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HEALTH AND SELF-EMPLOYMENT
IS THERE A DIFFERENCE IN HEALTH PROFILE BETWEEN FULLY SELF-EMPLOYED INDIVIDUALS AND WAGEWORKERS?

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Abstract

More and more people are becoming self-employed, yet little is known about the relation between health and self-employment. This thesis looks whether there is a difference in health profile between self-employed people and wageworkers. A general model for the effects of job type on health is the job demand control model (Karasek, 1979; Karasek and Theorell, 1990; Theorell and Karasek, 1996). Research has been done on the health implications of being self-employed, however this research was not able to draw a clear conclusion. By analyzing data from the panel study of income dynamics (PSID) this thesis aims to contribute to the knowledge of the relation between self-employment and health. The main results are that (i) self-employed individuals are more likely to have suffered or do still suffer from hypertension and cancer compared to wageworkers, (ii) the self-reported health of self-employed individuals is worse than the self-reported health of wageworkers, and (iii) self-employed individuals are less likely to have arthritis, asthma, and diabetes. Finally, (iv) evidence is found for a relation between self-employment and having a health condition in general.

TABLE OF CONTENTS

1. Introduction

According to the Bureau of Labor Statistics, about 14.7 million US workers were self-employed in 2013. This group consisted of about 5.3 million incorporated self-employed and about 9.4 million unincorporated self-employed[1]. Incorporated self-employed people work for themselves in corporate entities. Unincorporated self-employed people work for themselves in other legal entities.

In the European Union, the European Commission is trying to create a good environment for entrepreneurs with the 'Entrepreneurship 2020 Action Plan'[2]. In Europe, just over a third (37%) of the workers prefer to be self-employed. In the USA and China more than 50% feel that way (Citizens summary, European commission: entrepreneurship 2020 action plan, 2012).

In general, entrepreneurship is assumed to have a positive effect on the economy. Schumpeter (1934) first suggested this positive effect of entrepreneurship. It stated that entrepreneurs are the main cause of economic development. The explanation is that entrepreneurs are entering the market with innovations that are driving the current products out of the market. This process, called creative destruction, according to Schumpeter leads to economic development.

Similarly, Carree and Thurik (2003) and Wennekers and Thurik (1999) suggest that entrepreneurship has an impact on economic performance by the introduction of innovation, by enhancing rivalry, and by creating competition. Entrepreneurship also leads to job creation through the formation of new firms. Moreover, there are studies that show that entrepreneurship leads to job creation in different countries (Birch, 1979; Birch, 1987; Baldwin and Picot, 1995; Davidsson et al., 1998). Van Stel et al. (2010) discusses a possible U-shaped relation between economic development and the level of business ownership. However, they say that it is too early to draw clear conclusions about this relationship. However, the paper of Van Stel et al. (2010) suggests that in the future this relationship may be the trend. This could mean that it will become more pronounced over time.

In light of the economic relevance of entrepreneurship, it is important to understand the causes, characteristics, and consequences of this type of labor. There is empirical evidence that suggests

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[1] http://www.bls.gov/webapps/legacy/cpsatab9.htm (Visited May 2014)
[2] http://ec.europa.eu/enterprise/policies/sme/entrepreneurship-2020/index_en.htm (Visited July 2014)

Master Thesis Eva van Buuren Entrepreneurship and Strategy Economics

that entrepreneurs are more risk prone compared to managers (Stewart and Roth, 2001; Stewart and Roth, 2004). Zhao et al. (2010) found that entrepreneurial intention has a positive association with risk propensity. Both result show that there is a difference in risk attitude between entrepreneurs and people with the same function as a wageworker.

In addition, there is research on the personality traits of the entrepreneurs. A model used for research on personality traits is the big five model. This model looks at following five core personality dimensions: extraversion, neuroticism, agreeableness, conscientiousness and openness to experience. Extraversion is associated with traits such as being sociable, gregarious, assertive, talkative, and active. Neuroticism is associated with traits as being anxious, depressed, angry, embarrassed, emotional, worried and insecure. Traits that are associated with agreeableness are being courteous, flexible, trusting, good-natured, cooperative, forgiving, softhearted, and tolerant. Conscientiousness "*describes socially prescribed impulse control that facilitates task- and goal-directed behavior, such as thinking before acting, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks*". (John et al 2008, p.138). Openness to experiences. Traits associated with this dimension are being imaginative, cultured, curious, original, broad-minded, intelligent, and artistically sensitive (Barrick and Mount, 1991). Brandstatter (2011) looks at five meta-analyses investigating the personality of entrepreneurs. The article is a summary of the main result of the different studies. For the dimension of extraversion, the studies indicate that entrepreneurs are somewhat more extravert than managers. For the dimension of Neuroticism, they report that entrepreneurs score lower on average than managers, meaning that they are less neurotic on average. Looking at agreeableness, entrepreneurs have lower scores in this dimension than managers. Conscientiousness is reported as a dimension in which entrepreneurs score higher than managers do. For the last dimension, openness to experience, entrepreneurs have a higher score compared to managers. The main findings of this article are in line with the findings of Zhao and Seibert (2006) which is also involved in the article of Brandstatter (2011)

These findings imply that there is a difference in personality between entrepreneurs and non-entrepreneurs (mainly managers in the same function). These personality differences could lead to differences in behavior, resulting in health differences. Assuming that health can have an effect on the productivity and efficiency of the entrepreneur, and given the aforementioned importance of

entrepreneurship for the economy, the health of entrepreneurs can affect the economy. However, the precise relation between self-employment and health is still unclear. Therefore, this thesis aims to investigate differences in the health of wageworkers and that of entrepreneurs.

One of the leading models for job characteristics and health implications is the job demand control and demand model (Karasek, 1979; Karasek and Theorell, 1990; Theorell and Karasek, 1996). However, this model focuses only on the different situations that occur in work situations and not on the different types of occupation. Stephan and Roesler (2010), Baron et al. (2013), Buttner (1992), Jamal (1997) and Dahl et al. (2010) conducted research based on this model on the health implications of being self-employed. This model can be used to assess the effects of job types on health, which these authors then used to assess the effect of self-employment on health. In these studies, it was assumed that being self-employed belongs to a category of high job control and high job demand. According to the model job control and demand have an effect on the health. This effect is different for different types of health conditions. This means that for some conditions certain job control and demand level decreases the probability and for other conditions it increases the probability of suffering. However, in the literature contradicting results are found. In light of the ambiguous results about the relation between self-employment and health, additional research can help to improve the understanding of [the relation between self-employment and health]. This paper aims to answer the following research question:

Is there a difference in health profile between fully self-employed people and wageworkers?

In light of the available data, this study answers this main question using the following three sub questions:

1. Is there a relation between self-employment and specific health conditions?
2. Is there a relation between self-employment and mental health?
3. Is there a relation between self-employment and self-reported health?

To answer these questions, first a review of the literature on self-employment and its relation with health is provided. Following this, data from the public use dataset of the Panel Study of Income Dynamics (PSID), is analyzed.

The use of this dataset has several advantages. The first advantage is that it is a large panel study within the United States. It is an advantage because there is a relative high self-employment rate in this country. The high rate of self-employment leads to much variation in the explanatory variable, yielding more accurate regression estimates. In addition, compared to other datasets, the selection procedure of the subjects is not focused on one specific age group. The PSID selects families in the United States with different compositions, whereas, for example, the health and retirement study (HRS) selects mostly people above 50, which can have strong effects on the results, especially when looking at health and employment.

In the PSID families in the United States are interviewed about a wide range a subjects. This panel started in 1968 and the last available wave is from 2011. There is an interval of 2 years between the interviews. New data continues to be collected. Table 1.1 shows the conditions related to physical health, which are reported in these data. In addition, there are variables for self-reported health, mental well-being, and having a health condition.

Table 1.1: List of conditions that are reported in the survey of the PSID.

Ever had	Having
A stroke	A heart disease
A heart attack	Asthma
Cancer / having cancer	A lung disease
	Diabetes
	Arthritis
	Memory loss
	Hypertension
	Psychological problems
	Any other chronic condition

In this study, the probability of suffering from different physical and mental conditions, as well as grouped conditions, for self-employed individuals and wageworkers will be examined. The first part of the empirical study is a cross-sectional analysis with data from the last available wave when the writing of this thesis started, collected in 2011. For this analysis, logit models are estimated. The second part is a panel data analysis with data from 1999 to 2011, with a two-year period between data collections, leading to seven waves available for analysis. Data before 1999 is not used, since individual conditions have only been reported from 1999 onwards. For this part of the analysis, the fixed effect and random effect estimators for logit models are used. The Hausman test

is used to assess whether the fixed effects estimator is more appropriate than the random effects estimator in the panel data analysis.

The remainder of this thesis is organized as follows. In Section 2, there is a literature review that gives an overview of the existing literature about the relation between health and self-employment. Section 3 discusses the empirical approach that is used to assess whether there is a difference in health profile between fully self-employed people and wageworkers. Section 4 discusses the results of the analysis with data from the PSID. The fifth and final section concludes and discusses the results of this thesis.

2. Literature review

Job characteristics and health

Job demand control model (JDCM)

One of the leading models related to job characteristics and health is the job demand control model (Karasek, 1979; Karasek and Theorell, 1990; Theorell and Karasek, 1996). This model builds on two main dimensions: job control and job demand. Job control reflects the amount of control a person has in carrying out his or her job. This means the extent to which the person has authority to make decisions about when and how to perform task and how to develop their skills. Skill discretion and decision authority are the two main components of the job control dimension. In case of a high job control the person has a high decision authority about performing the tasks. The second dimension, job demand, refers to the work intensity the person experiences. Jackson and Palmer Rose (1998) define work intensity as activity in relation to the capacity for that work. This job demand is mainly the time pressure and role conflict the person experiences. In general job demand is negatively associated with health, whereas job control is positively correlated with health.

Figure 2 shows an overview of the job types that can result from the different combinations of job demand and job control (job decision latitude). According to the job demand control model entrepreneurs are in the left down corner with high job control and high job demand. This means that they are in the "active" job situation.

Figure 2: An overview of the job types in the model (Karasek and Theorell, 1990)
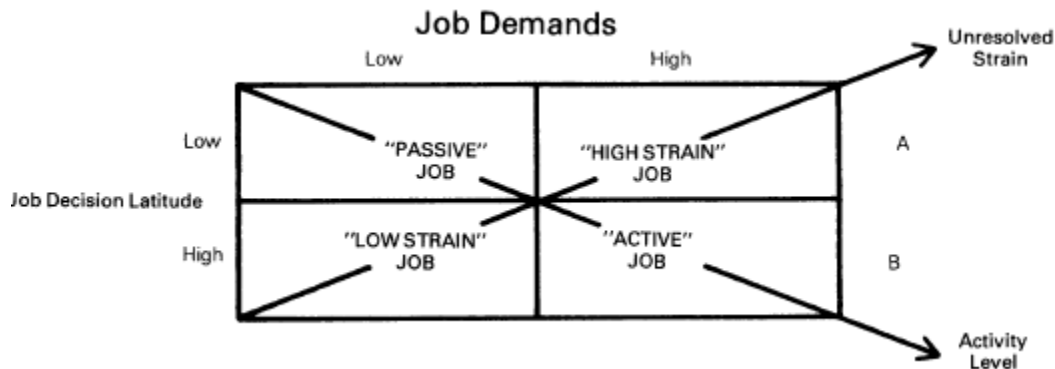
Based on this model two main hypotheses about the effect of the job demand and control on health can be stated. Multiple papers explored two hypotheses stemming from the JCDM. The first hypothesis, the high-strain hypothesis, is a combination of high job demands and a low level of job control. This hypothesis states that this combination leads to psychological strain and ill health (Karasek, 1979; Karasek and Theorell, 1990; Theorell and Karasek, 1996). In an empirical review of literature about the JCDM van der Doef and Maes (1999) finds that half of the studies confirm this hypothesis and the other half show non-significant results. They suggest that the main difference between the studies is in the design. In general, the supportive studies used more male or mixed samples and the non-supportive studies had a female sample.

The second hypothesis, the active-job hypothesis, refers to a situation with high job control and high job demands. This active job hypothesis situation is typical for an entrepreneur. This because a high job demand means that the person has a high a level of control in carrying out his or her job and in the case of an entrepreneur he or she is the only one that controls this because there is no other person that is the boss of the entrepreneur. For entrepreneurs the high job demand is because they have to do most or all of the work themselves this can lead to time pressure on role conflict which is typical for a high job demand. According to the theory, this situation should have a positive impact on the health of a person. This impact of the situation is by challenging him/her by the development of active patterns, and increased feelings of mastery, which prevent future perceptions of strain, as the job incumbent feels able to effectively cope with the causes of the perceived strain (Karasek and Theorell, 1990; Theorell and Karasek, 1996; Holman and Wall,

2002). For this hypothesis there is evidence that this situation has a positive impact on health (Van der Doef and Maes, 1999). It suggests that the health of entrepreneurs should be better compared to wageworkers, which are usually not in the active-job hypothesis (Van der Doef and Maes, 1999).

Health of the entrepreneurs compared to the wageworkers

Stephan and Roesler (2010) states different hypotheses about the health of entrepreneurs compared to the health of employees. These hypotheses are based on a model combining the JDCM and the allostatic-load model. The authors define the allostatic-load as follows: "the cost of chronic exposure to fluctuating or heightened neural or neuroendocrine responses" (McEwen & Stellar, 1993, p. 2093). They state that over time the behavioral and physiological responses to stress lead to wear and tear on organ systems and tissues, which leads to somatic diseases as well as mental disorder and cardiovascular diseases (i.e. hypertension, coronary heart disease, myocardial infarction, heart attack, and stroke), diabetes, ulceration of the gastrointestinal tract as well as diseases related to stress-related changes in the immune system, such as rheumatoid arthritis (McEwen, 2000 ; McEwen, 2005; McEwen & Stellar, 1993). The authors assume that entrepreneurs are in a situation with high job control and high job demand in the JDCM (Karasek, 1979; Karasek & Theorell, 1990; Theorell & Karasek, 1996). To test the hypotheses, Stephan and Roesler (2010) used a national representative sample derived from German National Health Survey 1998 (GHS; Public Use File BGS98, Stolzenburg, 2000). Looking at specific conditions the allostatic load model (McEwen, 1998; McEwen & Stellar, 1993) is used as a framework to explain how chronic stress influences health and how some specific diseases are stress related. This model assumes that the perception of stress, caused by work situations leads to physiological and behavioral responses. When there is no sufficient time to recover, a state of allostatic load can occur.

Stephan and Roesler (2010) base the first set of hypotheses on the assumption that entrepreneurs in general have high job control and an active job situation. Due to this fact they expect entrepreneurs to have a lower rate of stress related diseases. The first result is that entrepreneurs have a lower blood pressure compared to employees. An additional result is that entrepreneurs are expected to have lower prevalence rates of stress-related somatic diseases than employees.

According to the model job control has a positive effect on the mental health and well-being. Based on this positive effect the authors argue that entrepreneurs will suffer less from mental disorders.

Thus, entrepreneurs are expected to have lower prevalence rates of stress-related mental disorders than employees. In addition, entrepreneurs are expected to report higher well-being (life satisfaction) than employees do.

Baron et al. (2013) conducted research on the role of stress in entrepreneurship. Their study provides insight into the different processes and mechanisms of entrepreneurs to survive the stress, situations and conditions that could undermine the health. They use the Attraction-Selection-Attrition (ASA) theory as basis of their study. This theory says that primarily people that can handle the situation of entrepreneurship will get into it. In their research they find that entrepreneurs report levels of stress equivalent to or lower than those reported by persons in other occupations or careers. Looking at the relation between psychological capital and stress they find that the entrepreneurs' level of psychological capital is negatively associated with their reported level of stress. They found a positive association between psychological capital and subjective well-being, which is partly mediated by stress. Looking at the level of stress and the subjective well-being, they find a negative association between the two. They also find an indirect relationship between entrepreneurs' psychological capital and their level of subjective well-being. This indirect relationship is mediated by stress. Their study finds that age moderates this relationship, such that the relation between psychological capital and well-being is stronger for older entrepreneurs than for younger entrepreneurs. In addition, Rietveld et al. (2013) found that more healthy people are more likely to select into self-employment.

Other studies show that self-employed individuals are more likely to get health conditions. A study of Buttner (1992) shows a difference in entrepreneurial and managerial stress and found that entrepreneurs report a higher level of stress compared to managers. This stress could have an effect on the health status. However, the limited sample size of this study makes it difficult to draw strong conclusions. Jamal (1997) uses a Canadian sample and finds that self-employed experienced higher job stress, non-work satisfaction, and psychosomatic health problems. Another finding is that there is no significant difference found between self-employed and non-self-employed in job satisfaction and mental health. The finding of Lewin-Epstein and Yuchtman-Yaar (1991) is that self-employed face higher levels of behavioral and physiological risk factors compared to wageworkers. However, an opposite result for physician and disability days was found. Parslow et al. (2004) state that self-employment does not have health benefits for males. Looking at

females, it was discovered that they reported a worse physical health compared to their employed counterparts. Finally, no direct association between mental health and self-employment was found.

Yoon and Bernell (2013) find that self-employment is positively associated with perceived physical health and negatively associated with having diabetes, high blood pressure, high cholesterol, and arthritis. This finding implies that self- employed individuals are more likely to have a better-perceived physical health and that they have a lower change of having diabetes, high blood pressure, high cholesterol, and arthritis. For mental health, they find that no mental health outcome is significantly associated with self-employment.

To summarize, there is literature that shows evidence for a lower rate of stress related disease in the case of self-employment. (Stephan and Roesler, 2010; Yoon and Bernell, 2013). However other studies show that self-employed people tend to have a higher stress level which can be related to possible health issues (Buttner, 1992; Jamal, 1997). Parslow et al. (2004) finds that self-employment does not have health benefits for males. Looking at females, they find that they reported a worse physical health compared to their employed counterparts. Since the literature shows conflicting findings about the effect the following hypothesis is stated:

Hypothesis 1: There is a difference in stress-related-disease rates for self-employed individuals compared to wageworkers (e.g., hypertension, heart disease, heart attack, diabetes, rheumatoid arthritis and stroke)

Dahl et al., (2010) use a Danish sample of people one year after they entered into entrepreneurship to show that there is a significant positive connection between entering entrepreneurship and receiving psychotropics. These medicines change the brain function. This result implies the presence of a relation between mental well-being and entering entrepreneurship, which is associated with increased stress.

Bogan, Fertig, and Just (2014) finds that for men and women there is an increase in probability of pursuing self-employment in an unincorporated business when they face moderate psychological distress, defined as a level of distress with a score between 5 and 12 at the K6-Non-specific psychological distress scale. For males moderate stress also decreases the probability of being self-employed in an incorporated business. Overall, the result suggests that the relation between moderate mental health issues and self-employment may be explained by a push mechanism. This

mechanism means that due to mental health issues, it is more difficult to focus on opportunities and therefore they earn a lower wage as a wageworker, implying that there are lower opportunity cost for being self-employed.

Linking self-employment to job satisfaction Bradley and Roberts (2004) finds that self-employed have a higher job satisfaction. However, a big part of this relation is moderated by personality characteristics that are more likely to be associated with the self-employment sample. In this study Bradley and Roberts discus that this results of the study are consistent with the following ideas: *"(1) Depressed persons report lower levels of job satisfaction as compared to others; (2) Self-employed persons are less likely than others to be depressed; and (3) Lower levels of depression among the self-employed explain a portion of the observed positive association between job satisfaction and self-employment. Similarly, these findings suggest support for the argument that (1) persons reporting relatively high levels of self-efficacy generally are more satisfied with their jobs than are others; that (2) the self-employed typically report higher levels of self-efficacy than do others; and that (3) a portion of the relationship between job satisfaction and self-employment may be explained by relatively high self-efficacy among the self-employed*." These results suggest that there is a difference in the mental well-being profile for the people that make the transition into self-employment compared to the people that are staying their current wage job.

Gielnik et al., (2012) states that people with a bad mental health have less focus on opportunities and are therefore more likely to choose for a regular wage job. Their study suggests that self-employed can uphold high levels of business growth by maintaining a focus on opportunities. They also find that that the mental health has a negative indirect effect on the focus on opportunities.

Dahl et al., (2010) finds that a significant positive connection exists between entering entrepreneurship and receiving psychotropics. However Gielnik et al., (2012) states that people with a bad mental health have less focus on opportunities and are therefore more likely to choose for a regular wage job, which implies that people in self-employment have a better mental well-being. Jamal (1997) finds no relationship between being self-employed and not being self-employed in the area of mental health. Due to this contradicting results the following hypothesis is stated.

Hypothesis 2: Being self-employed is associated with the mental well-being

Selection into self-employment

In the literature, evidence is found that the attraction of a person towards self-employment is for an important part depended on the overall health profile of a person. This overall health profile is discussed in this section. In the literature, there are different theories about the directions of a relationship between (specific) health conditions and the selection into self-employment.

Looking at the decision of becoming self-employed, different characteristics play a role and these characteristics also can have an effect on the health. One of the most obvious factors is age. Parker (2009) finds an inverse U-shape relation between the amount of startups and the age and the decision of starting a business. An explanation for this are different factors related to health. For the peak at older age the increased likelihood of bad health is a possible explanation. Due to the fact that people with bad health are forced to leave the workforce and are therefore more likely to enter self-employment. Bound et al. (1991) find that health is a very important factor for the behavior of older men and women in the labor force. When people have a bad health they are more likely to switch jobs. Walker et al. (2007) finds that self-employment is a reactive rather than proactive response for older men and women. This is also related to the reason that self-employment for older people is a type of partial retirement. Zissimopoulos and Karoly (2007) finds peaks of self-employment for men and women around the age of 65 and 66. Evidence from the health and retirement study shows that self-employed workers are more likely to make the transition to part-time work – perhaps as a bridge to retirement – than wageworkers. Looking at education, Blanchflower (2000) finds that people with lowest level of education have the highest probability of becoming self-employed. However, there is also evidence for the fact that the highly educated have a higher probability for becoming self-employed, which can lead to a difference in health profile.

An argument in favor of the selection into self-employment is the finding from Zissimopoulos and Karoly (2007). Using the health and retirement study they find that having a health limitation is a pull factor into self-employment. A possible explanation is that there is discrimination in the job-selection procedure in terms of health, thereby forcing people with a bad health into self-employment (Verheul et al., 2010). However, there is evidence that having a health limitation is

not associated with self-employment. (Evans and Leighton, 1989; Van Praag and Van Ophem, 1995).

Looking at the transition into self-employment, Fuchs (1982) shows that good health is a predictor for continuing work at older ages among males. Evans and Leighton (1989), and Van Praag and Van Ophem (1995) show that having a health limitation is not associated with the choice for self-employment.

Summarizing the literature it show that there is a difference in rate for stress related diseases (Buttner, 1992 ; Jamal, 1997 ; Parslow et al. , 2004 ; Stephan and Roesler, 2010 ; Yoon and Bernell 2013). Also evidence is found for a different in level of mental wellbeing (Gielnik etl al., 2012; Jamal, 1997). In the final section of this review there is evidence that health has an effect when making the transition into self-employment (Evans and Leighton, 1989; Van Praag and Van Ophem, 1995; Walker et al., 2007; Zissimopoulos and Karoly , 2007). Based on the literature reviewed the following hypothesis is formulated:

Hypothesis 3: There is a difference in health profile between self-employed people and wageworkers

3. Methodology

Data

The data that is used in the analysis is from the Panel Study of Income Dynamics (PSID), public use dataset, produced and distributed by the Institute for Social Research, Survey Research Center, University of Michigan, Ann Arbor, Michigan (2014). In this study families in the United States are interviewed about a wide range of subjects. The panel study started in 1968 and the last available wave is from 2011at the outset of this thesis. New data continues to be collected.

The data that is used is data from the head of the family. This selection is because the head has the most available data. The PSID defines the head as follows:

"Within each wave of data, each FU (family unit) has one and only one current Head. Originally, if the family contained a husband-wife pair, the husband was arbitrarily designated the Head to conform with Census Bureau definitions in effect at the time the study began. The person

designated as Head may change over time as a result of other changes affecting the family. When a new Head must be chosen (see conditions for selecting a new Head below), the following rules apply: The Head of the FU must be at least 16 years old and the person with the most financial responsibility for the FU. If this person is female and she has a husband in the FU, then he is designated as Head. If she has a boyfriend with whom she has been living for at least one year, then he is Head. However, if the husband or boyfriend is incapacitated and unable to fulfill the functions of Head, then the FU will have a female Head."[3]

Due to this definition the male is the head of the family in most of the cases. For the individual health conditions from 1999 and onwards information is collected. Therefore, data from 1999 until the latest available wave (2011) is used. Between each wave there is a two-year period, yielding a total of seven waves. The subjects in the panel are identified by using a combination of the '1968 interview number' and the '1968 person number', which is unique for each individual. In some families the family head changes over time. However, the combination of those identifiers did not change. Therefore, when the head in the family changed a new identifier is generated, in order to ensure that there is a unique identifier for each individual.

In addition to attrition of the sample due to families dropping out, further attrition occurs when individuals seize being the head of the household. Consequently, for a considerable number of individuals data is only available in a limited number of waves. Table 1.2 shows the most recurring patterns of individual data-availability over the waves. From this table it can been seen that the most commonly occurring patterns include the last wave. Therefore, in the cross-sectional analysis data from the year 2011 is used. The explanation for the high amount of other patterns is that 22,058 (48.1%) families got a new head within the study. The individual-level data consist of 45,906 individuals, of which 7,743 subjects have observations in all seven waves.

Variables

In all the models, the main outcome variable is whether the respondent is self-employed or a wageworker. The explanatory variables in the models are the different conditions, such as mental health, and there is one condition for having a health condition. All variables, except for age and years of education, are dummy variables.

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[3] Website PSID guide, FAQ, http://psidonline.isr.umich.edu/Guide/FAQ.aspx?Type=5#130 (visited November 2013)

Table 1.2: Distribution of the individuals in the PSID over different patterns of availability across waves.

Data available in waves	Number of individuals in the category	Percent	Cum.
1-7	7,743	16.87	16
7	4,609	10.04	26.91
6-7	3,565	7.77	34.67
1	3,205	6.98	41.65
5-7	2,385	5.20	46.85
1-2	2,291	4.99	51.84
4-7	1,977	4.31	56.15
1-3	1,792	3.90	60.15
3-7	1,609	3.50	63.56
Other patterns	16,730	36.44	100.00
Total	45,906	100	

Self-employment

Individuals who indicate that they earn their income through self-employment only, are regarded as self-employed. Conversely, individuals who state that their income stems from wage work only, are regarded as wageworkers. Individuals for whom the income is a mixture of wage work and self-employment are discarded, since it is not possible to extricate the relative income share of the two employment types. Finally, unemployed individuals are not considered in this study.

Health conditions

Based on the reported conditions in the questionnaire, a list of health conditions is constructed. The following question is asked to the respondent to determine whether the respondent has (had) one or more conditions from a list of conditions: "*Has a doctor ever told you that you have or had any of the following (conditions)?*" Respondents answer this question for the twelve conditions that are listed in Table 1.1. For each condition a binary variable is constructed. These binary outcomes are the explanatory variables' in the models. In addition, a variable, indicating whether someone has (had) at least one of the conditions in Table 1.1, is constructed. This binary variable has the value one if the subject has at least one of the conditions and zero otherwise.

Declining self-reported health

For construction the variable about the self-reported health that is declining the answer to the question about the health now compared to two years age is used. The question is whether the health situation is the same, better or worse compared to two years ago. The variable has the value one if the answer is that the health is worse and zero if the answer is that the health is the same or better.

Mental Health

To measure mental health of the respondents, the K-6 Non-Specific Psychological Distress Scale is used. Dr. Kessler, Professor of Healthcare Policy at Harvard Medical School, developed this scale. "*This scale has six items, using a score scale from 1-5, which ranges from 'all of the time' to 'none of the time.' The items are rescored as follows: A response of 'All of the Time' = 4 points, 'Most of the Time' = 3 points, 'Some of the Time' = 2 points, 'A Little of the Time' = 1 point, and 'None of the Time' = 0 points. The scores of the individual answers add together to a score. A score of 13 or higher indicates sensitivity around the threshold for the clinically significant range of the distribution of nonspecific distress*" (Kesler et al., 2013). Therefore, the binary mental health variable has value 1 if the score is 13 or above and 0 if the score is below 13. Different papers show that this score is a good predictor of anxiety and depression (Furukawa et al., 2003; Cairney et al., 2007).

Control variables

Age, gender, and education are the control variables. In addition, the age squared and cubed are used to control for possible non-linear age effects. The education variable is in years. The gender variable has the value one if the person is a male.

Method

The first part of the study is a cross-sectional analysis where the data from the 2011 wave is used. For each health condition, a logit model is estimated. In these models, the indicator of the condition under consideration is the explanatory variable and self-employment the main outcome variable. In addition, the controls variables are included as covariates in each model. The decision to use the logit model was made because the explanatory variables are all dummy variables. An important

property of the logit model is that it links a linear combination of covariates and independent/outcome variables to changes in the odds of the dependent/ explanatory binary variable under consideration being true (e.g., suffering from diabetes). This property implies that estimates of the logit model quantify the relation between the independent variables and covariates (e.g., age and self-employment), and the probability of being affected by a certain condition. In order to interpret the effect sizes, a report on the average marginal effects of the estimated logit models is included.

The second part of the analysis uses data from all waves for a panel data analysis. In the analysis, both the Fixed Effects (FE) estimator and the Random Effect (RE) estimator are used in the logit models for panel data. A Hausman specification test is applied to the RE and FE estimators. This test indicates whether there is significant evidence to support the hypothesis that the RE estimator is inconsistent. An estimator is consistent if, as the sample size increases, the estimates "converge" to the true value of the parameter being estimated. More specifically, consistency means that, when the sample size increases, the sampling distribution of the estimator becomes increasingly concentrated at the true parameter value. When this is not the case, the estimator is inconsistent. Inconsistency can arise in the RE estimator, in case unobserved individual characteristics are related to both the explanatory variables and the outcome variable. An example of this is the relation between schooling and income in an oligarchic society. In such a society, both schooling and income are likely to be positively correlated with the socioeconomic status of the parents, independent of any direct relation between income and schooling. When applying the random effects (RE) estimator to data from such a country, the estimates are likely inconsistent. The, fixed effects (FE) estimator, however, removes this unobserved heterogeneity (i.e., the family-specific effect), yielding consistent estimates.

Therefore, testing whether the RE estimator differs significantly from the FE estimator, indirectly allows testing the hypothesis of unobserved heterogeneity. This test on a difference in significance of the two estimators is called the Hausman specification test. When the test shows a significant difference between the two estimators, the FE estimator is preferred, since the FE estimator is more likely to be consistent than the RE estimator. On the other hand, if there is no unobserved heterogeneity both the FE and the RE estimator are consistent. However, in this case the RE estimator is more efficient that the FE estimator.

Thus, when the Hausman specification test rejects the null hypothesis, the less efficient but consistent FE estimator is preferred. On the other hand, when the Hausman test does not reject the null hypothesis, the more efficient RE estimator is preferred

4. Results

Summary statistics

Table 2.1 shows the summary statistics of Wave 7 (2011). The sum of the self-employed people and wageworkers samples is not equal to the total sample size. This is because there are people in the sample that are unemployed or partly self-employed/ wageworker and are therefore not in the wageworker or self-employed sample. In addition, 13.8 percent of the total sample is self-employed in Wave 7. This is the highest percentage of all waves. In the other waves (1-6), the percentage of self-employment is between 12.5 and 13 percent. The average age is higher for the self-employed people compared to the wageworkers in all waves. Histograms with the distribution of age are in the appendix (Figure 2.1-2.2). The summary statistics of the other waves (Tables 11.1–11.6) and the correlation matrix of Wave 7 (Table 7) are in the appendix.

An explanation for the low number and large standard deviation for the years of education is the fact that around 30% of the respondents have a value of zero for the years of education. To check whether this has an effect on the results, the FE models are estimated without this subset of the sample. These results (Appendix: Table 9.3 and 9.4) are not significantly different from the results obtained for the full sample. Since it does not show a large difference in result, the subset is included in the sample for the analysis used for the interpretation. This to keep the number of observation higher for a better result.

An explanation for the high male ratio is that the definition of the head of the family is quite old-fashioned. The ratio of the different individual conditions is the highest in the overall sample, the average number of conditions in the overall sample is 1.001 in wave 7 and below one in the wageworkers and self-employed people subsamples.

Since the PSID is a panel dataset, it changes over the years and not all data is available in all the waves. The following variables are not in all the waves:

- The self-reported health variable is available for the first time in wave 3.

- The mental health variable is missing in wave 1 and 4.
- Reporting about having another chronic condition starts in wave 4.

Number of conditions

Table 2.2 shows the empirical distribution of the number of conditions in Wave 7 for the total sample and the subsamples. For the number of conditions, the minimum number is zero and the maximum is eleven. The table shows that in both the samples that are in the labor force more than 50 percent of the people have no condition. In the total sample of this wave, 49 percent of the individuals have no condition. The distribution of the other waves can be found in the appendix (Tables 10.1-10.6) and is not very different from this distribution.

Transitions

Table 2.3 shows how many subjects in the panel make a transition from self-employment to wageworker and from wageworker to self-employment, for a period of at least one wave. From this table it can been seen that of the wageworkers 24 percent makes the transition to self-employment. About four percent makes the transition from self-employment to wageworker. This means that in general there are more people in the sample that make a transition from wageworker to self-employment than the other way around. Table 2.4 shows the amount of people that have a gender transition in the sample. In total this are in total 2012 subjects. These subjects are removed from the sample because it is likely that there is a different respondent filling in the survey however is it not reported.

Table 2.1: Mean and standard deviation (in parentheses) of data from Wave 7.

Variable	Total sample (*N*=23,768 individuals)	Self-employed Sample (*N*=2,713)	wageworkers Sample (*N*=16,979)
Self-employed (0=no, 1=yes)	0.138 (0.344)	1.000 (0.000)	0.000 (0.000)
Age (in decades)	4.318 (1.448)	4.420 (1.307)	4.018 (1.204)
Gender (0=female, 1=male)	0.729 (0.444)	0.820 (0.380)	0.740 (0.440)
Education (Years)	9.112 (6.427)	9.174 (6.530)	9.010 (6.580)
Having a health condition (0= no condition, 1=at least one)	0.511 (0.500)	0.482 (0. 500)	0.455 (0.500)
Declining self-reported health (0=same or better, 1=worse health)	0.120 (0.325)	0.110 (0.312)	0.092 (0.289)
Mental Health (0=good, 1=bad)	0.038 (0.192)	0.032 (0.177)	0.030 (0.168)
Number of health conditions (min=0, max=11)	1.001 (1.367)	0.841 (0.134)	0.750 (1.046)
Individual conditions			
Stroke (0=no, 1=yes)	0.025 (0.155)	0.011 (0.105)	0.098 (0.098)
Heart attack (0=no, 1=yes)	0.037 (0.188)	0.025 (0.155)	0.019 (0.138)
Heart disease (0=no, 1=yes)	0.040 (0.196)	0.027 (0.161)	0.020 (0.202)
Asthma (0=no, 1=yes)	0.105 (0.308)	0.086 (0.280)	0.100 (0.300)
Lung disease (0=no, 1=yes)	0.046 (0.210)	0.043 (0.203)	0.034 (0.181)
Diabetes (0=no, 1=yes)	0.095 (0.293)	0.074 (0.266)	0.069 (0.254)
Arthritis (0=no, 1=yes)	0.128 (0.334)	0.096 (0.294)	0.081 (0.273)
Memory loss (0=no, 1=yes)	0.014 (0.118)	0.004 (0.061)	0.004 (0.060)
Hypertension (0=no, 1=yes)	0.282 (0.450)	0.268 (0.443)	0.233 (0.423)
Cancer (0=no, 1=yes)	0.044 (0.207)	0.059 (0.235)	0.025 (0.155)
Psychological problems (0=no, 1=yes)	0.071 (0.257)	0.038 (0.190)	0.055 (0.227)
Other condition (0=no, 1=yes)	0.122 (0.328)	0.110 (0.313)	0.101 (0.301)

Table 2.2: Empirical distribution of the number of conditions in wave 7.

#conditions	Total sample (*N*=23,768)			Self-employed sample (*N*=2,713)			Wageworker sample (*N*=16,979)		
	Count	Percent	Cum. (%)	Count	Percent	Cum. (%)	Count	Percent	Cum. (%)
0	11,621	48.89	48.89	1,408	51.90	51.90	9,260	54.54	54.54
1	5,965	25.10	73.99	726	26.76	78.66	4,481	26.39	80.93
2	3,178	13.37	87.36	328	12.09	90.75	2,051	12.08	93.01
3	1,546	6.50	93.87	138	5.09	95.83	800	4.71	97.72
4	807	3.40	97.26	88	3.24	99.08	260	1.53	99.25
5	333	1.40	98.66	20	0.74	99.82	81	0.48	99.73
6	175	0.74	99.40	2	0.07	99.89	23	0.14	99.86
7	82	0.35	99.74	3	0.11	100.00	15	0.09	99.95
8	42	0.18	99.92				8	0.05	100.00
9	10	0.04	99.97						
10	3	0.01	99.97						
11	6	0.03	100						
Total	23,768	100		2,713	100		16,979	100	

Table 2.3: Percentage of transitions in the panel data

Self-employment	Wageworker	Self-employed	Total
Paid employment	95.63	4.37	100.00
Self-employment	24.06	75.94	100.00
Total	86.72	13.28	100.00

Table 2.4: Percentage of gender transitions

	Female	Male	Total
Female	98.68	1.32	100.00
Male	0.28	99.72	100.00
Total	23.14	76.86	100.00

Cross sectional

This section discusses the results of the cross-sectional models. Tables 4.1- 4.2 show the average marginal effects of self-employment in the different models. The average marginal effects for the complete models are in Tables 8.1-8.2 in the appendix. The results of the logit models are in Tables 3.1-3.2.

Self-employment

Tables 3.1-3.2 show that being self-employed is positively associated with the probability of having a lung disease at the five percent significance level compared to being a wageworker. This means that self-employed people are more likely to suffer from a lung disease. At one percent significance, being self-employed is positively associated with an increase in the probability of ever had or currently having cancer. This means that self-employed people are more likely to suffer of had suffered with cancer. Finally, self-employment is negatively associated with the chance of having diabetes and the chance of having psychological problems, at five percent significance. This means that self-employed people are less likely to suffer from diabetes and psychological problems.

Table 3.1: The coefficients and standard errors (in parentheses) of the cross-sectional logit models

Outcome Variable:	Stroke	Heart attack	Heart disease	Asthma	Lung disease	Diabetes	Arthritis	Memory loss
Self-employment	-0.116 (0.204)	-0.175 (0.141)	-0.056 (0.136)	-0.058 (0.074)	0.259** (0.106)	-0.181** (0.081)	-0.047 (0.075)	0.015 (0.344)
Age	-1.894 (1.357)	-0.032 (1.258)	-2.684** (1.101)	-0.007 (0.467)	-2.815*** (0.663)	1.938** (0.798)	-0.638 (0.591)	-0.520 (2.933)
Age^2	0.492 (0.278)	0.220 (0.244)	0.746*** (0.221)	-0.082 (0.108)	0.575*** (0.147)	-0.091 (0.160)	0.331** (0.122)	0.186 (0.692)
Age^3	-0.030* (0.018)	-0.016 (0.015)	-0.050*** (0.014)	0.008 (0.008)	-0.034*** (0.010)	-0.004 (0.010)	-0.025*** (0.008)	-0.020 (0.052)
Male	-0.521*** (0.157)	0.604*** (0.151)	-0.379*** (0.114)	-0.338*** (0.053)	-0.750*** (0.081)	0.165*** (0.073)	-0.701*** (0.059)	0.441 (0.320)
Education	-0.004 (0.012)	-0.014 (0.009)	-0.005 (0.009)	0.001 (0.004)	-0.009 (0.006)	-0.018*** (0.005)	0.006 (0.005)	0.040** (0.020)
Constant	-3.000 (2.092)	-7.272*** (2.086)	-2.258 (1.743)	-1.203 (0.638)	1.220 (0.935)	-8.917 (1.287)	-3.491 (0.915)	-5.917 (3.970)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 3.1 continued

Outcome Variable:	Hypertension	Cancer	Psychological problems	Other conditions
Self-employment	-0.030	0.667***	-0.259**	0.033
	(0.051)	(0.100)	(0.108)	(0.068)
Age	0.496	-1.033	1.292**	1.850***
	(0.400)	(0.847)	(0.639)	(0.452)
Age^2	0.077	0.327*	-0.318**	-0.386***
	(0.086)	(0.171)	(0.147)	(0.097)
Age^3	-0.008	-0.020*	0.022**	0.028***
	(0.006)	(0.011)	(0.011)	(0.007)
Male	-0.424***	-0.562***	-0.849***	-0.316***
	(0.041)	(0.096)	(0.066)	(0.053)
Education	-0.005	0.029***	0.020***	0.011***
	(0.003)	(0.008)	(0.005)	(0.004)
Constant	-3.672***	-3.788**	-3.871***	-5.035***
	(0.593)	(1.326)	(0.880)	(0.665)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 3.2: The coefficients and standard errors (in parentheses) of the logit models with the mental and grouped conditions

Outcome Variable:	Having a health condition	Declining self-reported health	Bad mental health
Self-employment	-0.060	0.104	0.187
	(0.044)	(0.069)	(0.119)
Age	-0.309	-1.723***	-3.717***
	(0.364)	(0.447)	(0.948)
Age^2	0.100	0.378***	0.854***
	(0.086)	(0.098)	(0.228)
Age^3	-0.001	-0.022***	-0.062***
	(0.006)	(0.007)	(0.018)
Male	-0.408***	-0.312***	-0.417***
	(0.035)	(0.055)	(0.091)
Education	0.002	-0.007*	-0.021***
	(0.002)	(0.004)	(0.007)
Constant	-0.346	0.059	2.041***
	(0.492)	(0.645)	(1.243)

*** = 1 % significance ** = 5 % significance *=10% significance

Average marginal effects of self-employment

The average marginal effect of self-employment on the probability of having one of the conditions are listed in Tables 4.1-4.2. There are average marginal effects that are significantly differ from zero. For the probability of having a lung disease, being self-employed leads to a positive significant increase at the five percent level with a size of 0.9. This means that the probability of having one of the conditions increases with 0.9 percent when being self-employed.

In addition, being self-employed is associated with a significant 2.2 percent increases in the probability of ever had or having cancer, compared to being a wageworker. Being self-employed increases the chance of ever had or having cancer with 2.2 percent compared to being a wageworker. At the five percent significance level, being self-employed is associated with a 1.1 percent decrease in the probability of having diabetes and the probability of having psychological problems decreases with 1.2 percent compared to being a wageworker. When being self-employed the change of suffering from diabetes decreases with 1.1 percent and probability of having psychological problems decreases with 1.2 percent.

Table 4.2 shows the results of the models for the grouped and mental conditions. The conclusion based on this table is that being self-employed has no significant effect on having a health condition, declining self-reported health and a mental health with a bad score.

Gender

For the gender variable Table 3.1 and 3.2 show that there is an association between being a male and an increased probability for having the condition at the one percent significance for ever having a stroke, a heart attack, cancer and for having cancer, a heart disease, asthma, a lung disease, arthritis, hypertension, psychological problems, any other chronic condition, bad mental health, declining self-reported health, and at least one health condition.

At one percent significance, the probability of having diabetes is lower for males compared to females. This result shows that for most of the conditions males have higher probability to suffer from a condition compared to female.

Number of conditions

Table 5 shows the results of the Poisson regression with the number of condition as the explanatory variable. This table shows that there is no significant association of self-employment with the number of conditions.

Table 4.1: The average marginal effects (dy/dx) and standard deviation (in parentheses) of the self-employment variable in the logit models in wave7 for the individual conditions

Outcome Variable :	Stroke	Heart attack	Heart disease	Asthma	Lung disease	Diabetes	Arthritis	Memory loss
Self-employment	-0.001 (0.002)	-0.003 (0.002)	-0.001 (0.003)	-0.005 (0.006)	0.009** (0.004)	-0.011** (0.005)	-0.003 (0.005)	0.000 (0.001)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 4.1 continued

Outcome Variable	Hypertension	Cancer	Psychological problems	Other conditions
Self-employment	-0.005 (0.008)	0.022*** (0.004)	-0.012*** (0.004)	0.003 (0.006)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 4.2: The average marginal effects (dy/dx) and standard deviation (in parentheses) of the self-employment variable in the logit models in wave7 for the grouped and the mental conditions

Outcome Variable:	Having a health condition	Declining self-reported health	Bad mental health
Self-employment	-0.014 (0.010)	0.009 (0.006)	0.006 (0.004)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 5: Results of the Poisson regression model for the number of conditions

# conditions	Coefficient	Standard Error
Self-employment	-0.007	(0.023)
Age	-0.664***	(0.155)
Age^2	0.208***	(0.033)
Age^3	-0.014***	(0.002)
Male	-0.338***	(0.018)
Education	0.001	(0.001)
Constant	-0.002	(0.232)

*** = 1 % significance

Panel data

In this section the results of the panel data analysis are discussed. Tables 6.1-6.2 show the results for the fixed effect estimator (FE). The results of the sample excluding individuals with zero years of education can be found in the appendix (Tables 9.3-9.4). In this sample 47,494 observations are dropped. This leads to a few changes in significance level. This change in de results may be explained with the fact is that there are fewer observations in the sample.

One thing to notice is that the number of observation is not equal for all the models. This is due to the use of the fixed effect estimator. This estimator drops observations that are constant over time. For interpreting the effect of self-employment, the FE estimator is used, due to the result of the Hausman test. The tables with the random effect estimator are in the appendix (Tables 9.1 and 9.2)

Hausman test

Table 6.3 shows the coefficients of self-employment and the results of the Hausman test for the RE and FE estimator. This table shows a significant result for Hausman test except for the declining self-reported health. This means that that the FE estimator is the most efficient estimator for the interpretation. Therefore, the FE estimator is used for interpretation in this section.

Self-employment

Tables 6.1 and 6.2 show the results of the fixed effect estimator. From these tables it can been seen that at the 1 percent significance level, self-employment is associated with a decrease in probability of suffering from asthma and arthritis, compared to wageworkers. At the five percent significance level a decrease in probability is found for suffering from diabetes for self-employed individuals compared to wageworkers.

Table 6.1: Coefficients and standard errors (in parentheses) of the fixed effect models

Condition:	Stroke	Heart attack	Heart disease	Asthma	Lung disease	Diabetes
Self-employment	-0.2.48	-0.150	0.053	-0.384***	-0.218	-0.415**
	(0.258)	(0.197)	(0.136)	(0.108)	(0.132)	(0.163)
Age	-8.738***	-3.884**	-8.488***	1.336	1.354	-7.924***
	(1.955)	(1.936)	(1.170)	(0.922)	(0.989)	(1.501)
Age^2	2.197***	1.314***	1.772***	-0.205	-0.326	2.205***
	(0.405)	(0.401)	(0.236)	(0.217)	(0.227)	(0.337)
Age^3	-0.135***	-0.075***	-0103***	0.021	0.041**	-0.1.22***
	(0.017)	(0.027)	(0.015)	(0.016)	(0.168)	(0.024)
Education	-0.026	0.004	0.002	-0.005	0.009	-0.016
	(0.009)	(0.020)	(0.011)	(0.009)	(0.010)	(0.012)
Number of observations	2,039	3,158	6,750	9,698	7,530	9,222

*** = 1 % significance ** = 5 % significance *=10% significance

Table 6.1 continued

Condition:	Arthritis	Memory loss	Hypertension	Cancer	Psychological problems	Having another condition
Self-employment	-0.248***	0.304	0.344***	0.280*	0.204**	0.043
	(0.078	(0.234)	(0.074)	(0.168)	(0.099)	(0.082)
Age	-3.050***	-3.509	-1.181*	-6.717***	0.234	-1.060
	(0.718)	(2.145)	(0.705)	(1.554)	(0.965)	(0.890)
Age^2	0.980***	0.743	0.610***	1.700***	0.232	0.246
	(0.152)	(0.461)	(0.162)	(0.336)	(0.229)	(0.199)
Age^3	-0.071***	-0.039	-0.024**	-0.087***	-0.022	-0.014
	(0.010)	(0.032)	(0.012)	(0.023)	(0.017)	(0.014)
Education	0.005	0.040	0.004	0.015	-0.025*	-0.004
	(0.005)	(0.027)	(0.006)	(0.015)	(0.010)	(0.008)
Number of observations	18,849	1,368	29,741	5,102	9,109	14,555

*** = 1 % significance ** = 5 % significance *=10% significance

Table 6.2: Coefficients and standard errors (in parentheses) of the fixed effect models for the grouped and mental conditions

Condition	Having a health condition	Declining self-reported health	Mental health
Self-employment	0.165***	0.182**	0.025
	(0.063)	(0.082)	(0.139)
Age	-2.049***	-1.023	0.243
	(0.658)	(0.728)	(1.457)
Age^2	0.277*	0.215	-0.112
	(0.156)	(0.162)	(0.353)
Age^3	-0.010	-0.009	0.014
	(0.005)	(0.012)	(0.027)
Education	-0.016***	-0.016**	0.008
	(0.006)	(0.007)	(0.012)
Number of observations	25,759	14,977	5,048

*** = 1 % significance ** = 5 % significance *=10% significance

Table 6.3: The coefficients of self-employment (and standard errors) for the different conditions and the results of the Hausman test.

Outcome variable variable	Stroke	Heart attack	Heart disease	Asthma	Lung disease	Diabetes	Arthritis	Memory loss
Self-employment (RE)	-0.292 (0.185)	0.062 (0.170)	0.039 (0.102)	-0.165** (0.075)	-0.036 (0.094)	-0.473*** (0.090)	-0.095 (0.060)	0.596*** (0.160)
Self-employment (FE)	-0.2.48 (0.258)	-0.150 (0.197)	0.053 (0.136)	-0.384*** (0.108)	-0.218 (0.132)	-0.415** (0.163)	-0.248*** (0.078	0.304 (0.234)
Hausman chi^2 (p-value)	54.54 (0.000)	147.71 (0.000)	55.18 (0.000)	276.52 (0.000)	114.86 (0.000)	555.08 (0.000)	34.29 (0.000)	18.15 (0.003)
Sample size FE	2,039	3,158	6,750	9,698	7,530	9,222	18,849	1,368

*** = 1 % significance ** = 5 % significance *=10% significance

Table 6.3: Continued

Outcome variable	Hypertension	Cancer	Psychological problems	Other conditions
Self-employment (RE)	0.076 (0.055)	0.668*** (0.132)	0.154** (0.072)	0.082 (0.052)
Self-employment (FE)	0.344*** (0.074)	0.280* (0.168)	0.204** (0.099)	0.043 (0.082)
Hausman chi^2 (p-value)	506.85 (0.000)	60.92 (0.000)	238.22 (0.000)	16.49 (0.005)
Sample size (FE)	29,741	5,102	9,109	14,555

*** = 1 % significance ** = 5 % significance *=10% significance

Table 6.3: Continued

Outcome variable :	Having a health condition	Declining self-reported health	Bad mental health
Self-employment (RE)	-0.022 (0.049)	0.129*** (0.045)	0.068 (0.085)
Self-employment (FE)	0.165*** (0.063)	0.182** (0.082)	0.025 (0.139)
Hausman chi^2 (p-value)	993.64 (0.000)	4.59 (0.468)	19.30 (0.002)
Sample size (FE)	25,759	14,977	5,048

*** = 1 % significance ** = 5 % significance *=10% significance

Bonferroni correction

Since there is a long list of conditions, there is an increased likelihood of false positive results. To counteract this problem, a Bonferroni correction is employed. This correction is such that for *P* independent tests, the chance of rejecting at least one of the null hypotheses is at most α when all null hypotheses are true. For independent tests, this is achieved by setting $\alpha^* = \alpha/P$ as significance level for each test. This means that the significance level is lower than it needs to be, strictly speaking. However, in general, it is better to have a false negative result than a false positive result. In total, the list consists of 15 conditions. There the required significance level for each test, according to the Bonferroni correction, is 5% / 15 = 0.33%. When this correction is applied to the results of the FE models this means that the results with a *p*-value greater than 0.33% are insignificant. This means that the results that are significant at the five and ten percent level are insignificant when the correction is applied. The result that are significant at the one percent level, asthma and hypertension, have a p value of 0.000 and arthritis has a value of 0.002 this means that they are still significant. For having a health condition, the p-value is 0.009, this makes this result insignificant when looking at the Bonferroni correction.

Hypotheses

The first hypothesis is that there is a difference in stress-related disease rates for self-employed individuals compared to wageworkers (hypertension, heart disease, heart attack, diabetes, rheumatoid arthritis and stroke). Looking at the results of the FE models in this section, this hypothesis is confirmed with a significant increase in the probability for having hypertension and a decrease for having arthritis when being self-employed.

The second hypothesis is that being self-employed is associated with the mental well-being. The result show that there is an association between being self-employed and having psychological problem. When looking at result for the mental well-being based on the scale of Dr. Kessler no significant result is found. In conclusion this hypothesis is confirmed for psychological problems but not for the mental well-being.

The third hypothesis is that there is a difference in health profile between self-employed people and wageworkers. This hypothesis is confirmed. The main results are that (I) self-employed individuals are more likely to have suffered or still suffer from hypertension and cancer compared

to wageworkers (II) the self-reported health of self-employed individuals is worse than the self-reported health of wageworkers and (III) self-employed individuals are less likely to have arthritis, asthma, and diabetes. Finally, (IV) evidence is found for a relation between self-employment and having a health condition in general.

5. Conclusion

Cross-sectional

The results of the cross-sectional analyses show that self-employed individuals have a significant lower probability of having suffered from a heart attack, as well as a lower probability of suffering from diabetes. This is in line with the findings from Yoon and Bernel (2013). The only difference compared to Yoon and Bernel (2013) is that the cross-sectional analysis shows no significant result for arthritis.

Regarding psychological problems, self-employment is associated with a lower probability of having psychological problems. This is not in line with the findings about the push mechanism of Bogan, Fertig and Just (2014), it found an increase in probability of pursuing self-employment in an unincorporated business when facing moderate psychological distress. The finding also contradicts the result of Dahl et al. (2010) that entrepreneurs are more like to receive psychotropics after entering self-employment. Other results found in the cross sectional study are an increase in the probability for having a lung disease, ever had or having cancer when being self-employed compared to being a wageworker..

Panel data

The conclusions for the panel data are that being self-employed is associated with a decrease in probability of suffering from asthma, diabetes, and arthritis, when compared to wageworkers. Moreover, there is tentative evidence to support the claim of a positive association between being self-employed and the likelihood of having ever had or having cancer.

One of the most interesting results that is not widespread in the literature yet is the increased probability for either having or having had cancer. In the cross-sectional analysis, it is significant at the 1 percent level and in the panel analysis it is significant at the 10 percent level.

When looking at the finding for cancer there can be a link with the findings of Zissimopoulos and Karoly (2007). The finding of this article is that having a health condition can be a pull factor into self-employment. An alternative explanation is provided by Verheul et al. (2010), who argue that having a health condition can lead to discrimination in the job selection procedure. Other literature (indirectly) related to this finding is described in the discussion.

Looking at the self-reported health, the main finding is that the self-employed individuals are more likely to report a health that is worse than it was two years ago. This result is not in line with previous literature of Yoon and Bernell (2013) and Stephan and Roesler (2010). There was found that there is a positive association between perceived health and self-employment.

Looking at the results for the individual conditions, there are some contradicting results and some are in line with the literature. The result for diabetes contradicts the result of previous studies of McEwen (2000), McEwen (2005), and McEwen & Stellar (1993). However, findings are in line with the work of Yoon and Bernell (2013). The positive association between suffering from hypertension and self-employment is in line with the findings of McEwen (2000), McEwen (2005), and McEwen and Stellar (1993). However, it is in contradiction with the results of Stephan and Roesler (2010), and Yoon and Bernel (2013). Both these studies find a negative association between self-employment and suffering from hypertension. The results for arthritis are in line with Stephan and Roesler (2010), but contradict the results of McEwen (2000), McEwen (2005), and McEwen & Stellar (1993).

The results for the positive association between self-employment and psychological problems are in line with the findings about psychotropics of Dahl et al. (2010). They find positive association between entrepreneurship and receiving psychotropics.

The research question of this thesis is whether there is a difference in health profile between fully self-employed people and wageworkers. Looking at the findings, the answer to the question is that (i) self-employed individuals are more likely to have suffered or still suffer from hypertension and cancer compared to wageworkers, (ii) the self-reported health of self-employed individuals is worse than the self-reported health of wageworkers, and (iii) self-employed individuals are less likely to have arthritis, asthma and diabetes. Finally, (iv) evidence is found for a relation between self-employment and having a health condition in general.

6. Discussion

When looking at the results, there is a difference between the results of the cross-sectional analysis and the panel data analysis. An explanation for this is that the cross-sectional analyses only consist of contemporaneous observations. Effectively, it uses between-individual variation to assess the relationships of relevance. The panel data, on the other hand, yields both between-individual and within-individual variation. In case of unobserved heterogeneity, using the between-individual variation leads to biased estimates. The fixed effects estimator accounts for potential unobserved heterogeneity, by correcting for individual-specific effects, thereby preserving only within-individual variation for estimation and inference. This estimator requires within-individual variation across time. Therefore, this correction means that individual that have no variation over time are not included in this estimator. Consequently, the fixed effect estimates are most reliable, albeit statistically least efficient in case of heterogeneity across individuals is absent.

Looking at the data, the main advantage is that it is a panel study with many participants. However, a limitation is the small number of waves, making it hard to apply more refined methods, where, for instance, self-employment is allowed to precede a condition and vice versa. Therefore, it is hard to draw any conclusions about the direction of any effect. Thus, there is little scope for assessing whether the conditions under consideration increase the likelihood of (self-)selecting into self-employment, or, conversely, that the likelihood of having these conditions develops differently for those who are self-employed than for those who find employment as wage-worker. Moreover, both scenarios are described in the literature.

A disadvantage of the data is the definition of the head in the study. Due to this definition, there are more males in the used sample and therefore it is hard to draw gender-specific conclusions. Also the study of Van der Doef and Maes (1999) shows that there are more significant results found in studies with mixed and male samples than in samples consisting exclusively of females. Another disadvantage is that it is not clear which type of job the people are active in. Therefore it is not possible to make a distinction between the job types, which can affect the results, since some job types can also affect health.

The finding that is not directly described in the literature is the result for increase in the probability of ever had or having cancer when being self-employed. To link this to self-employment there should be a look at other literature related to cancer and employment in general. A different

position in the "regular" labor market could possible lead to selection into self-employment. An example of this type of research is on the position of cancer survivors in the labor market. De Boer, Taskila, Ojajärvi van Dijk and Verbeek (2009) find that overall, cancer survivors were more likely to be unemployed compared to healthy control participants. According to this research these individuals are 1.37 time more likely to become unemployed. This finding is the result of a meta-analysis of 26 articles that describe 36 studies. This analysis included 20,366 cancer survivors and 157,603 healthy control participants. Another finding related to cancer and employment is from Moran, Short, and Hollenbeak (2011). By comparing a group from the Penn State Cancer Survivor Survey group to a group drawn from the PSID, they find that cancer survivors have lower employment rates and work fewer hours than other similarly aged adults in a period between two and six years after surviving cancer.

Mehnert, de Boer and Feurston (2013) gives an overview of the current literature about the effect of cancer on employment. The work participation of cancer patients is measured in two ways, with employment status or the length of sick leave. Looking at the literature, it shows that several articles from the European Union and US imply an average return rate of 64 percent. However, this return rate is volatile since it has an interval between 24 and 94 percent (Spelten, Sprangers, and Verbeek, 2002; Taskila and Lindbohm, 2007; de Boer, Taskila, Ojajarvi,van Dijk and Verbeek, 2009; Steiner, Nowels and Main, 2010; Feurstein, Todd, Maskowit et al., 2010; Mehnert, 2011). This literature shows evidence for the fact that cancer survivors have a different position in the labor market compared to healthy people. This different position may lead to necessity-driven self-employment, due to the lack of the possibilities to be a wageworker.

Further research

Some of the findings of this study are in line with existing studies, whereas other results directly contradict previous studies. Therefore, an interesting venue for further research would be to meta-analyze the results from the studies with conflicting results, or carrying out additional well-powered studies. In addition, a study aiming to understand why the result differ across studies and what good and reliable methods are for research in this area, can be rewarding.

Another interesting subject for further research is to look at long-term data, in order to see whether there are different effects in the short and the long-term. This study has a period of 14 years, which is short term when looking at health effects. When looking at the literature, there are different

directions for the association between health and self-employment. Therefore, a suggestion for further research is to select a group of people that make the transition into self-employment and follow them for a longer period. This to investigate whether it is a selection effect or whether the type of employment has an effect or a combination of these two. For this approach, more long-term data is needed. It can also be interesting to do research about the reasons why people are self-employed to see whether these are health-related reasons.

Another implication for further research is to make a distinction between the different types of jobs and compare the effect of self-employment on health to these different job types separately.

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7. Appendix

Table 7: correlation matrix Wave 7

Correlation Matrix	Self-employment	Stroke	Heart attack	Heart disease	Asthma	Lung disease	Diabetes
Self-employment	1						
Stroke	0.0047	1					
Heart attack	0.0132**	0.2220***	1				
heart disease	0.0151**	0.1870***	0.4685***	1			
Asthma	-0.0162*	0.0238***	0.0146**	0.0562***	1		
Lung disease	0.0178**	0.0928***	0.0923***	0.1498***	0.1881***	1	
Diabetes	0.0097	0.1171***	0.142***	0.156***	0.023***	0.063***	1
Arthritis	0.0186***	0.1371***	0.1513***	0.2038***	0.0876***	0.1566***	0.1869***
Memory loss	0.0002	0.1776***	0.1022***	0.072***	0.0305***	0.0824***	0.0735***
Hypertension	0.0284***	0.153***	0.1826***	0.2204***	0.0579***	0.1007***	0.2792***
Cancer	0.0694***	0.1086***	0.1162***	0.1032***	0.0221***	0.0657***	0.073***
Psychological problems	-0.0264***	0.0756***	0.0659***	0.0852***	0.1264***	0.1074***	0.0615***
Other condition	0.0105	0.0535***	0.0692***	0.086***	0.0548***	0.0955***	0.0486***
Having a condition	0.0187***	0.1555***	0.1905***	0.1998***	0.3364***	0.2158***	0.3165***
Self-reported health	0.0202***	0.1386***	0.1297***	0.1781***	0.0618***	0.1407***	0.1294***
Age	0.1128***	0.1669***	0.2394***	0.2369***	-0.0562***	0.0771***	0.2787***
Male	0.0599***	-0.0178***	0.0457***	-0.02***	-0.0767***	-0.0643***	0.0038
Education	0.0086	0.0265***	0.0434***	0.0436***	-0.0202***	0.0112*	0.0424
Bad mental health	0.0071	0.0405***	0.077***	0.055***	0.0571***	0.0907***	0.0352***

*** = 1 % significance ** = 5 % significance *=10% significance

Correlation Matrix	Arthritis	Memory loss	Hypertension	Cancer	Psychological problems	Other condition	Having a condition
Arthritis	1						
Memory loss	0.1***	1					
hypertension	0.2516***	0.0813***	1				
Cancer	0.1251***	0.0414***	0.1078***	1			
Psychological problems	0.1434***	0.212***	0.0835***	0.0718***	1		
Other condition	0.1745***	0.097***	0.1188***	0.0503***	0.1375***	1	
Having a condition	0.3739***	0.117***	0.6133***	0.2117***	0.2701***	0.3649***	1
Self-reported health	0.2444***	0.1044***	0.2099***	0.1125***	0.1549***	0.2097**	0.2601***
Age	0.3452***	0.0615***	0.3913***	0.2402***	-0.0144***	0.1067***	0.3513***
Male	-0.095***	-0.0066	-0.0555***	-0.0158**	-0.1024***	-0.0348***	-0.066***
Education	0.0658***	0.0036	0.076***	0.0728***	-0.0004	0.0425***	0.0795***
Mental health	0.0443***	0.1105***	0.0529***	0.0174***	0.2266***	0.0767***	0.1064***

*** = 1 % significance ** = 5 % significance *=10% significance

Correlation Matrix	Declining self-reported health	Age	Male	Education	Mental health
Self-reported health worse	1				
Age	0.1615***	1			
Male	- 0.0357***	0.0523***	1		
Education	0.0236	0.2279	0.0948	1	
Mental health	0.1531***	-0.0115*	-0.0579***	-0.0368***	1

*** = 1 % significance ** = 5 % significance *=10% significance

Table 8.1: The average marginal effects (dy/dx) and standard errors (in parentheses) of the logit models from the 2011 sample (wave 7)

Outcome Variable :	Stroke	Heart attack	Heart disease	Asthma	Lung disease	Diabetes	Arthritis	Memory loss
Self-employment	-0.001	-0.003	-0.001	-0.005	0.009**	-0.011**	-0.003	0.000
	(0.002)	(0.002)	(0.003)	(0.006)	(0.004)	(0.005)	(0.005)	(0.001)
Age	-0.018	-0.001	-0.054**	-0.001	-0.094***	0.119**	-0.045	-0.002
	(.013)	(0.024)	(0.022)	(0.041)	(0.022)	(0.049)	(0.042)	(0.011)
Age^2	0.005*	0.004	0.015***	-0.007	0.019***	-0.006	0.023***	0.001
	(0.003)	(0.005)	(0.004)	(0.009)	(0.005)	(0.010)	(0.009)	(0.003)
Age^3	0.000*	0.000	-0.001***	0.001	-0.001***	0.000	-0.002***	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
Male	-0.005***	0.010***	-0.008***	-0.032***	-0.029***	0.010**	-0.056***	0.001
	(.002)	(.002)	(0.003)	(0.005)	(0.004)	(0.004)	(0.005)	(0.001)
Education	0.000	0.000	0.000	0.000	0.000	-0.001***	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 8.1 continued

Outcome Variable:	Hypertension	Cancer	Psychological problems	Other conditions
Self-employment	-0.005	0.022***	-0.012***	0.003
	(0.008)	(0.004)	(0.004)	(0.006)
Age	0.080	-0.028	0.063**	0.168***
	(0.064)	(0.023)	(0.031)	(0.041)
Age^2	0.012	0.009*	-0.016**	-0.035***
	(0.014)	(0.005)	(0.007)	(0.009)
Age^3	-0.001	-0.001*	0.001**	0.003***
	(0.001)	(0.000)	(0.001)	(0.001)
Male	-0.071***	-0.017***	-0.049***	-0.031***
	(0.007)	(0.003)	(0.004)	(0.005)
Education	-0.001	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 8.2: The average marginal effects (dy/dx) and standard errors (in parentheses) of the logit models for the grouped and the mental conditions

Outcome Variable:	Having a health condition	Declining self-reported health	Bad mental health
Self-employment	-0.014	0.009	0.006
	(0.010)	(0.006)	(0.004)
Age	-0.070	*-0.145****	*-0.106****
	(0.082)	*(0.038)*	*(0.027)*
Age²	0.023	*0.032****	*0.024****
	(0.019)	*(0.008)*	*(0.007)*
Age³	0.000	*-0.002****	*-0.002****
	(0.001)	*(0.001)*	*(0.001)*
Male	-0.093	*-0.028****	*-0.013****
	(0.008)	*(0.005)*	*(0.003)*
Education	*0.000****	*-0.001****	*-0.001****
	(0.001)	*(0.000)*	*(0.000)*

*** = 1 % significance ** = 5 % significance *=10% significance

Table 9.1: Coefficients and standard errors (in parentheses) of the random effect models

Condition:	Stroke	Heart attack	Heart Disease	Asthma	Lung disease	Diabetes
Self-employment	-0.292	0.062	0.039	-0.165**	-0.036	-0.473***
	(0.185)	(0.170)	(0.102)	(0.075)	(0.094)	(0.090)
Age	-2.337*	2.825*	-6.098***	-1.847***	-3.382***	-5.402**
	(1,338)	(1.711)	(0.703)	(0.499)	(0.580)	(0.851)
Age²	0.558**	-0.135	1.446***	0.296**	0.649**	1.499***
	(0.277)	(0.348)	(0.149)	(0.115)	(0.131)	(0.174)
Age³	-0.022	0.020	-0.086***	-0.024*	-0.032***	-0.097***
	(0.018)	(0.022)	(0.010)	(0.008)	(0.009)	(0.012)
Male	-1.333***	1.320***	-0.328**	-1.040***	-1.630***	-0.504***
	(0.181)	(0.277)	(0.111)	(0.066)	(0.083)	(0.091)
Education	-0.010	-0.006	0.000	0.001	-0.005	-0.021***
	(0.012)	(0.006)	(0.007)	(0.004)	(0.006)	(0.006)
Constant	-12.385***	-29.957***	-2.550**	-3.386***	-1.402*	-4.924***
	(1.317)	(2.702)	(1.039)	(0.785)	(0.831)	(1.379)
lnsig2u	3.628	4.172	2.779	3.325	2.465	3.283
	(0.024)	(0.030)	(0.062)	(0.015)	(0.048)	(0.020)
Sigma	6.136	8.052	4.012	5.274	3.431	5.162
	(0.072)	(0.121)	(0.124)	(0.041)	(0.082)	(0.050)
Rho	0.920	0.952	0.830	0.894	0.782	0.890
	(0.002)	(0.001)	(0.008)	(0.001)	(0.008)	(0.002)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 9.1 continued

Condition:	Arthritis	Memory loss	Hypertension	Cancer	Psychological problems	Having another condition
Self-employment	-0.095	0.596***	0.076	0.668***	0.154**	0.082
	(0.060)	(0.160)	(0.055)	(0.132)	(0.072)	(0.052)
Age	-1.095***	0.283	-2.135**	-8.269***	-0.168	1.673***
	(0.465)	(1.078)	(0.439)	(1.012)	(0.538)	(0.300)
Age^2	0.615***	-0.208	0.808***	1.856***	0.019	-0.324***
	(0.100)	(0.233)	(0.098)	(0.223)	(0.126)	(0.083)
Age^3	-0.044***	0.027*	-0.050***	-0.096***	-0.0002	0.023***
	(0.007)	(0.016)	(0.007)	(0.015)	(0.009)	(0.006)
Male	-1.1335***	-0.042	-0.840***	-2.210***	-1.563***	-0.371***
	(0.034)	(0.163)	(0.062)	(0.009)	(0.062)	(0.046)
Education	0.001	0.010	0.001	0.020**	0.010**	0.010***
	(0.004)	(0.011)	(0.035)	(0.009)	(0.004)	(0.003)
Constant	-5.978***	-10.093***	-4.962***	-4.493***	-4.521***	-5.988***
	(0.032)	(1.580)	(0.635)	(1.475)	(0.729)	(0.535)
/lnsig2u	2.286	2.464	2.941	3.844	2.316	1.395
	(0.032)	(0.045)	(0.020)	(0.024)	(0.023)	(0.036)
Sigma	3.136	3.429	4.351	6.844	3.183	2.009
	(0.049)	(0.078)	(0.044)	(0.083)	(0.037)	(0.036)
Rho	0.749	0.781	0.852	0.934	3.183	0.551
	(0.006)	(0.008)	(0.002)	(0.001)	(0.004)	(0.009)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 9.2: Coefficients and standard errors (in parentheses) of the random effect models for the grouped and mental conditions

Condition	Having a health condition	Declining self-reported health	Mental health
Self-employment	-0.022	0.129***	0.068
	(0.049)	(0.045)	(0.085)
Age	-1.362***	-1.145***	-1.433**
	(0.392)	(0.304)	(0.623)
Age^2	0.440***	0.270***	0.310**
	(0.091)	(0.067)	(0.147)
Age^3	-0.025***	-0.015***	-0.023**
	(0.007)	(0.005)	(0.011)
Male	-0.939***	-0.416***	-0.988***
	(0.052)	(0.038)	(0.069)
Education	0.011***	-0.008**	-0.021***
	(0.003)	(0.003)	(0.005)
Constant	0.975*	-1.309***	-2.491***
	(0.538)	(0.433)	(0.847)
/lnsig2u	2.417	0.726	1.708
	(0.023)	(0.044)	(0.079)
Sigma	3.348	1.438	2.349
	(0.039)	(0.031)	(0.092)
Rho	0.773	0.486	0.626
	(0.004)	(0.010)	(0.018)

*** = 1 % significance ** = 5 % significance *=10% significance

Table 9.3: Coefficients and standard errors (in parentheses) of the adjusted fixed effect models

Condition:	Stroke	Heart attack	Heart disease	Asthma	Lung disease	Diabetes
Self-employment	-0.347	-0.274	0.017	-0.249*	-0.245	-0.237
	(0.321)	(0.224)	(0.155)	(0.131)	(0.163)	(0.193)
Age	-7.264***	-4.768*	-7.989***	1.809	-0.702	-7.634***
	(2.621)	(2.438)	(1.413)	(1.100)	(1.157)	(1.839)
Age²	1.957***	1.495***	1.647**	-0.345	0.059	2.236***
	(0.516)	(0.485)	(0.278)	(0.257)	(0.263)	(0.399)
Age³	-0.121***	-0.085***	-0.094***	0.034*	0.019	-0.130***
	(0.032)	(0.031)	(0.018)	(0.019)	(0.019)	(0.028)
Education	-0.02	-0.083	0.021***	0.027	0.064	-0.046
	(0.110)	(0.081)	(0.046)	(0.036)	(0.044)	(0.048)
Number of observations	1,511	2,335	4,960	6,297	1,109	6,332

*** = 1 % significance ** = 5 % significance *=10% significance

Table 9.3: continued

Condition:	Arthritis	Memory loss	Hypertension	Cancer	Psychological problems	Having another condition
Self-employment	-0.193**	-0.054	0.319***	0.251	0.166	0.080
	(0.093)	(0.296)	(0.090)	(0.212)	(0.126)	(0.101)
Age	-2.823***	-2.875	-1.214	-6.717***	-0.169	-1.511
	(0.848)	(2.493)	(0.852)	(1.984)	(1.152)	(1.035)
Age²	0.920***	0.670	0.645***	1.758***	0.361	0.330
	(0.175)	(0.525)	(0.191)	(0.413)	(0.269)	(0.228)
Age³	-0.067***	-0.041	-0.026*	-0.091***	-0.033	-0.020
	(0.012)	(0.035)	(0.014)	(0.028)	(0.020)	(0.016)
Education	0.053**	0.049	0.050**	0.109	-0.034	-0.007
	(0.027)	(0.100)	(0.025)	(0.070)	(0.042)	(0.028)
Number of observations	13,540	969	19,910	3,751	6,010	9,974

*** = 1 % significance ** = 5 % significance *=10% significance

Table 9.4: Coefficients and standard errors (in parentheses) of the adjusted fixed effect models for the grouped and mental conditions

Condition	Having a health condition	Declining self-reported health	Mental health
Self-employment	0.141*	0.110	-0.098
	(0.078)	(0.098)	(0.181)
Age	-2.542***	-1.261	1.037
	(0.772)	(0.845)	(1.770)
Age²	0.370**	0.243	-0.247
	(0.180)	(0.185)	(0.420)
Age³	-0.016	-0.010	0.023
	(0.013)	(0.013)	(0.032)
Education	0.068***	-0.017	-0.032
	(0.022)	(0.028)	(0.047)
Number of observations	16,676	10,231	3,127

*** = 1 % significance ** = 5 % significance *=10% significance

Summary statistics

Table 10.1: Empirical distribution of the number of conditions in wave 6 (2009)

#conditions	Total sample (*N*=23,392)			Self-employed sample (*N*=2,604)			Wageworker sample (*N*=17,351)		
	Count	Percent	Cum.	Count	Percent	Cum.	Count	Percent	Cum.
0	11,205	47.90	47.90	1,305	50.12	50.12	9,172	52.86	52.86
1	6,285	26.87	74.77	761	29.33	79.34	4,808	27.71	80.57
2	3,073	13.14	87.91	293	11.25	90.59	2,147	12.37	92.95
3	1,450	6.20	94.10	134	5.15	95.74	820	4.73	97.67
4	739	3.16	97.26	89	3.42	99.16	233	1.34	99.01
5	352	1.50	98.77	11	0.42	99.58	114	0.66	99.67
6	154	0.66	99.43	9	0.35	99.92	38	0.22	99.89
7	103	0.44	99.87	2	0.08	100.00	14	0.08	99.97
8	30	0.13	100.00	-			4	0.02	99.99
9	-			-			-		
10	1	0.00	100.00	-			1	0.01	100.00
11	-			-					
Total	23,392	100.00		2,604	100.00		17,351	100.00	

Table 10.2: Empirical distribution of the number of conditions in wave 5 (2007)

#conditions	Total sample (*N*=22,018)			Self-employed sample (*N*=2,362)			Wageworker sample (*N*=16,567)		
	Count	Percent	Cum.	Count	Percent	Cum.	Count	Percent	Cum.
0	10,584	48.07	48.07	1,191	50.42	50.42	8,844	53.38	53.38
1	5,895	26,77	74.84	685	29.00	79.42	4,545	27.43	80.82
2	2,920	13,26	88.11	301	12.74	92.17	2,020	12.19	93.01
3	1,426	6.48	94.58	119	5.04	97.21	783	4.73	97.74
4	581	2.64	97.22	41	1.74	98.92	232	1.40	99.14
5	323	1.47	98.69	20	0.85	99.79	90	0.54	99.68
6	180	0.82	99.50	4	0.17	99.96	38	0.23	99.91
7	71	0.32	99.83	-			12	0.07	99.92
8	24	0.11	99.94	-			2	0.02	100.00
9	11	0.05	99.99	1	0.04	100.00			
10	3	0.01	100.00	-					
11	-			-					
Total	22,018			2,362	2,362	100.00		16,567	100.00

Table 10.3: Empirical distribution of the number of conditions in wave 4 (2005)

#conditions	Total sample (*N*=21,929)			Self-employed sample (*N*=2,385)			Wageworker sample (*N*=16,249)		
	Count	Percent	Cum.	Count	Percent	Cum.	Count	Percent	Cum.
0	10,851	49.48	49.49	1,263	52,96	52.96	8.930	54.96	54.96
1	5,700	25.99	75.48	633	26.54	79.50	4,468	27.50	82.45
2	2,537	11.57	87.04	251	10.52	90.02	1,675	10.31	92.76
3	1,439	6.81	93.85	160	6.71	96.73	769	4.73	97.50
4	715	3.26	97.11	51	2.14	98.87	277	1.70	99.20
5	338	1.54	98.65	10	0.42	99.29	89	0.55	99.75
6	182	0.83	99.48	9	0.38	99.66	38	0.23	99.98
7	77	0.35	99.84	-			3	0.02	100.00
8	29	0.13	99.97	8	0.34	100.00	-		
9	7	0.03	100.00	-			-		
10	-			-			-		
11	-			-			-		
Total	21,929	100.00		2,385	100.00		16,249	100.00	

Table 10.4: Empirical distribution of the number of conditions in wave 3 (2003)

#conditions	Total sample (*N*=20,875)			Self-employed sample (*N*=2,217)			Wageworker sample (*N*=15,685)		
	Count	Percent	Cum.	Count	Percent	Cum.	Count	Percent	Cum.
0	11,786	56.46	56.46	1,298	58.55	58.55	9,742	62.11	62.11
1	5,041	24.15	80.61	604	27.24	85.79	3,792	24.18	86,29
2	2,200	10.54	91.15	183	8.25	94.05	1,419	9.05	95.33
3	984	4.71	95.86	78	3.52	97.56	465	2.96	98.30
4	467	2.24	98.10	41	1.85	99.41	174	1.11	99.41
5	257	1.23	99.33	11	0.50	99.91	71	0.45	99.86
6	89	0.43	99.76	2	0.09	100.00	10	0.06	99.92
7	30	0.14	99.90	-			11	0.07	99.99
8	18	0.09	99.99	-			-	-	-
9	2	0.01	100.00	-			-	-	-
10	-	-	-	-			-	-	-
11	1	0	100.00	-			1	0.01	100.00
Total	20,875	100.00		2,217			15,685	100.00	

Table 10.5 Empirical distribution of the number of conditions in wave 2 (2001)

#conditions	Total sample (*N=20,026*)			Self-employed sample (*N=2,045*)			Wageworker sample (*N=14,085*)		
	Count	Percent	Cum.	Count	Percent	Cum.	Count	Percent	Cum.
0	11,661	58.23	58.23	1,307	63.91	63.91	9,092	64.55	64.55
1	4,835	24.14	82.37	468	22.89	86.80	3,437	24.40	88.95
2	1,898	9.48	91.85	174	8.51	95.31	1,061	7.53	96.49
3	831	4.15	96.00	64	3.13	98.44	320	2.27	98.76
4	479	2.39	98.39	17	0.83	99.27	154	1.09	99.85
5	175	0.87	99.27	13	0.64	99.90	15	0.11	99.96
6	100	0.50	99.77	2	0.10	100.00	3	0.02	99.98
7	35	0.17	99.94	-	-	-	3	0.02	10.00
8	10	0.05	99.99	-	-	-	-		
9	2	0.01	100.00	-	-	-	-		
10	-	-		-	-	-	-		
11	-	-		-	-	-	-		
Total	20,026	100.00		2,045			14,085	100.00	

Table 10.6 Empirical distribution of the number of conditions in wave 1 (1999)

#conditions	Total sample (*N=19,749*)			Self-employed sample (*N=1,986*)			Wageworker sample (*N=13,877*)		
	Count	Percent	Cum.	Count	Percent	Cum.	Count	Percent	Cum.
0	11,905	60.28	60.28	1,279	64.40	64.40	9,379	67.59	67.59
1	4,492	22.75	83.03	472	23.77	88.17	3,117	22.46	90.05
2	1,834	9.29	92.31	163	8.21	96.37	969	6.98	97.03
3	794	4.02	96.33	45	2.27	98.64	260	1.87	98.90
4	399	2.02	99.35	17	0.86	99.50	109	0.79	99.69
5	188	0.95	99.31	8	0.40	99.90	33	0.24	99.93
6	81	0.41	99.72	2	0.10	100.00	7	0.05	99.98
7	34	0.17	99.89	-			2	0.01	99.99
8	11	0.06	99.94	-			1	0.01	100.00
9	7	0.04	99.98	-			-		
10	4	0.02	100.00	-			-		
11	-	-	-	-			-		
Total	19,749	100.00		1,986	100.00		13,877	100.00	

Table 11.1: Mean and standard deviation (in parentheses) of data from wave 6

	Total sample (*N*= 23,392 individuals)		Self-employed Sample (*N*=2,604)		wageworkers Sample (*N*=17,351)	
Self-employed (0=no, 1=yes)	0.130	(0.337)	1.000	(0.000)	0.000	(0.000)
Age (in decades)	4.312	(1.420)	4.476	(1.254)	4.023	(1.182)
Gender (0=female, 1=male)	0.743	(0.437)	0.832	(0.374)	0.754	(0.431)
Education (Years)	9.127	(6.403)	9.252	(6.492)	9.007	(6.533)
Having a health condition (0= no condition, 1= a condition)	0.522	(0.500)	0.500	(0.500)	0.472	(0.500)
Declining self-reported health (0=same or better, 1=declining health)	0.142	(0.143)	0.150	(0.358)	0.116	(0.320)
Mental Health (0=good, 1=bad)	0.037	(0.190)	0.040	(0.195)	0.028	(0.164)
Number of health conditions (min=0, max=11)	1.000	(1.332)	0.856	(1.135)	0.774	(1.056)
Individual conditions						
Stroke (0=no, 1=yes)	0.025	(0.157)	0.013	(0.112)	0.013	(0.111)
Heart attack (0=no, 1=yes)	0.033	(0.179)	0.026	(0.158)	0.018	(0.134)
Heart disease (0=no, 1=yes)	0.038	(0.192)	0.032	(0.175)	0.020	(0.139)
Asthma (0=no, 1=yes)	0.101	(0.301)	0.090	(0.286)	0.095	(0.293)
Lung disease (0=no, 1=yes)	0.038	(0.192)	0.028	(0.165)	0.030	(0.170)
Diabetes (0=no, 1=yes)	0.086	(0.281)	0.056	(0.231)	0.068	(0.251)
Arthritis (0=no, 1=yes)	0.131	(0.338)	0.104	(0.306)	0.091	(0.287)
Memory loss (0=no, 1=yes)	0.014	(0.116)	0.008	(0.092)	0.005	(0.069)
Hypertension (0=no, 1=yes)	0.28	(0.451)	0.243	(0.430)	0.240	(0.427)
Cancer (0=no, 1=yes)	0.043	(0.204)	0.055	(0.229)	0.028	(0.166)
Psychological problems (0=no, 1=yes)	0.070	(0.255)	0.064	(0.245)	0.055	(0.228)
Other condition (0=no, 1=yes)	0.136	(0.343)	0.137	(0.344)	0.113	(0.318)

Table 11.2: Mean and standard deviation (in parentheses) of data from wave 5

	Total sample (*N= 22,018 individuals*)		Self-employed Sample (*N=2,362*)		wageworkers Sample (*N=16,567*)	
Self-employed (0=no, 1=yes)	0.125	(0.330)	1.000	(0.000)	0.000	(0.000)
Age (in decades)	4.308	(1.414)	4.506	(1.228)	4.010	(1.169)
Gender (0=female, 1=male)	0.740	(0.439)	0.855	(0.352)	0.750	(0.433)
Education (Years)	8.78	(6.354)	9.359	(6.353)	8.601	(6.463)
Having a health condition (0= no condition, 1= a condition)	0.520	(0.500)	0.497	(0.500)	0.467	(0.499)
Declining self-reported health (0=same or better, 1=declining health)	0.143	(0.350)	0.128	(0.334)	0.123	(0.328)
Mental Health (0=good, 1=bad)	0.037	(0.190)	0.026	(0.160)	0.031	(0.173)
Number of health conditions (min=0, max=11)	0.992	(1.327)	0.822	(1.078)	0.763	(1.046)
Individual conditions						
Stroke (0=no, 1=yes)	0.024	(0.154)	0.010	(0.100)	0.013	(0.112)
Heart attack (0=no, 1=yes)	0.036	(0.186)	0.030	(0.170)	0.020	(0.139)
Heart disease (0=no, 1=yes)	0.039	(0.195)	0.037	(0.188)	0.020	(0.140)
Asthma (0=no, 1=yes)	0.095	(0.293)	0.083	(0.275)	0.091	(0.288)
Lung disease (0=no, 1=yes)	0.040	(0.197)	0.036	(0.187)	0.029	(0.167)
Diabetes (0=no, 1=yes)	0.086	(0.281)	0.058	(0.234)	0.069	(0.253)
Arthritis (0=no, 1=yes)	0.132	(0.339)	0.109	(0.312)	0.090	(0.286)
Memory loss (0=no, 1=yes)	0.014	(0.118)	0.002	(0.046)	0.004	(0.06)
Hypertension (0=no, 1=yes)	0.277	(0.447)	0.234	(0.424)	0.235	(0.424)
Cancer (0=no, 1=yes)	0.043	(0.204)	0.056	(0.231)	0.027	(0.161)
Psychological problems (0=no, 1=yes)	0.063	(0.243)	0.043	(0.203)	0.049	(0.216)
Other condition (0=no, 1=yes)	0.144	(0.351)	0.124	(0.330)	0.120	(0.325)

Table 11.3: Mean and standard deviation (in parentheses) of data from wave 4

	Total sample (*N*= 21,929 individuals)		Self-employed Sample (*N*=2,385)		wageworkers Sample (*N*=16,249)	
Self-employed (0=no, 1=yes)	0.128	(0.334)	1.000	(0.000)	0.000	(0.000)
Age (in decades)	4.353	(1.430)	4.467	(1.224)	4.036	(1.142)
Gender (0=female, 1=male)	0.742	(0.438)	0.871	(0.335)	0.756	(0.430)
Education (Years)	8.721	(6.317)	9.047	(6.426)	8.592	(6.431)
Having a health condition (0= no condition, 1= a condition)	0.507	(0.500)	0.472	(0.499)	4.518	(0.498)
Declining self-reported health (0=same or better, 1=declining health)	0.152	(0.359)	0.156	(0.363)	0.123	(0.328)
Mental Health (0=good, 1=bad)	N.A		N.A		N.A	
Number of health conditions (min=0, max=11)	0.991	(1.357)	0.833	(1.181)	0.734	(1.038)
Individual conditions						
Stroke (0=no, 1=yes)	0.026	(0.160)	0.014	(0.119)	0.010	(0.101)
Heart attack (0=no, 1=yes)	0.037	(0.190)	0.036	(0.188)	0.018	(0.132)
Heart disease (0=no, 1=yes)	0.065	(0.247)	0.058	(0.235)	0.037	(0.188)
Asthma (0=no, 1=yes)	0.092	(0.289)	0.071	(0.258)	0.088	(0.283)
Lung disease (0=no, 1=yes)	0.036	(0.187)	0.023	(0.149)	0.027	(0.162)
Diabetes (0=no, 1=yes)	0.085	(0.279)	0.052	(0.222)	0.066	(0.248)
Arthritis (0=no, 1=yes)	0.144	(0.351)	0.121	(0.326)	0.098	(0.298)
Memory loss (0=no, 1=yes)	0016	(0.124)	0.011	(0.106)	0.004	(0.063)
Hypertension (0=no, 1=yes)	0.252	(0.434)	0.240	(0.427)	0.204	(0.403)
Cancer (0=no, 1=yes)	0.041	(0.199)	0.042	(0.202)	0.025	(0.155)
Psychological problems (0=no, 1=yes)	0.060	(0.237)	0.044	(0.205)	0.044	(0.205)
Other condition (0=no, 1=yes)	0.139	(0.346)	0.121	(0.327)	0.114	(0.318)

Table 11.4: Mean and standard deviation (in parentheses) of data from wave **3**

	Total sample (*N*= 20,875 individuals)		Self-employed Sample (*N*=2,217)		wageworkers Sample (*N*=15,685)	
Self-employed (0=no, 1=yes)	0.124	(0.329)	1.000	(0.000)	0.000	(0.000)
Age (in decades)	4.335	(1.363)	4.531	(1.145)	4.034	(1.093)
Gender (0=female, 1=male)	0.747	(0.434)	0.859	(0.348)	0.761	(0.426)
Education (Years)	8.668	(6.301)	9.175	(6.428)	8.515	(6.403)
Having a health condition (0= no condition, 1= a condition)	0.437	(0.496)	0.415	(0.493)	0.380	(0.485)
Declining self-reported health (0=same or better, 1=declining health)	0.122	(0.327)	0.119	(0.323)	0.098	(0.298)
Mental Health (0=good, 1=bad)	0.040	(0.197)	0.025	(0.156)	0.031	(0.174)
Number of health conditions (min=0, max=11)	0.789	(1.193)	0.649	(0.988)	0.588	(0.938)
Individual conditions						
Stroke (0=no, 1=yes)	0.022	(0.147)	0.005	(0.073)	0.012	(0.107)
Heart attack (0=no, 1=yes)	0.033	(0.178)	0.024	(0.154)	0.018	(0.133)
Heart disease (0=no, 1=yes)	0.055	(0.229)	0.048	(0.214)	0.033	(0.179)
Asthma (0=no, 1=yes)	0.073	(0.260)	0.059	(0.235)	0.068	(0.252)
Lung disease (0=no, 1=yes)	0.033	(0.178)	0.0189	(0.136)	0.026	(0.158)
Diabetes (0=no, 1=yes)	0.081	(0.272)	0.066	(0.248)	0.062	(0.242)
Arthritis (0=no, 1=yes)	0.147	(0.355)	0.131	(0.337)	0.101	(0.302)
Memory loss (0=no, 1=yes)	0.013	(0.114)	0.004	(0.060)	0.004	(0.064)
Hypertension (0=no, 1=yes)	0.239	(0.426)	0.227	(0.419)	0.196	(0.397)
Cancer (0=no, 1=yes)	0.035	(0.185)	0.038	(0.191)	0.020	(0.139)
Psychological problems (0=no, 1=yes)	0.060	(0.238)	0.028	(0.166)	0.050	(0.217)
Other condition (0=no, 1=yes)	N.A		N.A		N.A	

Table 11.5: Mean and standard deviation (in parentheses) of data from wave 2

	Total sample (*N*= 20,026 individuals)		Self-employed Sample (*N*=2,045)		wageworkers Sample (*N*=14,085)	
Self-employed (0=no, 1=yes)	0.127	(0.333)	1.000	(0.000)	0.000	(0.000)
Age (in decades)	4.321	(1.341)	4.482	(1.111)	4.021	(1.031)
Gender (0=female, 1=male)	0.758	(0.429)	0.903	(0.296)	0.783	(0.412)
Education (Years)	8.511	(6.282)	8.929	(6.520)	8.401	(6.389)
Having a health condition (0= no condition, 1= a condition)	0.421	(0.494)	0.362	(0.481)	0.358	(0.479)
Declining self-reported health (0=same or better, 1=declining health)	N.A		N.A		N.A	
Mental Health (0=good, 1=bad)	0.038	(0.191)	0.018	(0.133)	0.029	(0.168)
Number of health conditions (min=0, max=11)	0.742	(1.162)	0.564	(0.928)	0.515	(0.841)
Individual conditions						
Stroke (0=no, 1=yes)	0.021	(0.142)	0.011	(0.103)	0.007	(0.085)
Heart attack (0=no, 1=yes)	0.037	(0.188)	0.032	(0.177)	0.018	(0.132)
Heart disease (0=no, 1=yes)	0.051	(0.221)	0.039	(0.193)	0.026	(0.159)
Asthma (0=no, 1=yes)	0.072	(0.259)	0.056	(0.230)	0.066	(0.249)
Lung disease (0=no, 1=yes)	0.036	(0.187)	0.019	(0.137)	0.023	(0.149)
Diabetes (0=no, 1=yes)	0.075	(0.264)	0.056	(0.230)	0.056	(0.230)
Arthritis (0=no, 1=yes)	0.141	(0.348)	0.115	(0.319)	0.090	(0.287)
Memory loss (0=no, 1=yes)	0.013	(0.113)	0.009	(0.094)	0.002	(0.44)
Hypertension (0=no, 1=yes)	0.222	(0.416)	0.182	(0.386)	0.182	(0.386)
Cancer (0=no, 1=yes)	0.035	(0.183)	0.024	(0.153)	0.020	(0.141)
Psychological problems (0=no, 1=yes)	0.044	(0.206)	0.023	(0.150)	0.030	(0.170)
Other condition (0=no, 1=yes)	N.A		N.A		N.A	

Table 11.6: Mean and standard deviation (in parentheses) of data from wave 1

	Total sample (*N*= 15,863 individuals)		Self-employed Sample (*N*=1,986)		wageworkers Sample (*N*=13,877)	
Self-employed (0=no, 1=yes)	0.125	(0.331)	1.000	(0.000)	0.000	(0.000)
Age (in decades)	4.300	(1.377)	4.418	(1.093)	3.958	(1.009)
Gender (0=female, 1=male)	0.746	(0.435)	0.880	(0.325)	0.779	(0.415)
Education (Years)	8.363	(6.298)	8.978	(6.479)	8.282	(6.410)
Having a health condition (0= no condition, 1= a condition)	0.399	(0.490)	0.356	(0.479)	0.326	(0.469)
Declining self-reported health (0=same or better, 1=declining health)	N.A		N.A		N.A	
Mental Health (0=good, 1=bad)	N.A		N.A		N.A	
Number of health conditions (min=0, max=11)	0.709	(1.156)	0.530	(0.874)	0.468	(0.817)
Individual conditions						
Stroke (0=no, 1=yes)	0.023	(0.150)	0.004	(0.063)	0.007	(0.086)
Heart attack (0=no, 1=yes)	0.037	(0.189)	0.029	(0.167)	0.017	(0.128)
Heart disease (0=no, 1=yes)	0.054	(0.226)	0.038	(0.191)	0.028	(0.164)
Asthma (0=no, 1=yes)	0.063	(0.243)	0.051	(0.221)	0.057	(0.231)
Lung disease (0=no, 1=yes)	0.033	(0.179)	0.022	(0.146)	0.020	(0.141)
Diabetes (0=no, 1=yes)	0.065	(0.246)	0.058	(0.214)	0.046	(0.208)
Arthritis (0=no, 1=yes)	0.136	(0.342)	0.122	(0.327)	0.087	(0.282)
Memory loss (0=no, 1=yes)	0.014	(0.118)	0.009	(0.092)	0.003	(0.056)
Hypertension (0=no, 1=yes)	0.210	(0.407)	0.158	(0.365)	0.162	(0.368)
Cancer (0=no, 1=yes)	0.031	(0.174)	0.029	(0.167)	0.015	(0.122)
Psychological problems (0=no, 1=yes)	0.046	(0.209)	0.022	(0.146)	0.029	(0.169)
Other condition (0=no, 1=yes)	N.A		N.A		N.A	

Figure 3.1: Histogram with the age distribution in the total sample of wave 7
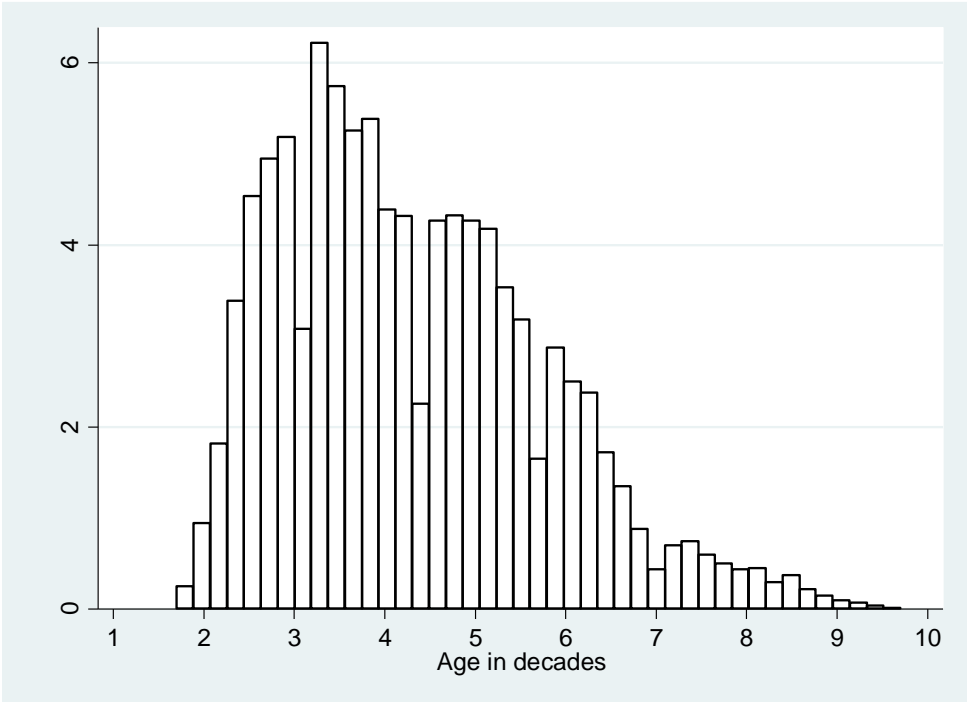

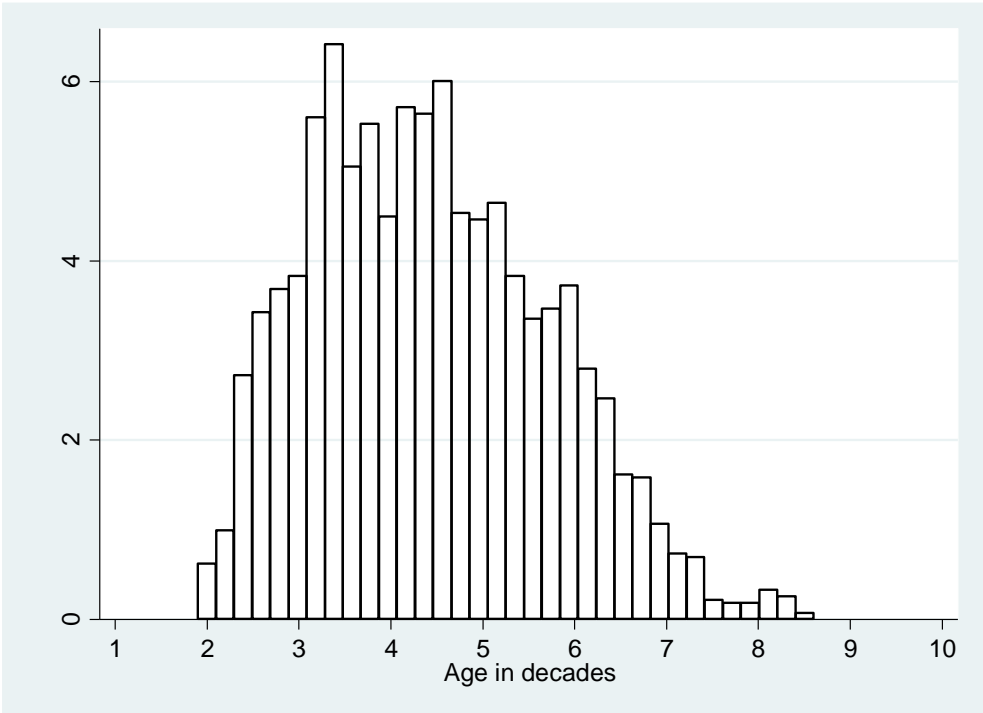**Figure 3.2:** Histogram with age distribution for the self-employed sample in wave 7

Figure 3.3: Histogram for age distribution for the wageworkers sample in wave 7