup> The variable ‘high risk in financial matters’ had to be dropped for the sample of not employed individuals, since there were no observations with transitions

on the assumption that a person’s risk attitude is an individual trait that is constant throughout life.

Our results are also more conclusive than the approach of Rosen and Willen (2002). They compare the mean incomes and their variances of employed persons with persons who were successfully self-employed for more than five years. As unsuccessful entrepreneurs usually close their businesses within the first 5 years after starting, unsuccessful entrepreneurs (and thus, the risk of failing as an entrepreneur) are systematically excluded in their data. Therefore, their main finding that “the increase in mean consumption that rewards the increased variance of

self-employment is much too large to be rationalized by conventional measures of risk aversion” is not astonishing at all. The income of self-employed people was systematically overestimated as the (probably rather low) incomes of those entrepreneurs who failed were virtually excluded in their data set. In contrast to this, we asked the nascent entrepreneurs about their risk attitudes at a time when they were not able to foresee the extent to which their business would succeed.

Our approach is to a certain extent also different to the analysis based on data from the General Entrepreneurship Monitor (GEM) and the Regional

**Table 7** Transitions between self-employment, regular employment and non-working for the 2004/05 wave

| 2004               | Labour market status 2005 |               |              |
|--------------------|---------------------------|---------------|--------------|
|                    | Self-employed             | Reg. employed | Not working  |
| Self-employed      | 792 (0.874)               | 67 (0.074)    | 47 (0.052)   |
| Regularly employed | 78 (0.011)                | 6444 (0.923)  | 457 (0.065)  |
| Not working        | 69 (0.040)                | 347 (0.201)   | 1313 (0.759) |

*Note:* Number of individuals who remain in the same employment status between 2004 and 2005 wave are displayed on the diagonal (row percentages in parentheses)

Entrepreneurship Monitor of Germany (REM).<sup>10</sup> In both monitors, a question is included whether ‘fear of failure’ would prevent the surveyed person from starting a business. This variable was then employed as an indicator or proxy for risk aversion (see, e.g., Wagner 2003; Köllinger et al. 2005b). Results in these articles are that ‘fear of failure’ has a significantly negative impact on the probability of becoming an entrepreneur.

Based on these observations, Wagner (2003) came—in contrast to our approach—to the conclusion that lower risk aversion even leads unemployed persons to become entrepreneurs. However, an individual’s attitude toward failure is not necessarily correlated with his/her risk aversion. As we mentioned in the Introduction, the fear of failing as self-employed might also be induced by the respondents’ perception of lack of those skills, knowledge and experiences which are required to start a new business. Therefore, Wagner’s empirical analysis is important, since it suggests that those individuals who have made a self-assessment with respect to their individual probability of surviving as entrepreneurs tend to make a corresponding decision.<sup>11</sup> Persons who consider their abilities as potential entrepreneurs to be inadequate have a lower probability of becoming self-employed even if they are unemployed at the time. However, the data of the GEM and the REM do not necessarily give us clues about the risk attitudes of these persons.

<sup>10</sup> For more information on the data collection methods of the GEM, see Reynolds et al. (2005). For the German GEM data used for the analysis of risk attitudes, see Sternberg et al. (2001) and for some interesting analysis of that year’s REM data of Germany, see Wagner and Sternberg (2005).

<sup>11</sup> We should emphasize once more that the individual perception of one’s entrepreneurial abilities are not necessarily equal to the objectively measurable abilities, see inter alia Köllinger et al. (2005b).

Our findings have several implications. Starting with the differences between previously employed and unemployed persons, we show that risk attitudes have an impact on the choice to enter self-employment only for formerly employed individuals. The observation that risk aversion plays no significant role for previously unemployed and inactive persons, indicates that other variables (than the risk attitudes) induce the non-working population to make this occupational choice. One possible explanation is that the probability of previously employed persons to remain employed in the next period (if they had not started their own business) is higher than the probability of previously unemployed or inactive individuals to become regularly employed in the next period (for data supporting this explanation, see Table 7). In other words, previously unemployed and inactive persons have to ‘bear’ lower opportunity costs when they become self-employed. In the context of promoting self-employment, a central objective of public policy in many industrialized countries, our results imply that nascent entrepreneurs might need differentiated support measures designed to fit their previous employment status.

The differing risk attitudes might also explain why previously unemployed entrepreneurs develop smaller businesses in terms of start-up capital and new job provisions than previously employed entrepreneurs. Both making use of more capital and creating new jobs are usually connected with higher risks.<sup>12</sup>

The observation that the risk attitudes of both male and female entrepreneurs have a similarly crucial

<sup>12</sup> It seems to be a stable pattern that previously employed entrepreneurs start their businesses with more capital and a higher pace of employment growth than previously unemployed entrepreneurs (Hinz and Jungbauer-Gans 1999). Recent surveys of an entrepreneurship monitor run by the German public bank KfW in 2005 confirm this observation (Kreditanstalt für Wiederaufbau 2005).

impact also has important implications. Within the German population, we observed that more than twice as many men than women are active as entrepreneurs and we also found that women are significantly more risk-averse than men (again in the German population).<sup>13</sup> This means that there is a higher share of women with high levels of risk aversion than men. Since risk attitudes—at least those of previously employed persons—play such a crucial role in this occupational choice, it becomes clearer why there is a smaller share of female entrepreneurs in the German population.<sup>14</sup>

In summary, these results tell us, first, that less risk-averse persons are more likely to become entrepreneurs given that they start their business out of regular employment. Second, for persons who become self-employed out of unemployment, the risk attitude seems to have no impact on this significant decision.

## Appendix A: Arrow–Pratt coefficient of relative risk aversion

From the responses to the hypothetical investment question, under certain assumptions, we can calculate proxies for individual Arrow–Pratt coefficients of RRA. Utility is a function of wealth. Individuals may choose to invest an amount  $inv$  between zero and  $x = 100,000$  Euros (the hypothetical windfall gain). There are equal probabilities  $\alpha$  of earning a profit of  $inv$  and losing half of it. Thus, the agent maximizes his/her expected utility subject to the budget constraint:

$$\begin{aligned} \max \quad & (\alpha U(x + inv) + \alpha U(x - \frac{inv}{2})) = \max(f(inv)) \\ \text{s.t.} \quad & 0 \leq inv \leq 100,000 \end{aligned} \quad (2)$$

The problem is solved by finding the null of the first derivative:

$$\begin{aligned} f'(inv) = 0 & \xRightarrow{\alpha > 0} U'(x + inv) = \frac{1}{2} U'(x - \frac{inv}{2}) \\ & \xRightarrow{\text{Taylor-approx.}} U'(x) + inv U''(x) \approx \frac{1}{2} U'(x) - \frac{inv}{4} U''(x) \\ & \xRightarrow{inv \neq 0 \wedge U'(x) \neq 0} \rho_{ARA} = \frac{-U''(x)}{U'(x)} \approx \frac{2}{5inv} \end{aligned} \quad (3)$$

Third, for both women and men, risk attitudes have a similar impact on the decision to start as an entrepreneur, thus women's higher average risk aversion could explain why there is a lower share of female entrepreneurs—at least in the German population.

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Individuals cannot indicate risk-neutral or risk-loving attitudes by construction of the hypothetical investment question, which implies the assumption  $U''(x) < 0 \forall x$ . As  $\alpha > 0$ , it follows that

$$f''(inv) = \alpha U''(x + inv) + \frac{1}{4} \alpha U''(x - \frac{inv}{2}) < 0 \forall inv \quad (4)$$

Thus,  $f(inv)$  reaches its global maximum at the null.  $\rho_{ARA}$  is the Arrow–Pratt measure of absolute risk aversion. We approximate the individual's total wealth endowment  $w$  with the hypothetical 100,000 Euros to calculate the coefficient of RRA  $\rho_{RRA}$ :

$$\rho_{RRA} = \rho_{ARA} \cdot w \approx \frac{2}{5inv} \cdot 100,000 \quad (5)$$

As  $inv$  is nonnegative,  $\rho_{RRA}$  is always positive (risk averse agents). If an individual chooses to

<sup>13</sup> The latter finding—women are more risk-averse than men—is a more general one and also found in other countries; see Croson and Gneezy (2004) for a recent survey of gender differences in preferences.

<sup>14</sup> It has to be pointed out, that Wagner (2007), again making use of the German REM data, found a corresponding result as men differ from women in their fear of failing as an entrepreneur in a way that the gender gap can also be explained by this variable.

invest nothing ( $inv = 0$ ), we arbitrarily set his/her  $\rho_{RRA}$  to 4 (double the coefficient of an individual choosing the smallest investment possible, i.e.,

20,000 Euros). The results remain basically unchanged, albeit somewhat less significant, if  $\rho_{RRA}$  is set to 8 or 16.

## Appendix B: Definition of variables used in the estimations

**Table B.1** Detailed description of the risk measures used

| Variable label                                                                           | Description                                                                  |
|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Hypothetical risky investment<br>after winning 100,000 Euros in the lottery <sup>a</sup> |                                                                              |
| Lowinvest                                                                                | Dummy for individuals who would invest nothing. Omitted category.            |
| Medinvest                                                                                | Dummy for individuals who would invest 20, 40 or 60 thousand Euros.          |
| Highinvest                                                                               | Dummy for individuals who would invest 80 or 100 thousand Euros.             |
| General willingness to take risks <sup>b</sup>                                           |                                                                              |
| Lowrisk                                                                                  | Dummy for individuals who indicated 0–2 on 11-point scale, omitted category. |
| Medrisk                                                                                  | Dummy for individuals who indicated 3–7 on 11-point scale.                   |
| Highbrisk                                                                                | Dummy for individuals who indicated 8–10 on 11-point scale.                  |
| Willingness to take risks<br>in financial matters <sup>c</sup>                           |                                                                              |
| Lowriskfin                                                                               | Dummy for individuals who indicated 0–2 on 11-point scale, omitted category. |
| Medriskfin                                                                               | Dummy for individuals who indicated 3–7 on 11-point scale.                   |
| Highbriskfin                                                                             | Dummy for individuals who indicated 8–10 on 11-point scale.                  |
| Willingness to take risks<br>in occupation <sup>c</sup>                                  |                                                                              |
| Lowriskocc                                                                               | Dummy for individuals who indicated 0–2 on 11-point scale, omitted category. |
| Medriskocc                                                                               | Dummy for individuals who indicated 3–7 on 11-point scale.                   |
| Highbriskocc                                                                             | Dummy for individuals who indicated 8–10 on 11-point scale.                  |
| RRA                                                                                      | Approximate Arrow–Pratt coefficient of RRA (see Appendix A).                 |

<sup>a</sup> The original SOEP-question for the hypothetical investment is: Please consider what you would do in the following situation:

Imagine that you had won 100,000 Euros in the lottery. Almost immediately after you collect the winnings, you receive the following financial offer from a reputable bank, the conditions of which are as follows: There is the chance to double the money within 2 years. It is equally possible that you could lose half of the amount invested. You have the opportunity to invest the full amount, part of the amount or reject the offer

What share of your lottery winnings would you be prepared to invest in this financially risky, yet lucrative investment? Possible answers: ‘100,000’, ‘80,000’, ‘60,000’, ‘40,000’, ‘20,000 Euros’, and ‘Nothing, I would decline the offer’

<sup>b</sup> The original SOEP-question for the general willingness to take risks 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?”

Please tick a box on the scale, where the value 0 means: ‘risk averse’ and the value 10 means: ‘fully prepared to take risks’

<sup>c</sup> The original SOEP-questions for the different areas are: “People can behave differently in different situations. How would you rate your willingness to take risks in the following areas? Please tick a box on the scale, where the value 0 means: ‘risk averse’ and the value 10 means: ‘fully prepared to take risks’

How is it in financial matters? How is it in your occupation?”

**Table B.2** Detailed description of the variables used

| Variable label         | Description                                                                                                 |
|------------------------|-------------------------------------------------------------------------------------------------------------|
| Female                 | Dummy for females                                                                                           |
| East                   | Dummy for individuals who live in East-Germany                                                              |
| Highschool             | Dummy for individuals who have a high school degree (“Fachhochschulreife” or “Abitur”)                      |
| Apprenticeship         | Dummy for individuals who finished an apprenticeship (“Lehre”)                                              |
| Hightechnicol          | Dummy for individuals who finished a higher technical college or similar                                    |
| University             | Dummy for individuals who have a university degree                                                          |
| Age                    | Age of individual                                                                                           |
| Agesqr                 | Age squared                                                                                                 |
| Workexp10 <sup>a</sup> | Years of work experience, divided by 10.                                                                    |
| Unemexp10 <sup>a</sup> | Years of unemployment experience, divided by 10.                                                            |
| Disabled               | Dummy for handicapped/physically challenged individuals                                                     |
| German                 | Dummy for German nationality                                                                                |
| Nchild                 | Number of children under 17 in the household                                                                |
| Married                | Dummy for married and not separated individuals. Omitted category for marital status is “single”/“widowed”. |
| Separated              | Dummy for married, but separated individuals                                                                |
| Divorced               | Dummy for divorced individuals                                                                              |
| Fatherse               | Dummy for individuals whose father is/was self-employed                                                     |
| Capitalinc             | Income from interests, dividends and renting out in 2004 (reported retrospectively in 2005) in 1000 Euros.  |
| Duration <sup>a</sup>  | Tenure of current spell in 2004 (self-employment or regular employment)                                     |
| Dursq                  | Square of duration variable                                                                                 |

<sup>a</sup> Uses information from the lifetime employment history in the SOEP

*Note:* Dummy variables equal one if condition holds and zero otherwise

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