DISCUSSION PAPER SERIES

IZA DP No. 8651

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November 2014

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zur Zukunft der Arbeit
Institute for the Study
of Labor

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Discussion Paper No. 8651
November 2014

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ABSTRACT

Do Entrepreneurs Really Earn Less?*

Based on representative micro data for Germany, we compare the incomes of self-employed with those of wage workers. Our results show that the median self-employed entrepreneur with employees earns significantly more than the median salaried employee, while the median solo entrepreneur earns less. However, solo entrepreneurship pays for those with a university entrance degree but no further professional qualification as well as for those who were in the upper percentiles of the income distribution in their previous salaried job. Surprisingly, the variation in hourly incomes of solo entrepreneurs is higher than that of entrepreneurs with employees.

JEL Classification: L26, D22

Keywords: income, entrepreneurship, self-employment, start-ups, Germany

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* We gratefully acknowledge support of the Research Data Center of the German Statistical Offices of the Laender at the DIW Berlin. We are indebted to Tom Åstebro, Adam Lederer, Simon Parker, and participants of the "13th Interdisciplinary European Conference on Entrepreneurship Research" in Chur (Switzerland) and the yearly conference of the German Economic Association (Verein für Socialpolitik) 2014 in Hamburg (Germany) for their comments.

1. Introduction

Owning a business is often associated with a promising way to become rich. Indeed, taking Germany as an example, 34 percent of the wealthiest people earned their money by running their own company. Only 8 percent became rich in an employee position. The rest, 58 percent, were born rich—simply inheriting a fortune (Manager Magazine 2013). But looking at the overall income distribution, the results are mixed for entrepreneurs in relation to paid employees. There seems to be agreement on three stylized facts, as established by Hamilton (2000). First, the median self-employed person earns less than the median wage-employed.[1] Second, the variance in entrepreneurial incomes is considerably larger than that of paid employees. Third, only a tiny minority of business founders eventually become exceptionally rich (Henrekson and Sanandaji 2013).

The huge entrepreneurial premium for a minority of so-called superstars and the seemingly low return to most entrepreneurs has led to the question: Why do individuals remain self-employed if they could earn more in paid employment? Have they not given up hope of earning considerably more according to the biased expectations hypothesis (Koellinger, Minniti, and Schade 2007)? Do they derive non-pecuniary gains from entrepreneurship (Benz and Frey 2008)? Or do entrepreneurs systematically underreport their incomes (Åstebro and Chen 2014), and at the end of the day earn more than employed individuals?

We contribute to solving the entrepreneurial income puzzle by disentangling the heterogeneous group of entrepreneurs into subgroups. Using the representative data of the German Micro-Census, a survey of 800,000 individuals, we start by separately examining incomes of the self-employed with employees (employers) and those of the solo self-employed.[2] We then investigate the incomes of entrepreneurs depending on their socio-demographic, educational, and professional background.

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[1] See Åstebro and Chen (2014) for an overview of later results; not all studies claim that entrepreneurs earn less than paid employees.

[2] In several countries the latter group has gained increasing importance (Fritsch, Kritikos and Sorgner 2012; van Stel, Scholman and Wennekers 2012).

Observing a general income distribution in wage and self-employment similar to Hamilton's (2000) baseline study, our estimates indicate that entrepreneurship pays, depending on the type of self-employment and the human capital of the self-employed. Most important, the self-employed with employees are more likely to have higher incomes than paid employees. There is thus no entrepreneurial income puzzle if individuals are ready to risk employing others in their business. In contrast, the solo self-employed are on average less likely to earn more than paid employees. But solo self-employment appears to be a profitable career option for some groups, namely for individuals in the upper percentiles of the wage-income distribution and for those with a university entrance degree (Abitur) but no further professional qualification. Interestingly, the variance in incomes from entrepreneurship is much higher for the solo self-employed than the employers.

The remainder of the paper is organized as follows. Section 2 describes the theoretical and empirical background. Section 3 reviews data and measurement issues and provides descriptive results. Section 4 provides multivariate analyses of what determines incomes separated by employment states. Section 5 considers underreporting and overestimating entrepreneurial incomes. Section 6 concludes.

2. Previous research

Whether entrepreneurs can earn more than paid employees attracts considerable attention in the empirical literature. It is generally assumed that people select their employment according to its expected utility and start to pursue an own venture when it appears more rewarding to them than being a paid employee or unemployed (Knight 1921; Lucas 1978; Evans and Jovanovic 1989). Along these lines, Taylor (1996) argues that higher expected earnings in self-employment than in paid employment are a key factor determining the utility of self-employment. And as becoming self-employed is risky, Kihlstrom and Laffont (1979) assume that the occupational choice between self-employment and a salaried job is driven by a risk-return tradeoff. More risk-tolerant persons prefer to become

entrepreneurs when they expect to realize higher but riskier incomes, while less risk-tolerant persons prefer wage work with lower but predictable incomes.

There are several explanations for why higher risk tolerance is a necessary but insufficient condition for earning higher incomes. To earn more, the self-employed also need to be more productive or more innovative than a paid employee. Lucas (1978) highlights the distribution of managerial talent across the working population and argues that those with more talent tend to become entrepreneurs with higher incomes.

But talent alone cannot explain the added value that an entrepreneur may create. Holmes and Schmitz (1990) develop a model where individuals have different abilities in identifying and exploiting opportunities for new products, and introducing them to the market. And assuming that transforming entrepreneurial abilities into running a business is a random process, individuals with higher abilities have a higher probability of starting and running their own firm that may allow them to realize higher incomes than in a salaried job.[3] Individuals may also have incomplete information about their abilities (Jovanovic 1982 and MacDonald 1988). Those who learn about their lack of entrepreneurial abilities will, after a while, return to wage employment, and those who have them will remain entrepreneurs.

Why might it pay the entrepreneur to also employ others? Åstebro, Chen, and Thompson (2011) argue that economies of scale result from a division of labor—that "when the engineer works with the marketer to produce a new product, the two together do better than if one of them had done both tasks" (see also Åstebro and Chen 2014, 94). So, entrepreneurs who employ wage workers can be more productive and have higher incomes than solo entrepreneurs.

[3] These models, thus, imply that personality traits such as willingness to take risks (Caliendo, Fossen and Kritikos 2010) or low scores in 'agreeableness' (Caliendo, Fossen and Kritikos 2014) influence entrepreneurial survival.

While these approaches may explain why some entrepreneurs are able to realize higher profits than others, it is often argued that non-pecuniary gains from entrepreneurship can also be important in determining people's entrepreneurial choices. That may explain why some individuals stay in self-employment even though they earn no more or even less than as a paid employee. Non-pecuniary utility includes being one's own boss, determining one's work activities, and working flexibly or creatively (Benz and Frey 2008; Millan, et al., 2011, Hyytinen, et al., 2013).

There are an increasing number of empirical studies on entrepreneurial earnings. Åstebro and Chen (2014) provide an overview of almost all studies supporting and contrasting with Hamilton's approach (2000). They show that several recent analyses have found that some entrepreneurs earn more than their employed counterparts.[4] They also show that entrepreneurial income distribution is centered to the left of the wage distribution of employed individuals and is more positively skewed. Moreover, entrepreneurs work more hours per week than paid employees. Last but not least, the results for the type of person that selects entrepreneurship are mixed. In some countries, more qualified and relatively well paid employees tend to switch into entrepreneurship. In other countries, business founders come from both the upper and lower part of the wage distribution. Such differences could explain country differences in the incomes from entrepreneurship and paid employment.

It also highlights why the strong heterogeneity in the earnings premium might depend on the type of entrepreneur. But the empirical evidence is very limited in this respect. Parker (1999), in his analysis of the distribution of self-employment income in the United Kingdom, concludes that the inequality of incomes is likely to come from the greater heterogeneity among the self-employed, particularly in their occupation.

[4] Studies for Germany that are partly reviewed by Åstebro and Chen (2014) suggest that – similar to other countries – the distribution of entrepreneurial earnings has a higher standard deviation than the wage distribution due to higher incomes in upper percentiles (Merz 2006). Martin (2013) using the German Socioeconomic Panel finds that self-employed persons on average earn more than paid employees. Kneiding and Kritikos (2013) using data from the German 'Survey of Income and Consumption' show that average earnings of the self-employed are higher than those of paid employees.

Fairlie (2005) studied young adults whose parents both have less than high school education. He shows that male business owners from such families earn more than wage workers while female business owners earn less. Braguinsky, Klepper, and Ohyama (2012) show a positive monetary return to high-tech entrepreneurs, particularly younger ones. Åstebro, Braunerhjelm, and Broström (2013) find a significant negative earnings differential in the returns from academic entrepreneurship, which becomes insignificant after controlling for several covariates.

Åstebro and Chen (2014) address measurement issues. They call those studies that find lower incomes for self-employed into question by claiming that entrepreneurs systematically underreport their earnings. After correcting for such an underreporting bias, they suggest that entrepreneurship in the United States pays.[5]

Putting together, the literature clarifies that incomes from entrepreneurship are at higher risk than incomes from wage employment. But it is not clear that becoming self-employed leads to substantially higher incomes than being in a comparable job as a paid employee. Some authors highlight random processes where success depends on ability, on learning, and on scale economies, all influencing incomes and income expectations. The returns to entrepreneurship may include more than pecuniary incomes, because many studies observe lower median incomes in self-employment, creating the returns-to-entrepreneurship puzzle. By analyzing subgroups of self-employed we can solve much of that puzzle.

3. Data and Methods

3.1 Data source and the identification of self-employment

Our investigation is based on German Micro-Census data[6] provided by the German Federal Statistical Office. The Micro-Census is a representative

[5] In their study, Kneiding and Kritikos (2013) also reveal, similar to Åstebro and Chen (2014), that the median consumption spending of entrepreneurs is higher than that of wage earners.

[6] The Micro-Census was started in 1957 as an annual survey of private households and persons in West Germany. In 1991 it was expanded to include the former East German states. The central aim of the survey is to collect nationally representative micro-data

annual survey delivering information on the socio-economic situation of about 820,000 persons living in 380,000 households across Germany, about 1 percent of the German population.[7] The analysis here is based mainly on the 2009 wave. We also use the latest Micro-Census panel data for 2001–04, with about 25 percent of the respondents providing insights into selection issues related to self-employment.

An advantage of these data over other sources is that the nonresponse rate is very low, making missing-value problems largely irrelevant (Fritsch, Kritikos, and Rusakova, 2012). For instance, the nonresponse rate for a question about labor market income is only about 4 percent, far below that in other surveys (Schimpl-Neimanns, 1998). Moreover, different types of self-employment are distinguished by such characteristics as demographics, industry, occupation, region, and business size.

The sample comprises 262,249 individuals, of whom 15,165 are solo self-employed (5.8%) and 11,963 are self-employed with employees (4.6%). Self-employed people are identified in a question about current employment status, distinguishing between solo self-employed (without employees) and self-employed with employees (employers). Those persons who report their current employment status as an employee, a (home-)worker, or an apprentice are subsumed under ‘paid employees.’ Civil servants and those in military or helping family members are not considered. Nor are self-employed farmers included because they are not obliged to report their earnings.

about the population structure, economic and social situation of individuals and households, labor activity, education, as well as living conditions and health. The Micro-Census includes most of the attributes of the European Union Labor Force Survey, thus making it possible to compare the data on employment activity across EU member states. A stable set of core questions posed every year covers the most essential areas, such as population, demography, education, training, occupational dynamics, earnings, and income. For more information on the Micro-Census program, see Micro-Census Law 2005 of 24 June 2004 (Federal Law Gazette I, p. 1350).

[7] The German Socio-Economic Panel, another representative household survey of the German population, contains information on about 11,000 households with little more than 20,000 individuals. For a description, see Wagner, Frick, and Schupp (2007).

3.2 Measurement of income in the Micro-Census

The Micro-Census includes information about the net monthly individual income in 24 narrowly defined income groups that range from €0–150 to more than €18,000 (Table 1).[8] The respondents are advised to declare net income after taxes and social insurance contributions. We compared the midpoints of income intervals as reported in the Micro-Census with the mid-points of the same intervals constructed on the basis of income values in the German Socio-Economic Panel data (for this database see Wagner, Frick and Schupp 2007). This comparison did not show any significant differences between the two sources. Therefore, we are confident that the income measures are sufficiently precise for our analysis.

Table 1: Income groups from the German Micro-Census

Income group	Income value, €	Income group	Income value, €
1	0-150	13	2,600-2,900
2	150-300	14	2,900-3,200
3	300-500	15	3,200-3,600
4	500-700	16	3,600-4,000
5	700-900	17	4,000-4,500
6	900-1,100	18	4,500-5,000
7	1,100-1,300	19	5,000-5,500
8	1,300-1,500	20	5,500-6,000
9	1,500-1,700	21	6,000-7,500
10	1,700-2,000	22	7,500-10,000
11	2,000-2,300	23	10,000-18,000
12	2,300-2,600	24	more than 18,000

We use two income measures. The first is an ordinal variable that assumes 24 values for the different income groups (Table 1). The second contains the hourly incomes that correspond to the midpoints of the income intervals divided by the number of working hours per month. Furthermore, a wide set of variables control for factors that may affect a personal income, such as age, gender, tenure, industry, nationality, marital status, children in the household, highest achieved level of formal education, regular number of working hours per week, and region of

[8] The question refers to the income in the month prior to the survey.

residence.[9] Table A1 in the Appendix provides descriptive statistics of variables used in the analysis.

Figures 1.1 and 1.2 show the distribution of the two income measures by employment status. The monthly incomes of the self-employed reveal two peaks that can be explained by different shapes of the underlying distribution functions for self-employed with and without employees (Figure 1.1). This observation suggests substantial differences in the income distribution of the solo self-employed and the self-employed with employees. The distribution of hourly incomes from self-employment and wage employment (Figure 1.2) is quite similar to the distribution found by Hamilton (2000). Distinguishing between solo self-employment and employers makes clear, that the income distribution of the solo self-employed is more skewed to the left than that of the self-employed with

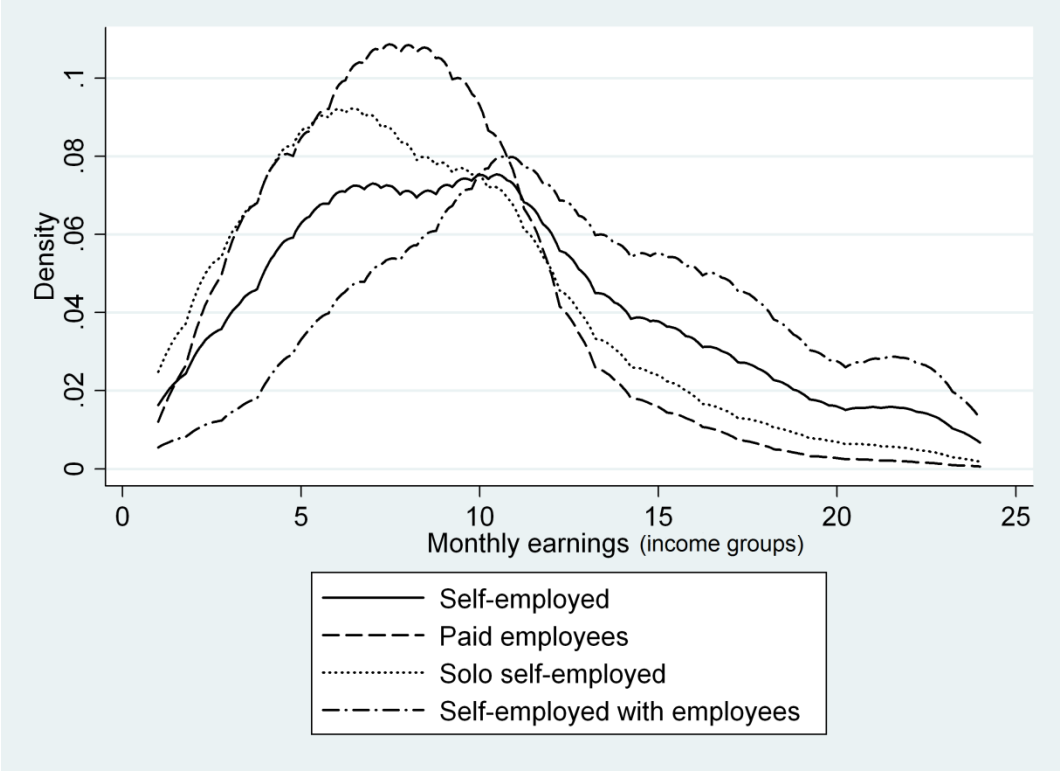

Figure 1.1: Distribution of monthly earnings by employment status

[9] Region is particularly relevant for the former East Germany, where wage differentials with West Germany persist (Smolny and Kirbach 2011).

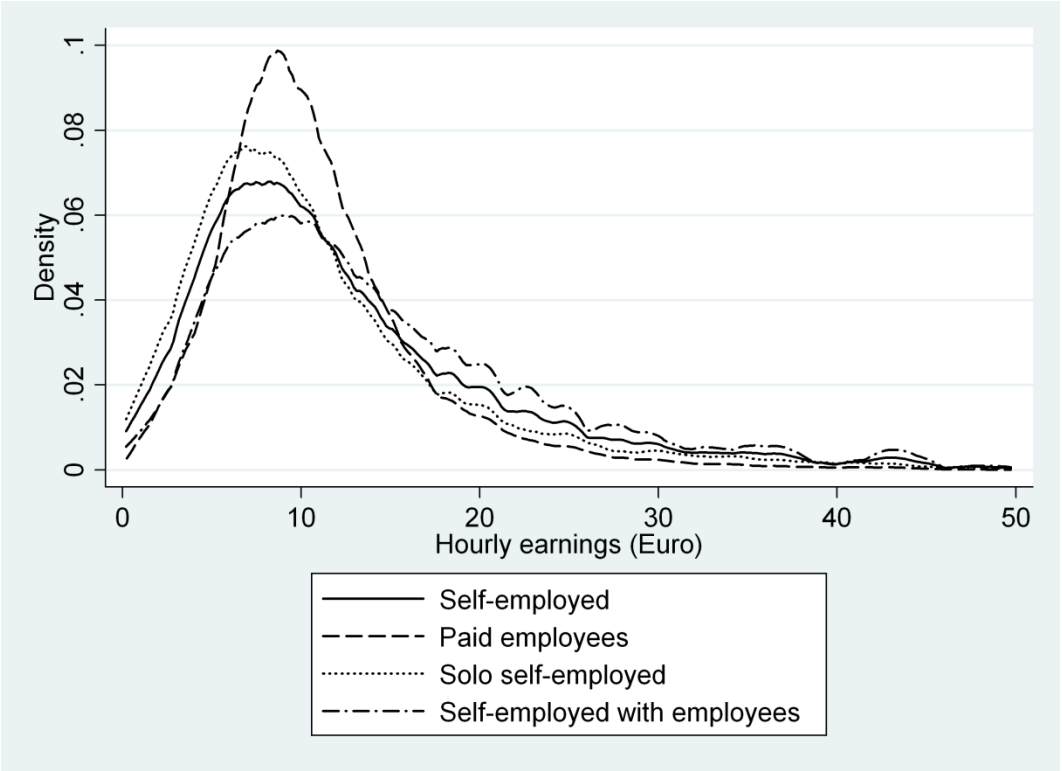

Figure 1.2: Distribution of hourly earnings by employment status

employees. And the monthly and hourly incomes of both types of self-employment are more dispersed than those of paid employees, partly due to higher shares of respondents in the upper percentiles of the distribution.

According to our data, the *mean* monthly income of self-employed persons is 1.58 times that of paid employees (Table 2). This difference is more pronounced for the self-employed with employees (2.17 times) than for solo entrepreneurs (1.11 times). The median monthly income of solo self-employed and paid employees is, however, exactly the same, while the median monthly income of employers is 1.75 times that of employees. The pattern is similar for hourly incomes. While the mean income per working hour of all self-employed is 1.35 times (about €4) that of paid employees, the median hourly income of solo entrepreneurs is 0.94 (€0.62) that of paid employees (Table 2) and the median hourly income of employers 1.22 times (€2.25). Similar to previous research (Åstebro and Chen 2014), the standard deviation of hourly incomes in self-employment

Table 2: Net monthly and hourly income by employment status, in €

	Paid employees	Self-employed	Solo self-employed	Self-employed with employees
	Monthly income*			
Mean value	1,534.16	2,424.44	1,703.99	3,337.73
Standard deviation	1,136.24	2,563.67	1,675.03	3,139.38
1st percentile	175	75	75	175
5th percentile	400	400	175	800
10th percentile	400	600	400	1,000
25th percentile	800	1,000	800	1,600
50th percentile	1,400	1,850	1,400	2,450
75th percentile	1,850	3,050	2,150	3,800
90th percentile	2,450	4,750	3,050	6,750
95th percentile	3,400	6,750	4,250	8,750
99th percentile	5,250	14,000	8,750	20,000
	Hourly income			
Mean value	11.51	15.59	14.28	17.25
Standard deviation	12.35	40.54	47.64	29.06
1st percentile	2.19	0.47	0.47	0.94
5th percentile	3.75	2.68	2.38	3.70
10th percentile	5	4.17	3.75	5
25th percentile	7.5	6.67	6.25	7.71
50th percentile	10	10.28	9.38	12.25
75th percentile	13.44	17	15	19.79
90th percentile	18.56	28.13	23.75	31.94
95th percentile	23.53	40	35	43.75
99th percentile	42.19	89.29	100	87.5
Number of observations	235,121	27,128	15,165	11,963

* The monthly income corresponds to the midpoints of income intervals, as reported in Table 1.

is about 3.3 times that of hourly wages in paid employment. The results suggest that the median solo entrepreneur is not compensated for the higher income risk, while the median self-employed with employees is.

Further differentiating between employment states, the self-employed with workers have higher monthly incomes than paid employees

from the 5th percentile on and higher hourly incomes from the 25th percentile on. So, a great majority of the self-employed with employees earn more than wage workers; the standard deviation of their hourly wages is however 2.3 times that for paid employees. In contrast, being a solo entrepreneur seems to pay only from the 75th percentile on. Remarkably, the standard deviation of hourly earnings of solo entrepreneurs is almost 4 times that for paid employees, and 1.6 times that for entrepreneurs with employees, indicating pronounced heterogeneity among the solo self-employed.

4. Determinants of incomes

Multivariate analysis estimates the relationship between employment and income using three different models (Table 3). The dependent variable in model I is monthly income. Given the categorical character of this variable, we apply ordered logit regression. The dependent variable in model II, estimated with OLS regression, is the natural logarithm of hourly income. To capture the skewness of the income distribution, we also perform quantile regressions at the 25th, 50th, and 75th percentiles (model III). The main variables of interest are the dummies (yes=1; no=0) for a person in paid employment (as reference category), solo self-employment, or self-employment with employees.

The results are quite similar across models (Table 3). Most important, the parameter estimates from models I and II indicate that the solo self-employed are less likely, but the self-employed with employees are more likely, to earn higher incomes than paid employees. There is an inverted u-shaped relationship between income and a person's age and between income and the number of years in the current job. Those with a tertiary degree tend to have the highest incomes, and those with a vocational degree have significantly higher incomes than those without such a degree. Males and those with children tend to receive higher incomes. There also are significant effects specific to industries and regions. Model III further reveals a significantly positive relationship between solo self-employment and hourly earnings at the 75th percentile.

And at the 25th percentile, both the solo self-employed and the self-employed with employees earn significantly less than paid employees.

Table 3: Parameter estimates from earnings regressions

	Model I	Model II	Model III		
	Ologit	OLS	25th percentile	50th percentile	75th percentile
Paid employee			Reference		
Solo self-employed	-0.743***	-0.177***	-0.315***	-0.127***	0.0362***
	-0.0236	(0.00709)	(0.00490)	(0.00410)	(0.00483)
Self-employed with employees	0.328***	0.0390***	-0.102***	0.0778***	0.224***
	(0.0269)	(0.00696)	(0.00549)	(0.00459)	(0.00541)
Age	0.214***	0.0567***	0.0619***	0.0496***	0.0400***
	(0.00244)	(0.000787)	(0.000746)	(0.000624)	(0.000735)
Age, squared	-0.00231***	-0.00056***	-0.00068***	-0.000529***	-0.000381***
	(3.01e-05)	(9.76e-06)	(9.03e-06)	(7.55e-06)	(8.90e-06)
Years in current job	0.0680***	0.00822***	0.0155***	0.0115***	0.00615***
	(0.00111)	(0.000327)	(0.000360)	(0.000301)	(0.000354)
Years in current job, squared	-0.000780***	-7.87e-05***	-0.00019***	-0.000124***	-4.65e-05***
	(3.06e-05)	(8.83e-06)	(1.02e-05)	(8.57e-06)	(1.01e-05)
School attendance without university-entrance qualification			Reference		
University-entrance qualification	0.638***	0.251***	0.0877***	0.151***	0.311***
	(0.0269)	(0.00899)	(0.00709)	(0.00593)	(0.00698)
Vocational degree	1.281***	0.317***	0.395***	0.293***	0.225***
	(0.0117)	(0.00375)	(0.00367)	(0.00307)	(0.00362)
Tertiary degree	2.926***	0.649***	0.711***	0.634***	0.595***
	(0.0159)	(0.00460)	(0.00450)	(0.00377)	(0.00444)
Married	-0.0458***	-0.00495**	0.0138***	0.0267***	0.0274***
	(0.00836)	(0.00246)	(0.00273)	(0.00228)	(0.00269)
Children in household (1=yes)	0.416***	0.133***	0.0878***	0.122***	0.162***
	(0.00857)	(0.00250)	(0.00270)	(0.00226)	(0.00266)
German	0.0371**	-0.00181	-3.72e-05	-0.00475	0.00818*
	(0.0145)	(0.00443)	(0.00451)	(0.00377)	(0.00444)
Male	0.949***	0.127***	0.154***	0.122***	0.0985***
	(0.00825)	(0.00227)	(0.00243)	(0.00203)	(0.00239)
Working hours per month	0.105***	-	-	-	-
	(0.000522)				
Industry dummies			Yes***		
Regional dummies			Yes***		
Number of observations	262,249	262,249	262,249	262,249	262,249
R-squared	-	0.286	0.2109	0.187	0.1753
Pseudo R2	0.161	-	-	-	-
Log Likelihood	-592,469	-	-	-	-
Chi2	149,320***	-	-	-	-
F statistic	-	2,559***	-	-	-

Note: The dependent variable in model I is an ordinal variable that consists of 24 income groups. The dependent variable in models II and III is the natural logarithm of hourly earnings defined as the midpoints of income intervals divided by the number of working hours per month. *** Statistically significant at the 1 percent level. ** Statistically significant at the 5 percent level. * Statistically significant at the 10 percent level.

The finding that the solo self-employed tend to earn less than paid employees may reflect different returns to ability or to education. To control for such an effect, we run the earnings regressions with interaction terms between a dummy variable indicating a respondent's status as solo self-employed and his or her highest level of formal education (Table 4). These interaction variables indicate differences in the return to education between paid employment and solo self-employment.

A crucial result is a highly significant positive interaction effect of solo self-employment on incomes among persons who have a university entrance diploma ("Abitur," which is similar to a high school diploma). This is the only group that achieves higher returns to formal education in solo self-employment than in paid employment. In contrast, the solo self-employed with a vocational or tertiary degree are likely to earn less than comparable paid employees. Moreover, the non-significance of the variable "solo self-employed" indicates that solo entrepreneurs who finished secondary education without having earned a university entrance diploma and without further professional qualification do not earn significantly different incomes from comparable paid employees. A possible explanation for the positive effect of employment status on the income of persons with a university entrance diploma is that formal education is an important determinant of earnings in paid employment and that people with only limited formal education have a good chance of earning higher incomes by becoming solo self-employed.

To account for heterogeneity of entrepreneurial incomes, we run the earnings regressions for further subgroups according to gender, economic sector, and region where the entrepreneur operates. The basic pattern of the results remains largely unchanged: the solo self-employed are less likely and the self-employed with employees are more likely to have higher incomes than paid employees. Differences are found only for marital status and nationality (Table A2 in the Appendix). Our basic finding holds for both males and females.

Table 4: Parameter estimates from earnings regressions by the level of education

	Model I	Model II
	Ordered logit	OLS
Solo self-employed * university entrance qualification	0.653***	0.207***
	(0.134)	(0.0450)
Solo self-employed * vocational degree	-0.698***	-0.202***
	(0.0949)	(0.0291)
Solo self-employed * tertiary degree	-1.399***	-0.318***
	(0.101)	(0.0306)
Solo self-employed	0.0477	0.0260
	(0.0903)	(0.0277)
Self-employed with employees	0.322***	0.0363***
	(0.0269)	(0.00695)
Paid employees	Reference	
School attendance without university-entrance qualification	Reference	
University entrance qualification	0.538***	0.218***
	(0.0271)	(0.00901)
Vocational degree	1.301***	0.324***
	(0.0117)	(0.00375)
Tertiary degree	3.008***	0.669***
	(0.0160)	(0.00454)
Age	0.212***	0.0557***
	(0.00244)	(0.000785)
Age, squared	-0.00228***	-0.000548***
	(3.01e-05)	(9.73e-06)
Years in current job	0.0684***	0.00826***
	(0.00111)	(0.000327)
Years in current job, squared	-0.000788***	-8.00e-05***
	(3.06e-05)	(8.83e-06)
Married	-0.0471***	-0.00525**
	(0.00837)	(0.00246)
Children in household (1=yes)	0.418***	0.134***
	(0.00857)	(0.00250)
German	0.0341**	-0.00223
	(0.0145)	(0.00443)
Male	0.946***	0.125***
	(0.00825)	(0.00226)
Working hours per month	0.105***	-
	(0.000523)	
Industry dummies	Yes***	Yes***
Regional dummies	Yes***	Yes***
Number of observations	262,249	262,249
R-squared	-	0.288
Log Likelihood	-592,019	-198212
Chi2	151,892***	-
Pseudo R2	0.162	-

Note: The dependent variable in Model I is a categorical variable which indicates 24 income groups; Dependent variable in Model II is logarithm of hourly earnings. Robust standard errors in parentheses. *** Statistically significant at the 1 percent level. ** Statistically significant at the 5 percent level. * Statistically significant at the 10 percent level.

To investigate whether less or more able individuals are likely to become entrepreneurs, wages from paid employment prior to starting up can be taken as proxy for a person's abilities (see Hamilton's 2000 approach). Regressing current employment status (solo self-employed vs. employer vs. paid employee) on the incomes from one year before in paid employment would reveal selection issues. The data for this analysis are from the most recent available Micro-Census Panel Data from 2001 through 2004 (see Section 3.1).

Multivariate analysis in Table 5 sheds light on the role of incomes from paid employment prior to starting up for the probability of making a transition to self-employment, conditional on other variables that may affect income. It is possible to infer from the estimated coefficients whether the employment status in period *t+1* is significantly associated with the wages from employment in period *t*. The results in Table 5 suggest that people who change from paid employment to either solo self-employment or self-employment with employees are more likely to have earned higher net incomes during their time in paid employment than those who remain in paid employment. This finding, in line with Hamilton (2000), indicates a positive selection of more able persons into self-employment.[10] So, we can reject the argument that low-wage workers start as solo entrepreneurs and high-wage workers become entrepreneurs with employees.

A closer look at the results of quantile regression (Model II) reveals a positive and weakly significant effect of a transition into solo self-employment in period *t+1* for the 50th percentile estimate and a highly significant effect for the 75th percentile estimate. The results show a similar pattern for those who turn to self-employment with employees: here the estimated effect is highly significant from the 50th percentile on. Thus, the analysis of the financial situation of entrepreneurs prior to starting up a business suggests that a transition from paid employment into self-employment is particularly likely for those who previously earned higher

[10] Astebro and Chen (2014) point, however, to the studies that also find a negative selection into self-employment.

Table 5: Selection into self-employment based on differentials in income from paid employment

	I	II		
	OLS	Quantile regression		
		25th percentile	50th percentile	75th percentile
Paid employee in t+1		Reference		
Solo self-employed in t+1	0.0800**	0.0137	0.0343*	0.140***
	(0.0391)	(0.0235)	(0.0205)	(0.0221)
Self-employed with employees in t+1	0.0992***	0.0132	0.0997***	0.274***
	(0.0384)	(0.0267)	(0.0233)	(0.0251)
Age	0.0694***	0.0737***	0.0545***	0.0410***
	(0.00232)	(0.00151)	(0.00130)	(0.00139)
Age, squared	-0.00069***	-0.00081***	-0.00058***	-0.00039***
	(2.84e-05)	(1.81e-05)	(1.57e-05)	(1.70e-05)
Male	0.285***	0.299***	0.232***	0.197***
	(0.00638)	(0.00443)	(0.00380)	(0.00409)
Married	-0.0275***	0.000653	0.0164***	0.0120**
	(0.00800)	(0.00540)	(0.00493)	(0.00557)
Children in household	0.0863***	0.0686***	0.0944***	0.136***
	(0.00589)	(0.00451)	(0.00393)	(0.00422)
German	0.00242	-0.0116	0.00361	0.0361***
	(0.0115)	(0.00876)	(0.00757)	(0.00814)
Years in current job	0.00509***	0.0136***	0.0106***	0.00656***
	(0.000838)	(0.000634)	(0.000564)	(0.000614)
Years in current job, squared	-0.000019	-0.00018***	-0.00012***	-0.00006***
	(2.32e-05)	(1.81e-05)	(1.63e-05)	(1.77e-05)
School attendance without university entrance qualification		Reference		
University entrance qualification	0.158***	-0.00413	0.0580***	0.187***
	(0.0282)	(0.0175)	(0.0153)	(0.0165)
Vocational degree	0.305***	0.341***	0.276***	0.220***
	(0.00961)	(0.00609)	(0.00558)	(0.00616)
Tertiary degree	0.667***	0.677***	0.655***	0.640***
	(0.0131)	(0.00865)	(0.00773)	(0.00847)
Industry dummies	Yes***	Yes***	Yes***	Yes***
Regional dummies	Yes***	Yes***	Yes***	Yes***
Year dummies	Yes***	Yes***	Yes***	Yes***
Number of observations	61,728	61,728	61,728	61,728
Pseudo R-squared		0.2231	0.2041	0.1907
F-statistic	443.76***			

Note: The dependent variable is the logarithm of hourly incomes in *t={2001,2002,2003}*. Standard errors (in parentheses) are clustered by individual in model I. *** Statistically significant at the 1 percent level. ** Statistically significant at the 5 percent level. * Statistically significant at the 10 percent level.

incomes in paid employment. The income from paid employment of future self-employed at lower percentiles is not significantly different from the income of people who remained in paid employment.

5. Under-reporting and over-reporting income

Both Åstebro and Chen (2014) and Sarada (2013) present evidence that the self-employed in the United States have a pronounced tendency to underreport their incomes. They argue that the common finding of self-employed persons earning less is reversed when accounting for this underreporting. Their evidence is based on the data for expenditures for food that is not available in the German Micro-Census. For this reason, it is not possible to test an underreporting bias in a comparable way. If such a bias were present, however, it would even strengthen our basic finding that many self-employed persons earn more than in paid employment.

One could also argue that entrepreneurial net earnings are overestimated in the data. The reason is that self-employed people in Germany are less subject to obligatory social insurance payments than paid employees.[11] If self-employed people who are not obliged to pay for social insurance tend not to have voluntary insurance—say, due to low incomes or less risk aversion—their reported net incomes may be not fully comparable to the net incomes of their paid employee counterparts.

We test whether differences in social insurance payments of the self-employed and the paid employees significantly affect the difference in their incomes using information about social insurance in the Micro-Census. We add to the earnings regression interaction terms between being self-employed (with or without employees) and the variable indicating whether social insurance is being paid.

[11] While employers discharge contributions to pension, unemployment, health and long-term care insurances for their employees, self-employed people in general have to pay compulsory contributions only for health and long-term care insurance but may voluntarily choose to pay contributions to other insurances. There are, however, several exceptions from this rule. Particularly, self-employed craftsmen, teachers, artists, writers, those in care services, medical doctors, tax consultants and several other occupational groups are subject to further compulsory social insurance.

Table A3 in the Appendix shows interaction effects between employment status (solo self-employed or employer) and a dummy variable that indicates whether a respondent pays for private social insurance or not (column I). Since it can be argued that self-employed with high incomes are more likely to pay for private social insurance than self-employed with lower incomes, we distinguish between private and obligatory pension insurance. In the latter case, the results should not be disturbed by a possible income-based selection bias (column II in appendix Table A3).

Obligatory insurance is paid for by 95.5 percent of paid employees, 16.6 percent of solo self-employed, and 10.8 percent of self-employed with employees. Private life insurance is paid for by about 38 percent of paid employees, 42.5 percent of solo self-employed, and 63 percent of self-employed with employees. The interaction effects between both types of self-employment and payments of private life insurance are statistically significant and positive. The solo self-employed with private life insurance tend to earn higher incomes than solo self-employed without such insurance, though both types of solo entrepreneurs on average earn lower incomes than their paid employee counterparts. Returns are similar whether solo entrepreneurs are subject to compulsory pension insurance or not. In both cases, they are lower than the returns to paid employment. Thus, over-reporting incomes from self-employment is unlikely to be an issue here.

6. Summary, conclusions, and further research

In this analysis, we address the entrepreneurial income puzzle: Why do many individuals remain in self-employment even though they could earn more if they would accept a job as paid employee? We have doubts about whether there really is such a puzzle. We can confirm the results of previous studies on returns from entrepreneurship, as summarized by Åstebro and Chen (2014). We observe that the median self-employed person in Germany does not earn significantly more per work-hour than the median wage worker, even while confronted with a much higher

variance in incomes. We also observe the same skewness in the distribution of incomes with superstar effects, thus very few self-employed have extremely high earnings. Moreover, self-employed persons on average work considerably longer hours than paid employees.

Such aggregate data suggest that entrepreneurship does not pay. But more disaggregated analysis provides important insights. The differences in returns from entrepreneurship are substantial for different types of self-employed. The median self-employed with employees earns 22 percent more per hour than the median wage worker, and compared with wage workers, the standard deviation in incomes is “only” 2.3 times larger. In contrast, the median solo entrepreneur earns a lower hourly income than the median wage worker, and the standard deviation of hourly earnings is almost 4 times larger. What might explain why solo entrepreneurs have higher standard deviations in incomes than self-employed with employees? One possibility is their higher income-risk; another is their greater heterogeneity.

How can these new results be incorporated into existing theories of entrepreneurship? First, they clearly point to the relevance of risk-related approaches to entrepreneurship. The fact that a transition into self-employment pays for the majority of self-employed, if they are not just solo self-employed but also employ other people, shows that this higher risk tolerance may be rewarded by higher incomes. We, further, see indirect confirmation of the approach of Holmes and Schmitz (1990), who emphasize that specific abilities increase the probability of success.

At least three groups of solo entrepreneurs deserve further attention. First are the superstars who earn high incomes. The mere finding that such superstars are among the solo entrepreneurs makes clear that solo self-employment is not just the choice for low-income individuals driven by the necessity to set up a business. Second are those with a university entrance qualification (‘Abitur’) who are better off when being their own boss than when employed. These two groups give rise to the question why do they have higher incomes than paid employees?

Third are solo entrepreneurs who gain less than they would probably earn if employed. Why do they remain in the market?

One reason for higher incomes among the first two groups of solo self-employed may be imperfections in the labor market. Salaried pay might be too rigid for these two groups. Strong orientation at the formal qualification may lead to low wage payments for those without further professional qualifications, and ceilings may limit wages for highly qualified employees. Other market-based explanations could be weak bargaining positions or an oversupply of workers lacking further professional qualification, or imperfect evaluation of their productivity. It may also be that some solo entrepreneurs can specialize more on their talents than would have been possible in paid employment (say, by providing special services), thus increasing both their productivity and income.

With regard to the question why some individuals, mostly solo entrepreneurs, remain in self-employment when they could earn more in paid employment, we should, first of all, be aware that our cross-sectional data provide only snapshots. Earlier analysis shows that up to 50 percent of all entrepreneurs exit self-employment within five years of having launched their business, and many of them return to wage employment exactly because they can earn higher incomes (Caliendo and Kritikos 2010). Some low-income entrepreneurs may thus give up their venture. And those who remain in solo self-employment and accept lower incomes might do so for various reasons. One explanation could be that they are not aware of their lower incomes because they compare monthly not hourly incomes. Or they may feel forced to remain self-employed due to a lack of alternatives in wage employment. Or they may deliberately remain self-employed because they prefer to be their own boss. As they are not hiring others in their business to earn higher incomes, non-monetary utility seems to be at play for solo entrepreneurs.

Our analysis points to several topics that should be analyzed in future research. First, we need to know more about the diverse types of entrepreneurs, their former careers, their skills and motivations, as well as

the businesses they are running.[12] Second, we need to gain a better understanding of what distinguishes entrepreneurs who hire employees from solo entrepreneurs. Third, we need better longitudinal data to go beyond just a snapshot of the incomes from entrepreneurship in one period. Such data could show how self-employed people react to lower incomes—if they switch to paid employment or if they remain in entrepreneurship. In particular, we should try to understand under what conditions individuals who earn less in self-employment than in wage employment remain in self-employment. Is it labor market rigidities, own preferences (and non-pecuniary utility from self-employment), or incomplete information about income alternatives that drive this occupational choice?

In sum: the common assertion that self-employed persons tend to earn less than paid employees does not hold true. Despite considerable heterogeneity, many but not all self-employed earn more. To what extent this positive gain can be sufficient to reward their entrepreneurial initiative and to compensate for bearing more risk remains open and needs to be addressed in future research. In this context, it should also be analyzed, why solo entrepreneurs have greater variance in income than self-employed with employees.

[12] Unfortunately, virtually all of the available longitudinal datasets such as the Panel Studies on Entrepreneurial Dynamics (PSED; see Davidsson and Gordon 2012; Reynolds and Curtin 2011) relate either to the founder or to businesses, but do not include information on both.

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Appendix

Table A1: Descriptive statistics for independent variables.

	Full sample		Paid employees		Self-employed		Self-employed without employees		Self-employed with employees	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Age	41.565	11.617	41.088	11.705	45.692	9.905	44.747	10.336	46.891	9.191
Years in current job	10.366	9.903	10.307	10.001	10.870	8.989	9.023	8.445	13.211	9.113
Without university-entrance qualification & without vocational degree	0.123	0.328	0.031	0.174	0.037	0.190	0.059	0.235	0.051	0.220
University-entrance qualification without further degree	0.032	0.175	0-131	0.337	0.056	0.229	0.052	0.221	0.019	0.138
Vocational degree	0.684	0.465	0.695	0.460	0.590	0.492	0.575	0.494	0.610	0.488
Tertiary degree	0.161	0.368	0.143	0.351	0.317	0.465	0.315	0.464	0.319	0.466
Married	0.563	0.496	0.555	0.497	0.632	0.482	0.561	0.496	0.722	0.448
Children in household	0.342	0.474	0.339	0.473	0.367	0.482	0.332	0.471	0.412	0.492
German	0.929	0.256	0.930	0.255	0.923	0.267	0.910	0.286	0.939	0.239
Male	0.528	0.499	0.513	0.500	0.662	0.473	0.597	0.491	0.745	0.436
Working hours per week	35.800	12.093	34.844	11.063	44.079	16.626	38.359	16.992	51.329	12.917
Number of observations	262,249		235,121		27,128		15,165		11,963	

Table A2: Parameter estimates from earnings regressions.

	East Germany	West Germany	Primary sector	Secondary sector	Tertiary sector	Males	Females
Paid employees				Reference			
Solo self-employed	-0.973***	-0.642***	-0.101	-0.999***	-0.671***	-0.571***	-0.655***
	(0.0450)	(0.0279)	(0.192)	(0.0541)	(0.0254)	(0.0313)	(0.0381)
Self-employed with employees	0.342***	0.359***	0.520**	0.00703	0.322***	0.651***	0.568***
	(0.0610)	(0.0301)	(0.202)	(0.0545)	(0.0304)	(0.0306)	(0.0604)
Vocational degree	1.742***	1.204***	1.190***	1.364***	1.266***	1.484***	1.078***
	(0.0361)	(0.0122)	(0.0880)	(0.0199)	(0.0149)	(0.0166)	(0.0163)
Tertiary degree	3.539***	2.835***	2.561***	3.592***	2.802***	3.384***	2.500***
	(0.0428)	(0.0174)	(0.167)	(0.0296)	(0.0194)	(0.0224)	(0.0234)
University entrance qualification	0.833***	0.601***	0.490*	0.428***	0.738***	0.638***	0.317***
	(0.0643)	(0.0293)	(0.288)	(0.0555)	(0.0303)	(0.0369)	(0.0386)
School attendance without university entrance qualification				Reference			
Age	0.185***	0.221***	0.199***	0.252***	0.200***	0.238***	0.247***
	(0.00538)	(0.00275)	(0.0180)	(0.00439)	(0.00308)	(0.00334)	(0.00360)
Age, squared	-0.00214***	-0.00234***	-0.00215***	-0.00279***	-0.00214***	-0.00264***	-0.00269***
	(6.56e-05)	(3.39e-05)	(0.000224)	(5.43e-05)	(3.81e-05)	(4.11e-05)	(4.44e-05)
Years in current job	0.0909***	0.0638***	0.0691***	0.0706***	0.0671***	0.0777***	0.0597***
	(0.00243)	(0.00126)	(0.00870)	(0.00198)	(0.00145)	(0.00153)	(0.00165)
Years in current job, squared	-0.00116***	-0.000746***	-0.00132***	-0.000703***	-0.000694***	-0.00103***	-0.00062***
	(6.75e-05)	(3.45e-05)	(0.000242)	(5.27e-05)	(4.21e-05)	(4.12e-05)	(4.77e-05)
Married	-0.0474***	-0.0153	0.291***	0.330***	-0.248***	0.775***	-0.838***
	(0.0177)	(0.00968)	(0.0691)	(0.0159)	(0.0104)	(0.0126)	(0.0123)
Children in household (1=yes)	0.446***	0.409***	0.267***	0.402***	0.380***	0.440***	0.187***
	(0.0193)	(0.00960)	(0.0712)	(0.0154)	(0.0108)	(0.0118)	(0.0130)
German	0.0679	0.0615***	-0.553***	-0.0134	0.145***	0.141***	0.0512**
	(0.0583)	(0.0149)	(0.136)	(0.0247)	(0.0182)	(0.0198)	(0.0221)
Male	0.514***	1.077***	0.969***	1.184***	0.806***	-	-
	(0.0170)	(0.00964)	(0.0697)	(0.0169)	(0.00973)		
Working hours per month	0.0786***	0.108***	0.0802***	0.112***	0.0984***	0.0692***	0.113***
	(0.00112)	(0.000588)	(0.00426)	(0.00120)	(0.000583)	(0.000805)	(0.000710)
Industriy dummies				Yes***			
Regional dummies				Yes***			
Number of observations	55,872	206,377	3,745	82,586	162,733	138,477	123,772
Log Likelihood	-120,004	-468,705	-7,960	-185,507	-370,694	-321,262	-259,980
Chi2	27,077***	120,250***	1,692***	48,450***	85,080***	82,192***	61,241***
Pseudo R2	0.133	0.167	0.131	0.157	0.152	0.150	0.150

Notes: Results of ordered logit regression. Dependent variable is an interval variable, which represents 24 income groups. Robust standard errors in parentheses. *** statistically significant at the 1 percent level; ** statistically significant at the 5 percent level. Industry dummies are based on *Klassifikation der Wirtschaftszweige* (2008).

Table A3: Earnings regressions with controls for overestimation of entrepreneurial incomes

	I	II
Main effects:		
Paid employee	Reference	
Solo self-employed	-0.754*** (0.0348)	-1.050*** (0.0362)
Self-employed with employees	0.149*** (0.0530)	0.0362 (0.0381)
Obligatory pension insurance (1=yes, 0=no)	-	-0.365*** (0.0255)
Private life insurance (including private pension insurance) (1=yes, 0=no)	0.408*** (0.008)	-
Interaction effects:		
Solo self-employed with obligatory pension insurance	-	0.231*** (0.0667)
Self-employed with employees with obligatory pension insurance	-	-0.0967 (0.0850)
Solo self-employed with private life insurance	0.168*** (0.0516)	-
Self-employed with employees with private life insurance	0.257*** (0.0626)	-
Control variables	Yes***	Yes***
Number of observations	216,521	262,239
Log Likelihood	-485,513	-592,623
Chi2	126,471***	147,509***
Pseudo R2	0.166	0.161

Notes: Dependent variable is 24 income groups. Results of ordered logit regression with robust standard errors (in parentheses). Control variables are age, age squared, years at current job and its squared value, educational level, marital status, children in household, nationality, gender, number of working hours per week, regional dummies, industrial sector dummies. The number of observations in model I is lower than in model II because responses to the question about private insurances are not obligatory in the Micro-Census. *** statistically significant at the 1 percent level; ** statistically significant at the 5 percent level; * statistically significant at the 10 percent level.