Switching to self-employment can be good for your health

Nikolova, Milena

Published in:
Journal of Business Venturing

DOI:
10.1016/j.jbusvent.2018.09.001

Publication date:
2019

Journal of Business Venturing 34 (2019) 664–691

Contents lists available at ScienceDirect

Journal of Business Venturing

journal homepage: www.elsevier.com/locate/jbusvent

Switching to self-employment can be good for your health☆

Milena Nikolova

University of Groningen, Faculty of Economics and Business, Global Economics and Management, Nettelbosje 2, 9747 AE Groningen, the Netherlands

ARTICLE INFO

Keywords:
Mental health
Physical health
Self-employment
Difference-in-differences

JEL codes:
I10
J01
L26

ABSTRACT

Relying on theoretical insights from the Job Demand-Control model, which links occupational characteristics to health, this paper provides the first causal evidence of the physical and mental health consequences of self-employment. I utilize German longitudinal data for the period 2002–2014 and difference-in-differences estimations to study switches from unemployment to self-employment (necessity entrepreneurship) and transitions from regular- to self-employment (opportunity entrepreneurship). I find that necessity entrepreneurs experience improvements in their mental but not physical health, while opportunity entrepreneurship leads to both physical and mental health gains. Importantly, the health improvements cannot be explained by changes in income or working conditions and are not driven by personality and risk preferences or the local unemployment conditions. As such, the findings highlight an additional non-monetary benefit of self-employment and have implications for entrepreneurship theory and practice, current and would-be entrepreneurs, as well as policy-makers.

1. Executive summary

A myriad of studies documents that the self-employed are more satisfied with their jobs compared to similar regular employees. This job satisfaction premium is often attributed to the utility that entrepreneurs derive from having flexibility and autonomy (Benz and Frey, 2008a, 2008b; Hundley, 2001). Against this backdrop, the question of how self-employment affects physical and mental health has received relatively less attention in the literature (Shepherd and Patzelt, 2015, 2017) and to date, no studies address the causality issue. This paper fills this gap. Specifically, drawing upon the Job Demand and Control model (Karasek, 1979; Theorell and Karasek, 1996), which broadly links occupational characteristics to health, and relying on German panel data, I furnish a causal estimate of the mental and physical consequences of switching to entrepreneurship. A key feature of this research is the distinction I make between individuals who transition from unemployment to self-employment and those who were initially private sector employees and then started a business.

I find that necessity entrepreneurs (i.e., those who switch from unemployment to self-employment) experience improvements in their mental but not physical health, while opportunity entrepreneurship (i.e., transitions from regular employment to self-

☆ The first version of this paper appeared as GLO Discussion Paper No. 226 and should be replaced with the current version. I am extremely grateful to Johannes Kleinhempel, Boris Nikolaev, Olga Popova, Jenny Kragl, Clemens Buchen, Martin Binder, Ricardo Mora, Rasmus Wiese, and the participants at the Entrepreneurship and Well-being Workshop in Steninge, Sweden, as well as Research Seminar participants at the Global Economics and Management Seminar at the University of Groningen, IOS Regensburg, and the European Business School, Wiesbaden for helpful comments, suggestions, and critiques. Help locating relevant literature from Margard Ody and copy-editing support from Richard Forsythe on an earlier version of this paper are also acknowledged. The author is also very grateful to the data services of the IDSC of IZA for access to the German Socio-Economics Panel dataset. The first draft of this paper was written while the author was a Research Associate at IZA and revised at the University of Groningen. All errors are the author's.

E-mail address: m.v.nikolova@rug.nl.

https://doi.org/10.1016/j.jbusvent.2018.09.001
Received 9 June 2017; Received in revised form 27 July 2018; Accepted 7 September 2018
Available online 17 September 2018
0883-9026/

employment) leads to both physical and mental health gains. Importantly, the health improvements cannot be explained by changes in income or the working conditions alone and are not driven by personality, risk preferences, or the local unemployment conditions. As such, the results highlight the non-pecuniary benefits of entrepreneurship.

My findings suggest that because self-employment is conducive to better health outcomes, policy instruments such as start-up grants can also indirectly improve mental and physical health outcomes in society. Given that self-employment is about 10% of total employment in Germany (OECD, 2017) —the country of focus in this paper—and that about 5% of the population is the owner/manager of a new enterprise or in the process of starting a business (GEM, 2018), the results have implications for entrepreneurs, would-be entrepreneurs, and policymakers.

This study's contributions to the literature are four-fold. First, I add to the emerging scholarship on the health consequences of self-employment by examining physical and mental health outcomes side-by-side. Second, I theoretically and empirically highlight importance of heterogeneity by focusing on switches to self-employment from two different initial labor market states: unemployment and regular paid employment. Third, I utilize a methodologically robust approach that allows me to offer a causal estimate of the health consequences of entrepreneurship in the short run. Finally, the paper finds support for theoretical predictions of the Job Demand-Control model and extends our understanding of the nexus between entrepreneurship and well-being.

2. Introduction

Studies in economics, psychology, and entrepreneurship have documented that the self-employed have higher job satisfaction than similar regular workers. This finding holds even after controlling for income (Binder and Coad, 2013, 2016; Blanchflower and Oswald, 1998; Nikolova and Graham, 2014), occupation, and skill differences (Hessels et al., 2017a). Scholars attribute this job satisfaction premium to the non-pecuniary benefits of doing interesting work and the autonomy that often come with being one's own boss (Benz and Frey, 2008a, 2008b; Hundley, 2001).

Nonetheless, the question of how self-employment affects physical and mental health has received relatively less attention in the literature (Shepherd and Patzelt, 2015, 2017).[1] Theoretically, it is possible that self-employment hinders or improves health, or that it affects mental and physical health differentially. Empirically testing the net physical and mental health effects of the channels associated with necessity and opportunity entrepreneurship is this paper's main aim.

On the one hand, the self-employed may derive psychological benefits from having greater autonomy and being their own boss. Given the link between mental and physical health (Robson and Gray, 2007), the psychological benefits from autonomy and self-actualization could also translate into improved physical health. In addition, the self-employed's flexible work schedules could accommodate health-enhancing behaviors such as practicing sports or going to the doctor. At the same time, self-employment could compromise physical and mental health through the long working hours, time pressure, stress, and decreased socialization.

The labor market status before starting a new business also likely plays a role for entrepreneurship's health consequences. First, given the high psychological costs of unemployment (Kuhn, Lalive, & Zweimüller, 2009; Winkelmann, 2014), *necessity* entrepreneurs escaping the precariousness of joblessness likely benefit in terms of psychological health. At the same time, the unemployed also give up leisure time when they become entrepreneurs and may thus have less time to pursue health-enhancing, which could worsen their physical health. The long working hours associated with self-employment and the reduction in leisure time could damage physical health (Taris, Geurts, Schaufeli, Blonk, & Lagerveld, 2008). Nevertheless, given that unemployment leads to smoking, drinking, and weight gain (Deb et al., 2011; Marcus, 2014), switching to self-employment could improve physical health if it uproots unhealthy habits or entails job-related physical activity. Thus, the effects of entrepreneurship on physical health are nuanced and depend on whether the positive or negative mechanisms dominate, which I test empirically.

Second, *opportunity* entrepreneurship may improve mental health if it brings autonomy and flexibility. In addition, these mental health benefits from the "procedural utility" (Benz and Frey, 2008a, 2008b), i.e., the utility from the process of being an entrepreneur, likely bring physical health benefits, given that psychological health is associated with physical well-being.[2]

This paper contributes to the literature on the well-being consequences of entrepreneurship (Andersson, 2008; Baron et al., 2016; Patzelt and Shepherd, 2011; Shir, 2015; Uy et al., 2013) and the scholarship on entrepreneurship and health (Rietveld, Kippersluis, & Thurik, 2015; Shepherd and Patzelt, 2015, 2017; Stephan and Roesler, 2010). Drawing upon theoretical perspectives from the Job Demand-Control model (Karasek, 1979; Theorell and Karasek, 1996), and relying on German panel data, this paper furnishes the first causal estimate of the mental and physical consequences of self-employment. In particular, using difference-in-differences (DID) applied after a novel non-parametric matching technique called entropy balancing (Hainmueller, 2012), I find that self-employment improves mental and, in some cases, physical health. Individuals who transition from

[1] At the outset, I point out that throughout this paper, I use the terms "entrepreneurship" and "self-employment" synonymously and that self-employment is used to operationalize the concept of entrepreneurship. The operationalization of the concept varies across the disciplines and is often constrained by data availability (Parker, 2009). For example, business scholars define entrepreneurship in terms of opportunity recognition and venture creation (Parker, 2009; Reynolds et al., 2005; Shir, 2015), especially in conditions of uncertainty (McMullen and Shepherd, 2006). In contrast, economists view entrepreneurship in terms of self-employment and business ownership. For a historical view on the definition and conceptualization of entrepreneurship in economics see van Praag (1999) and Hébert and Link (1989). The Global Entrepreneurship Monitor (GEM) defines entrepreneurs as the creators of new ventures within the last 42 months. Yet, even this definition is problematic. Parker (2009) furnishes further details and nuances as well as discusses the main critiques of the frequently used definitions of entrepreneurship.

[2] Nevertheless, opportunity entrepreneurship could also have negative consequences associated with stress and exhaustion. See Sections 3 and 4 below.

unemployment to self-employment (necessity entrepreneurs) realize large mental health gains but no overall physical health improvements, while switching from regular employment to self-employment (opportunity entrepreneurship) improves both physical and mental health, with the latter gains being larger. I do not find any heterogeneity according to whether the self-employed have employees or not, a result which deserves further exploration. Moreover, the health effects cannot be explained by changes in the household's financial situation or the self-employee's working conditions and are not driven by personality traits, risk preferences, and local unemployment conditions.

Studying the health-entrepreneurship nexus is policy-relevant for several reasons. First, entrepreneurship is important for economic growth and innovation (Kritikos, 2014; van Praag and Versloot, 2007).[3] Second, if self-employment is also conducive to better health outcomes, then policy instruments such as start-up grants that stimulate entrepreneurship can also improve health outcomes in society.

3. Theoretical background

3.1. The job demand-control model

The Job Demand-Control model (Karasek, 1979; Theorell and Karasek, 1996) furnishes a theoretical lens for conceptualizing self-employment's health implications. Broadly conceived, it postulates that a mismatch between *job demands* (perceived work intensity, time stress, workload, and conflicting demands) and *job control* (perceived control and authority over work and skill development) determines *job strain*, which influences health and longevity. Thus, the model's key implication is that combinations of job demands and job control result in different health outcomes. In particular, the concurrence of high job demands and low job control results in high psychological strain and illness (the "high strain" hypothesis) (Karasek, 1979; Theorell and Karasek, 1996). In fact, chronic stress could lead to behavioral and psychological responses that damage organs and tissues, thus predisposing individuals to physical conditions such as hypertension, myocardial infarction, diabetes, ulcers, arthritis (McEwen, 2005; McEwen and Stellar, 1993; O'leary, 1990; Stephan and Roesler, 2010), and potentially mental disorders through increased cortisol levels (McEwen, 2000).

In contrast, the combination of high job demands and high decision control ("active jobs") leads to "desirable stress" (eustress) as it allows the worker to learn and better him/herself, develop new skills, and provides a feeling of mastery (Hessels et al., 2017b; Stephan and Roesler, 2010; Theorell and Karasek, 1996).[4] Eustress may increase coping behavior or lead to biochemical and hormonal changes, which can improve health (Edwards and Cooper, 1988; Simmons and Nelson, 2001). Active jobs allow respondents to experience simultaneously high stress and high enjoyment, which may lead to physiological reactions such as short-term energy boosts, which may be associated with certain positive health outcomes (Stephan and Roesler, 2010). Thus, entrepreneurs, who are "prototypes" of individuals working in active jobs, should experience better health compared with regular employees (Stephan and Roesler, 2010).

3.2. Other channels through which self-employment can enhance health

The "active jobs" hypothesis is conceptually similar to "procedural utility", which posits that individuals value not only the end results but also the conditions and processes that generate these outcomes (Frey et al., 2004; Fuchs-Schündeln, 2009). For instance, research shows that freedom of choice is strongly related to happiness (Verme, 2009) and happiness is linked to health. Thus, the self-employed derive happiness from being able to do what they like. Given that there is a causal link from subjective well-being to health (De Neve et al., 2013), it may be that the well-being benefits derived from being one's own boss improve health. Specifically, given the evidence suggesting that mental health could influence physical health outcomes and life expectancy (Chang et al., 2011; Ohrnberger et al., 2017; Robson and Gray, 2007; Surtees et al., 2008), mental health benefits may translate into physical health.

Self-employment can also affect well-being through furnishing more room for health-enhancing behaviors. The entrepreneurial lifestyle may allow for flexible time organization and thus the ability to engage in physical exercise (Goldsby et al., 2005; Shepherd and Patzelt, 2017). Specifically, while entrepreneurs have a busy schedule, they may have control over the daily agenda and shift appointments or tasks around to allow for workouts, doctor visits, or healthy eating habits.

Nonetheless, self-employment could worsen health if it entails reduced socialization, loneliness, long working hours, and role ambiguity (Cardon and Patel, 2015). Specifically, if the self-employed derive procedural utility from their work, they will likely spend long hours on the job, thus reducing their own leisure time or even neglecting their physical and mental health. The self-employed may also and be unable to detach from work, which can lead to exhaustion, physical health complaints, and loss of sleep (Taris et al., 2008; van der Hulst, 2003). In line with this explanation, research shows, for example, that the self-employed work many hours and come home exhausted from work (Blanchflower, 2004). There could also be a blurring between the personal/family life and work life (Binder and Coad, 2016) and work-life conflict (Prottas and Thompson, 2006), which could lead to burnout and ill health. Furthermore, the self-employed likely face high job demands and time pressure, which may limit social activity and lead to isolation (Patzelt and Shepherd, 2011), especially if they work alone. Finally, because the self-employed often earn a lower income (Hamilton,

[3] For an overview of the arguments that entrepreneurship does not lead to growth and innovation, see Shane (2009).

[4] In addition, according to the Job Demand-Control model, jobs with low demands and low control are monotonous and carry health risks, while "low strain" jobs with high control and low job demands carry few health risks (Karasek, 1979; Stephan and Roesler, 2010; Theorell and Karasek, 1996).

2000), they might face financial limitations in terms of health investments such as purchasing healthy foods or paying for gym memberships.[5]

3.3. Self-employment and health: prior evidence

The literature examining the health consequences of entrepreneurship is still emerging (Shepherd and Patzelt, 2015, 2017). Moreover, studies present conflicting evidence: some contributions (Baron et al., 2016; Binder and Coad, 2016; Hessels et al., 2017b) document a positive relationship between health outcomes and entrepreneurship, while others find a negative one (Blanchflower, 2004; Buttner, 1992; Jamal, 1997).[6] Still others find a positive association between entrepreneurship and health in some dimensions, but a negative in others (Stephan and Roesler, 2010). These mixed findings are due to the choice of the countries and years, the divergent operationalizations of health, and the methodological limitations and the inability to tackle self-selection into entrepreneurship.[7]

Specifically for Germany,[8] using statistical matching, Binder and Coad (2016) find a positive link between being self-employed (rather than a regular employee) and subjective health during 1997–2010. Exploiting German cross-sectional data for the year 1998, Stephan and Roesler (2010) document that entrepreneurs have better health outcomes than employees in some dimensions (lower somatic and mental morbidity, blood pressure, hypertension and somatoform disorders), but do not differ from employees in others (e.g. diabetes, arthritis, back pain, stomach ulcers, neck pain, affective disorders, anxiety and substance abuse/depression). The self-employed also report higher life satisfaction as well as a lower number of sick days and physician visits compared with employees (Stephan and Roesler, 2010).

This paper builds upon the extant literature by investigating self-employment's mental and physical health consequences using a large representative panel dataset of working age adults in Germany and an empirical strategy that is superior to the prevailing cross-sectional methodologies. I also explore the differences across individuals switching from unemployment to entrepreneurship and individuals transitioning from regular employment to self-employment.

4. Hypotheses development

4.1. Necessity vs. opportunity entrepreneurs

Some individuals choose entrepreneurship to take advantage of business opportunities, while others start a business to escape the precariousness of unemployment (Parker, 2009). Thus, *necessity* entrepreneurs are those who have no other work alternatives, i.e. those who select self-employment to avoid unemployment. *Opportunity* entrepreneurs, who constitute about 75% of all entrepreneurs in Europe (GEM, 2018), choose to be self-employed to increase (rather than maintain) their income or to become independent (Desai, 2017). Thus, individuals who are pulled into self-employment (opportunity entrepreneurs) are likely to substantively differ from those pushed into entrepreneurship because of lack of better alternatives (Binder and Coad, 2013, 2016; Larsson and Thulin, 2017).

There are divergent operationalizations of the concepts of necessity and opportunity entrepreneurship (Fairlie and Fossen, 2018).[9] Contributions using the GEM cross-country data rely on self-reported questions asking respondents whether they engaged in the start-up activity to take advantage of a business opportunity or because of a lack of better work choices. However, this definition of opportunity vs. necessity entrepreneurship is problematic, as it is based on retrospective answers, which may reflect the business' ex-post success rather than the pre-startup-up motivations (Fairlie and Fossen, 2018).[10] Other studies define necessity entrepreneurs as

[5] Practically, the self-employed may also have worsened health insurance access (Hamilton, 2000). Yet, in Germany entrepreneurs are required to obtain health insurance.

[6] Buttner (1992) uses a sample of 112 managers and entrepreneurs in the US southeast. She discovers that entrepreneurs have lower job satisfaction and worse health outcomes (frequency of health problems multiplied by their severity). Jamal (1997) relies on a cross-sectional sample of 235 employed and self-employed Canadians in an unknown city and demonstrates that the self-employed experience higher job stress and psychosomatic stress than the non-self-employed. Furthermore, using an urban sample of Israeli men collected in 1984–5, Lewin-Epstein and Yuchtman-Yaar (1991) demonstrate that self-employment is associated with worse health outcomes such as stress and smoking but not in terms of BMI or health satisfaction.

[7] Rietveld et al. (2015) find that individual heterogeneity and the selection of healthier individuals into self-employment largely explain the positive cross-sectional findings between health and self-employment. If the self-selection is taken into account, the association between self-employment and self-reported health could even be negative.

[8] The self-employed experience more tiredness, yet fewer mental health problems than regular employees in Sweden (Andersson, 2008). Hessels et al. (2017b) reveal that the self-employed in Australia are less stressed than regular employees, a finding that also holds cross-sectionally in 61 countries.

[9] The necessity vs. opportunity entrepreneurship distinction may only be relevant in the short run. Over time, if individuals remain self-employed, they must be satisfied enough with their overall working conditions and as such cannot be classified as being necessity entrepreneurs, even if their venture started off this way (Kautonen and Palmroos, 2010).

[10] Larsson and Thulin (2017) demonstrate that opportunity entrepreneurs are more satisfied with their lives compared to employees, while the opposite conclusion holds for necessity entrepreneurs. In addition, Kautonen and Palmroos (2010) reveal that starting a business out of necessity rather than opportunity is linked with slightly lower satisfaction with self-employment in Finland. Specifically for Germany, Block and Koellinger (2009) show that relative to those who became entrepreneurs because of both opportunity and necessity reasons (the reference category), necessity entrepreneurs are less satisfied with their startup, while opportunity entrepreneurs are more satisfied.

individuals who transition from unemployment to self-employment and opportunity entrepreneurship as those who switch from regular paid employment to self-employment (Binder and Coad, 2013, 2016; Block and Sandner, 2009; Fairlie and Fossen, 2018).[11]

Whether one becomes self-employed to escape unemployment or to pursue one's business ideas could have implications for health. First, the expected health consequences of self-employment for *necessity* entrepreneurs are likely to be nuanced. A large body of literature shows that the unemployed suffer large and lasting decreases in their subjective well-being and mental health (Kuhn et al., 2009; Winkelmann, 2014).[12] These well-being declines are not due to the loss of income but rather to the fact that by being unemployed, one cannot comply with the social norm to work (Chadi and Hetschko, 2017a; Hetschko et al., 2014; van Hoorn and Maseland, 2013; Winkelmann, 2014). Moreover, unemployment is a traumatic experience as it brings insecurity: past joblessness increases the risk and fear of future unemployment, which reduces psychological well-being (Knabe and Rätzel, 2011). Thus, switching from unemployment to self-employment likely brings mental health benefits through increasing self-esteem and the opportunity to comply with society's work norms and avoiding stigma associated with welfare receipt. The empirical evidence also suggests that the self-employed report that they perceive themselves to be *less* likely to lose their jobs (Blanchflower, 2004; Hetschko, 2016; Hundley, 2001; Millán et al., 2013). Thus, necessity entrepreneurs may also derive psychological benefits through the increased job security and knowledge that their fate is in their own hands. The mental health benefits of escaping the misery of unemployment, coupled with the procedural utility from being your own boss, likely result in mental health benefits for necessity entrepreneurs.

At the same time, the evidence on unemployment's physical health consequences is more mixed, with some studies finding no effects (Browning et al., 2006; Kuhn et al., 2009; Schmitz, 2011), while others reporting that job loss may lead to smoking, drinking, and weight gain (Deb et al., 2011; Marcus, 2014) and worse physical health (Black et al., 2015).[13] Therefore, after starting their own business, necessity entrepreneurs may abandon certain unhealthy habits such as smoking, drinking, and overeating, which should increase their physical health. At the same time, however, compared to being unemployed, working is associated with a decline in leisure, thus potentially leaving less time for exercise and increasing stress and exhaustion.[14] Thus, switching from unemployment to self-employment is unlikely to be associated with large physical health benefits.

Hypothesis 1a. Necessity entrepreneurs are expected to experience mental health benefits.

Hypothesis 1b. Necessity entrepreneurs are expected to experience few or no physical health improvements.

Furthermore, based on the active jobs and procedural utility arguments, it is reasonable to expect that opportunity entrepreneurship will improve mental health. Opportunity entrepreneurs may also experience physical health improvements through the flexibility to organize their work agenda and finding time for exercise or if the mental health improvements also lead to better physical health.

Hypothesis 2a. Opportunity entrepreneurs are expected to experience mental health benefits.

Hypothesis 2b. Necessity entrepreneurs are expected to experience physical health improvements.

5. Methods

5.1. Methodological challenges

Ideally, the causal effects of entrepreneurship on health would be identified using exogenous variation induced by randomly-assigned self-employment status. The randomization would ensure that the treated and control groups would have had similar health trajectories in the absence of the treatment, which would allow identifying the causal effects of self-employment on health by comparing the post-treatment health status of the treated and control groups. In the absence of randomization, the estimated effects contain the true treatment effects as well as selection bias—i.e. health differences that would have arisen even in the absence of switching into self-employment.

Credibly tackling methodological issues and thus unpacking the causal effects of entrepreneurship on health is challenging. First, unobserved traits such as risk tolerance and personality traits (e.g. openness and extroversion) (Caliendo, Fossen, & Kritikos, 2014) not only influence the self-employment decision, but also health behaviors (Cobb-Clark et al., 2014), and thus health outcomes.

[11] Only opportunity but not necessity entrepreneurs in Britain experience life satisfaction benefits up to two years after (Binder and Coad, 2013); similarly, only opportunity entrepreneurs in Germany are more satisfied with their jobs, lives, and health up to three years into self-employment (Binder and Coad, 2016). Satisfaction with leisure time declines more in the necessity than in the opportunity case, which may be due to the fact that while self-employment may bring job benefits for opportunity entrepreneurs, this job satisfaction may crowd out well-being in other domains (Binder and Coad, 2016).

[12] The individual psychological costs of unemployment also spill over to other family members (Bubonya et al., 2017; Marcus, 2013; Nikolova and Ayhan, 2018; Powdthavee and Vernoit, 2013).

[13] In addition, Gerdtham and Johannesson (2003) and Sullivan and Von Wachter (2009) find that unemployment increases mortality, which is a crude proxy for physical health.

[14] Practicing certain sports requires a financial investment such as purchasing equipment or paying a gym membership fee and the unemployment may participate in fewer of those activities. Nevertheless, sports such as walking, jogging, and biking are free of charge and may be taken up by the unemployed. To my knowledge, no papers examine the effects of unemployment on the sports activities of the unemployed.

Second, healthier or sicker individuals may choose to become self-employed, which poses self-selection problems (Rietveld et al., 2015). For example, if ill health makes it difficult to maintain a regular job, those with pre-existing mental and physical health conditions may become self-employed.[15] Alternatively, relatively healthy persons may choose to be self-employed as entrepreneurs only earn an income when they are able to work. Third, while entrepreneurship affects health, health also influences entrepreneurial outcomes, which results in reverse causality.

Addressing these issues with standard econometric techniques is non-trivial. Typical solutions for dealing with endogeneity with observational data include instrumental variable analyses, matching techniques, and natural experiments. Nevertheless, finding an instrument that is correlated with the decision to become self-employed but does not directly influence health outcomes is often impossible. Policy reforms regarding entrepreneurship that can be used as a natural experiment are also rare. Finally, while panel data (Hessels et al., 2017b; Rietveld et al., 2015) and propensity score matching (Binder and Coad, 2016) have helped deal with time-invariant unobservables and selection on observables, respectively, these techniques cannot eliminate all sources of bias.

5.2. Empirical strategy overview

Following several recent papers in the labor economics and health literatures (Chadi and Hetschko, 2017b; de Bruin et al., 2011; Freier et al., 2015; Hetschko et al., 2017; Kunze and Suppa, 2017; Marcus, 2013), this paper's empirical strategy is based on difference-in-differences (DID) applied after entropy balancing. Specifically, the method comprises two steps: (i) data pre-processing to create comparable groups of individuals switching from the same initial health and labor market state to self-employment using entropy balancing (Hainmueller, 2012); and (ii) estimating a weighted regression of the treatment (change in employment status) on the change in health status based on weights obtained in step 1.[16] The main advantage of combining entropy balancing with DID is that it allows to tackle time-invariant unobserved heterogeneity through the DID and selection on observables through the entropy balancing.[17]

First, the pre-processing step entails entropy balancing, which is a novel non-parametric technique allowing to achieve balance on the different moments of the covariate distribution. As such, it has some advantages over traditional matching methods such as propensity score matching (PSM) (Hainmueller, 2012). Specifically, entropy balancing is more efficient and reduces covariate imbalance. Unlike PSM, which requires an iterative trial and error process and researcher judgment regarding the tolerance levels and the inclusion of covariates, entropy balancing achieves covariate balance by weighting the sample units. The procedure allows obtaining covariate balance by imposing a set of constraints on different moments of the covariate distribution. Unlike with PSM, in which some units are discarded after matching, the entropy balancing weights deviate as little as possible from base weights to prevent loss of information and maintain efficiency (Hainmueller, 2012).

Second, the DID eliminates time-invariant unobservables such as personality traits or motivation that influence both the decision to become self-employed and health outcomes (Marcus, 2013). The DID estimator compares the difference in mean health outcomes of the treatment group before and after entering self-employment with that of a suitable comparison group before and after, or more formally:

$$\beta = (H_{S=1,t=1} - H_{S=1,t=0}) - (H_{S=0,t=1} - H_{S=0,t=0}), \quad (1)$$

where H is the health outcome, $S = 1$ for those who switch into self-employment and 0 otherwise. In practice, (1) can be estimated by regressing the within-person changes in health outcomes from the baseline until the end of the treatment period on a dummy for switching into self-employment.

More formally:

$$\Delta H_i = \alpha + \beta S_i + \varepsilon_i. \quad (2)$$

The resulting estimate is the average treatment effect on the treated (ATT), i.e. the change in physical or mental health status resulting from switching into self-employment.

[15] There is ample evidence regarding the selection into self-employment based on health status. The disabled are disproportionately self-employed in Europe, for instance (Pagán, 2009). Moreover, individuals with certain mental health conditions are more likely to be operating their own firm. For example, exploiting U.S. data from the 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions, Wolfe and Patel (2017) empirically demonstrate that respondents with Obsessive-compulsive Personality Disorder are more likely to be self-employed. Furthermore, Wiklund et al. (2017) rely on case study research based on 14 Swedish entrepreneurs with ADHD, all of whom note that becoming entrepreneurs allowed them to adapt their work to manage their disease's symptoms. Similarly, Wiklund et al. (2017) demonstrate that ADHD symptoms are linked to entrepreneurial intentions and business startups among MBA graduates in the United States. Finally, a working paper using panel data from the United States reveals that mental health affects self-employment entry (Bogan et al., 2014).

[16] The matching does not comprise the main estimation strategy. Rather, it is a pre-processing step creating comparable treated and comparison groups based on observable characteristics to be used in the estimation of treatment effects. This pre-processing step can mitigate model-dependence since the entropy balancing ensures that the treatment is orthogonal to moments of the covariate distribution included in the weighting (Hainmueller, 2012).

[17] The combination of DID with entropy balancing is similar to the DID matching estimator proposed by Heckman et al. (1997) but it differs in that the pre-processing step is based on entropy balancing as opposed to propensity score matching in Heckman et al. (1997).

5.3. Empirical strategy in further detail

In a first step, using entropy balancing, I match individuals who have similar initial labor market status, (physical and mental) health, and socio-demographic characteristics at time period t_0 and transition into self-employment at the next interview in time period t_1.[18] The *treated* group switches into self-employment and the *comparison* group remains in the original labor market condition. In separate analyses, I consider (i) individuals who switch from unemployment to full-time self-employment (necessity entrepreneurs) and (ii) those who transition from being regular private employees to being full-time self-employed (opportunity entrepreneurs). In a second step, using the entropy balancing weights from step 1 – which deviate as little as possible from uniform weights – I regress the change in health status on the treatment indicator and control for the conditioning variables, which are measured at t_0.[19]

The identifying assumption is that the conditioning variables include all factors that simultaneously influence changes in health and changes in employment status. In other words, in the absence of treatment (self-employment entry), conditional on the covariates and the pre-treatment outcomes, the health outcomes of the treated and matched controls would follow the same trend. Under this assumption, the matched DID design in principle allows eliminating selection bias in observational data (Card et al., 2011; Heinrich et al., 2010). Thus, I assume that:

$$E[\Delta H_0 \mid EB(\mathbf{X}), S = 1] - E[\Delta H_0 \mid EB(\mathbf{X}), S = 0] = 0 \tag{3.1}$$

or

$$E[H_{0,t=1} - H_{0,t=0} \mid EB(\mathbf{X}), S = 1] = E[H_{0,t=1} - H_{0,t=0} \mid EB(\mathbf{X}), S = 0] \tag{3.2}$$

where $\Delta H_0 = H_{0,t=1} - H_{0,t=0}$ refers to the change in mental health from the before *(t = 0)* to the after period *(t = 1)* in the absence of treatment and *EB(X)* are the entropy-balanced covariates, including the pre-treatment levels of the health outcomes.[20] While fundamentally untestable, to make the assumption plausible, I ensure that the treated and comparison individuals: (i) were on similar mental and physical health tracks before switching to self-employment, (ii) start from the same initial employment condition, (iii) have comparable employment and unemployment histories and (iv) have similar socio-demographic characteristics.[21]

6. Data, variables, and analysis samples

6.1. Data

I rely on the German Socio-Economic Panel (SOEP) from 2002 to 2014 (Version 32.1). The SOEP is a representative household panel of individuals aged 18 and older (Wagner et al., 2007). The data offer rich longitudinal information related to health and labor market characteristics, income, household composition and finances, and family biography.[22] While the SOEP is available since 1984, the Health Module, which I use in this paper, was introduced in 2002 and is included every two years.

6.2. Measures

6.2.1. Outcome variables: physical and mental health

The health variables in this paper are based on questions in the Short Form (SF)-12 questionnaire, which is a well-known survey instrument for extracting physical and mental health information (Andersen et al., 2007).[23] The SF-12 questionnaire is a 12-item subset of the larger SF-36 health questionnaire and is typically used in large national surveys (Andersen et al., 2007). The SF-12 assesses broad health status rather than specific diseases (Bowling, 2005). The reliability and validity of the SF-12 questionnaire have been well-documented (Gandek et al., 1998; Salyers et al., 2000; Ware et al., 1996) and are now a stylized fact.

More precisely, the SF-12 questionnaire measures *physical* health in four domains – bodily pain, general health, role physical, and

[18] I used the Stata user-written command –ebalance- for the entropy balancing (Hainmueller and Xu, 2013). Appendix Tables A1 and A2 provide information on the pre-treatment characteristics and the bias reduction achieved with entropy balancing.

[19] I add the conditioning variables for precision and to reduce the unexplained variance in the health outcomes but they not alter the estimated average treatment effects (i.e., the effects of entrepreneurship on physical and mental health), as the treatment effects are mean-independent of the conditioning variables after weighting.

[20] This is similar to the unconfoundedness assumption (Marcus, 2013).

[21] Typically, DID estimators rely on the parallel trends assumption, stating that in the absence of treatment, the health outcomes of the treated comparison groups would follow the same trend. Yet, the plausibility of the parallel trends assumption is rarely questioned in empirical research (Kreif et al., 2016; Ryan et al., 2015) although it is unlikely to hold in many health settings (O'Neill et al., 2016). One viable solution when the parallel trends assumption is violated is to use methods that control for the pre-treatment outcomes. In this paper's setting, the entropy balancing step reduces the influence of confounders that may affect health outcomes and increases the plausibility of the parallel trends assumption. Importantly, since this paper's matching covariates also include the pre-treatment levels of the outcome, I assume common trends conditional on the same starting levels of health (Lechner, 2011), or “independence conditional on past outcomes” (O'Neill et al., 2016).

[22] The SOEP started in 1984 in West Germany and since 1990, has also included East Germany. The SOEP now annually polls about 11,000 households and 30,000 individuals. For further information, please visit https://www.diw.de/en/diw_02.c.221178.en/about_soep.html.

[23] For a detailed discussion about designing and conducting health surveys, see Aday and Cornelius (2006).

Table 1
Definitions and measurement of the dependent variables.
Source: Author based on SOEP Codebooks.

Variable	Definition
Mental Component Scale (MCS)	Weighted combination of mental health, role emotional, vitality, and social functioning (0–100 score). Computed via exploratory factor analysis and standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to better mental health.
Mental health	Based on how often the respondent felt (i) down and gloomy and (ii) calm and relaxed in the past four weeks (0–100 score). Computed via exploratory factor analysis and standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to better mental health.
Vitality	How often the respondent felt energetic in the past four weeks (0–100 score). Standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to higher vitality.
Role emotional	In the past four weeks, how often the respondent felt that (i) she achieved less than she wanted due to mental health problems or that (ii) she carried out her tasks less thoroughly than usual due to mental health problems (0–100 score). Standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to better role emotional.
Social functioning	In the past four weeks, how often the respondent felt that due to physical and mental health problems she was limited socially. Standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to better social functioning.
Physical Component Scale (PCS)	Weighted combination of physical functioning, general health, bodily pain, and role physical (0–100 score). Computed via exploratory factor analysis and standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to better physical health.
Bodily pain	How often the respondent felt strong physical pains in the past four weeks (0–100 score). Standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to less bodily pain
General health	How the respondent would describe current health (from very good to bad) (0–100 score). Standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to better general health.
Role physical	In the past four weeks, how often the respondent felt that (i) she achieved less than she wanted due to physical health problems or that (ii) she carried out her tasks less thoroughly than usual due to physical health problems (0–100 score). Standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to better role physical.
Physical functioning	Based on whether her state of health affects her (i) when she goes several floors on foot and (ii) when she has to lift something heavy or where one requires agility (0–100 score). Standardized to have a mean of 50 and a standard deviation of 10 in 2004. Higher values correspond to better physical functioning.

physical functioning, which jointly comprise the Physical Component Composite Scale (PCS). Similarly, the Mental Component Summary Scale (MCS) consists of the sub-domains vitality, role emotional, mental health, and social functioning. The dependent variables in this paper are thus PCS and MCS (Table 1).[24] All outcome variables range from 0 to 100 and are standardized to have a mean of 50 and a standard deviation of 10. This eases the interpretation and allows for the direct comparability of the magnitudes of the coefficient estimates.

6.2.2. Self-employment

The self-employed in this paper are individuals who work full-time and employ others or are solo entrepreneurs.[25] I specifically exclude self-employed farmers and those helping in family businesses as these individuals are not engaged in the creation of new business ventures. Both private employees and the self-employed are full-time employees only.

6.2.3. Conditioning variables

The conditioning variables, detailed in Table 2, include the respondents' demographic and labor market characteristics such as age, sex, education, marital status, expectations about one's future employment status (job security worries), as well as household characteristics including the number of children, household size, real disposable household income, home ownership, place of residence (federal state), whether the household had a windfall income in the previous year, initial health status, and survey year dummies. For the transitions from private employment to self-employment, I include pre-treatment job characteristics and industry dummies.[26]

Given that liquidity constraints are important for the decision to become and remain self-employed (Blanchflower and Oswald, 1998; Hurst and Lusardi, 2004; Lindh and Ohlsson, 1996) and may also affect health, I include household income, home ownership (a proxy for wealth), as well as windfall income in the previous year as part of the matching covariates. In addition, I control for the job security worries as a way of capturing certain unobserved heterogeneity related to occupational switches, especially given research

[24] In separate regressions in the appendix, I also provide results using the sub-components of the PCS and MCS scales (Table A3).

[25] Specifically, I include the categories 420 to 433 from the “occupational position” variable in the SOEP. The dataset contains information on all types of individual labor force status since the last interview, including private employment, civil service, self-employment, apprenticeship/traineeship, registered unemployment, retirement, and being a student. I limit the sample to the self-employed, the unemployed, and private employees.

[26] Due to small number of cases, the industries agriculture, mining and energy are combined. For the same reason, the marital status categories divorced, separated or widowed are combined. Similarly, I merge Bremen with Lower Saxony and Hamburg with Schleswig Holstein.

Table 2
Definitions and measurement of the conditioning variables.
Source: Author based on SOEP Codebooks.

	Definition
Variable	
Age	Age in years
Migration background	1 = direct or indirect migration background; 0 = no migration background
Male	Respondent's gender, 1 = Male, 0 = Female
Marital status	Indicators for married, single, and divorced/separated/widowed
Years of education	Number of years of education
No. persons in the household	Number of persons in the household
No. children in the household	Number of children in the household
Home ownership	1 = owner of dwelling, 0 = not owner of dwelling
Disposable household income	Household post-government income (CPI-adjusted)
Windfall	1 = the household had windfall income last year (from lottery, inheritance or gift) exceeding 500 EUR; 0 = no windfall income
Disabled	1 = disabled, 0 = not disabled
Doctor visits	Number of annual doctor visits
Mental Component Scale	See Table 1
Physical Component Scale	See Table 1
Life satisfaction	Overall life satisfaction on a 11-point scale: [0] Completely dissatisfied- [10] Completely satisfied
Work experience	Full time and part-time work experience (number of years)
Unemployment experience	Unemployment experience in years
Year and regional dummies	
State dummies	Dummy variables for 14 federal states (combined Bremen with Lower Saxony and Hamburg with Schleswig-Holstein due to low number of observations)
Year dummies	Dummy variables for years 2002, 2004, 2006, 2008, 2010, 2012
Additional Conditioning Variables for Those Switching from Regular Employment	Length of time with firm, industry dummies, actual weekly working hours, desired weekly working hours, job security worries (whether the respondent is very concerned, somewhat concerned, or not at all concerned about his/her job security), and company size.
Additional control variables for testing channels and robustness checks	
Household income from asset flows	Household income from savings, dividends, and rents (CPI-adjusted)
Autonomy	The self-employed are categorized according to the size of the firm and regular workers are differentiated according to their vocational training and level of responsibility assumed in their tasks. The scale ranges from 0 (apprentice) to 5 (high autonomy), with 1 assigned to manual workers, 2 to those working in production or services with minimum level of specialization. Jobs requiring a middle track of secondary education and limited amount of responsibility are assigned to group 3, while group 4 includes those who have a higher education degree. Group 5 comprises managers. The self-employed are in either groups 3, 4, or 5, depending on the number of employees (SOEPGroup, 2017).
Big 5 Personality traits	The Big 5 personality traits (Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism) are based on 15 survey statements in the SOEP (3 per each item) in 2003, 2005 and 2009. I sum the original items for each concept and standardize the sums to have a mean of 0 and standard deviation of 1. Openness is measured using responses to the following statements: is original, comes up with new ideas; values artistic, aesthetic experiences; has an active imagination is eager for knowledge. Conscientiousness is measured using responses to the following statements: does a thorough job; tends to be lazy; does things effectively and efficiently. Extraversion is measured using responses to the following statements: is communicative, talkative; is outgoing, sociable; is talkative. Agreeableness is measured using responses to the following statements: is sometimes somewhat rude to others; has a forgiving nature; is considerate and kind to others. Neuroticism is measured using responses to the following statements: worries a lot; gets nervous easily; is relaxed, handles stress well.
Risk preferences	The respondent's answer to the question: "Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" on a scale of 0 = not at all prepared and 10 = fully prepared
ROR-level unemployment rate	The unemployment rate at the Raumordnung Region (ROR) level based on the INKAR Database

Note: The additional conditioning variables are used when analyzing the transition from regular employment to self-employment.

showing that job security worries may be as detrimental for mental well-being as unemployment itself (Witte, 1999). All conditioning variables (see Table 2) originate from the pre-treatment survey year.

6.2.4. *Construction of the treatment and comparison groups*

Using entropy balancing, I create two matched samples: (i) one for individuals who transition from unemployment to full-time self-employment or remain unemployed and (ii) one for those who switch from regular full-time employment to full-time self-employment or remain regular employees (see Tables A1 and A2 for balancing tests). In both samples, individuals are aged 18 to 60.[27]

[27] Like in Caliendo et al. (2014), I specifically exclude individuals over 60 to avoid early retirement cases as well as issues related to necessity entrepreneurship in old age.

Table 3
Entropy balancing DID results, switches to entrepreneurship, main results.
Source: Author's calculations based on SOEP 2002–2014.

Panel A: Necessity Entrepreneurship (Unemployment to Self-Employment)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	3.789***	1.034
	(1.082)	(0.900)
Pre-treatment covariates	Yes	Yes
Number of individuals	1652	1652
R^2	0.470	0.393
Panel B: Opportunity Entrepreneurship (Regular Employment to Self-Employment)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	1.141**	0.795**
	(0.462)	(0.329)
Pre-treatment covariates	Yes	Yes
Number of individuals	21,711	21,711
R^2	0.318	0.354

Notes: Robust standard errors in parentheses. All regressions include the lagged pre-treatment characteristics (see Tables A1 and A2). In Panel A, "Treatment" is coded as "1" for those switching from unemployment to self-employment between two survey waves and 0 for those who remain continuously unemployed. In Panel B, "Treatment" is coded as "1" for those switching from regular full-time employment to full-time self-employment between two survey waves and 0 for those who remain continuously employed as full-time employees. See Table 1 for detailed definitions.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

The *treated* group comprises individuals who switch from the original condition (unemployment or regular employment, respectively) to self-employment between two survey waves with the SF-12 questionnaire. The *comparison* group comprises individuals who remain in the initial labor market state. The occupational transition can occur at any time between the two survey waves that include the health questions. I pool the estimation across six treatment periods: 2002–2004, 2004–2006, 2006–2008, 2008–2010, 2010–2012, and 2012–2014. For example, for the 2002–2004 treatment period, in 2002, both treatment and controls are unemployed (or, in separate analyses, private employees). Treated individuals change to self-employment in 2003 or 2004, while the controls remain in the initial condition (unemployment or private employment) in both 2003 and 2004. Those who switch in 2003 must also remain self-employed in 2004. As such, the estimated average treatment effects should be seen as averages over the two-year self-employment durations (Marcus, 2013). Thus, the estimated treatment effects concern the short-run.

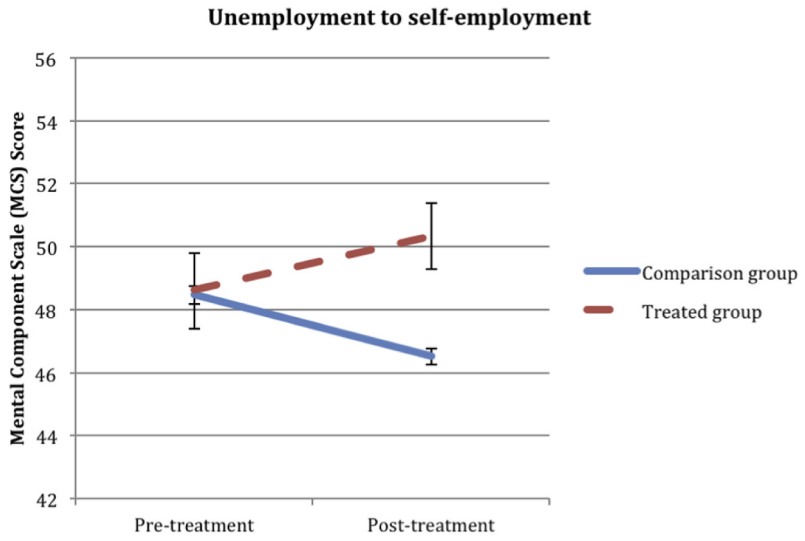
7. Results

7.1. Main results

Table 3 details the health effects from necessity entrepreneurship (Panel A) and opportunity entrepreneurship (Panel B). The outcome in Model (1) is overall mental health and in Model (2), overall physical health, both of which are measured on a scale of 0–100, with a mean of 50 and a standard deviation of 10 (See Table 1).

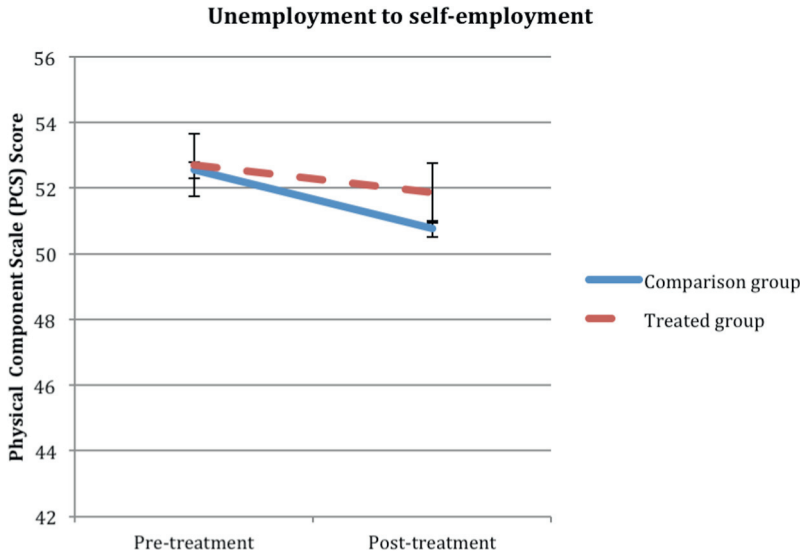
First, Panel A demonstrates that transitioning from unemployment to self-employment (necessity entrepreneurship) boosts overall mental health (MCS) but not overall physical health (PCS).[28] Specifically, the mental health premium from necessity entrepreneurship is on average about 3.8 points (on a 0–100 scale). This result corresponds to a difference of about 38% of a standard deviation as the health measure is standardized to have a mean of 50 and standard deviation of 10. Fig. 1 graphically depicts this key result. Specifically, while both the treated and comparison groups start from the same mental health levels (by construction), individuals who transition into self-employment experience mental health improvements, while those who remain unemployed experience, on average, no change in their MCS scores. Moreover, the coefficient estimate for overall physical health (PCS) in Model (2) in Panel A, Table 3, however, is small and statistically insignificant, meaning that the self-employed experience no change in their physical health compared with those who remain continuously unemployed. This result is also

[28] See also Fig. 1–2 and the left panel of Fig. 5 for a graphical representation of these results. The regression results concerning the different subdomains of the Mental Component Scale (MCS) and the Physical Component Scale (PCS) are available in Table A3.



Source: Author's calculations based on SOEP 2002-2014

Fig. 1. Average Mental Component Scale (MCS) scores, treated and comparison groups, with 95% confidence intervals, necessity entrepreneurs.

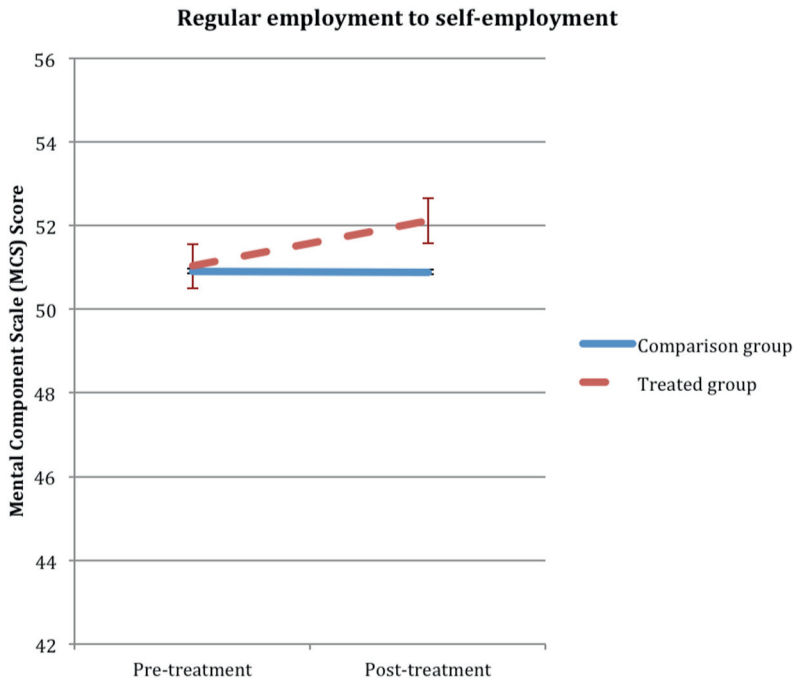


Source: Author's calculations based on SOEP 2002-2014

Fig. 2. Average Physical Component Scale (PCS) scores, treated and comparison groups, with 95% confidence intervals, necessity entrepreneurs.

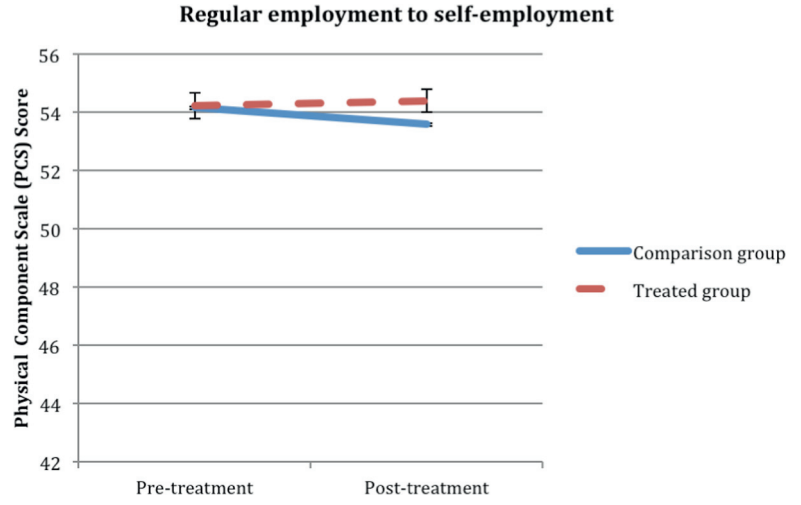
graphically shown in Fig. 2. Thus, Panel A in Table 3 furnishes empirical evidence in support of Hypotheses 1a and 1b, namely that necessity entrepreneurship leads to mental but not physical health improvements. This conclusion is also confirmed by formally testing for the equality of the two coefficient estimates using seemingly unrelated regressions. Specifically, the *p*-value associated with the χ^2 test for the equality of coefficient estimates from Models (1) and (2) in Panel A performed after the seemingly unrelated regressions is 0.000.

Second, I assess the physical and mental health changes due to opportunity entrepreneurship. Model (1) in Panel B demonstrates that opportunity entrepreneurship increases overall mental health (MCS) by about 11% of a standard deviation or 1.1 points (on a 0–100 scale). At the same time, Model (2) in Panel B reveals that unlike necessity entrepreneurship, opportunity entrepreneurship also contributes to overall physical health (PCS) improvements of about 8% of a standard deviation. In fact, results from tests performed after seemingly unrelated regressions confirm that the mental health benefits (MCS) associated with opportunity



Source: Author's calculations based on SOEP 2002-2014

Fig. 3. Average Mental Component Scale (MCS) scores, treated and comparison groups, with 95% confidence intervals, opportunity entrepreneurs.



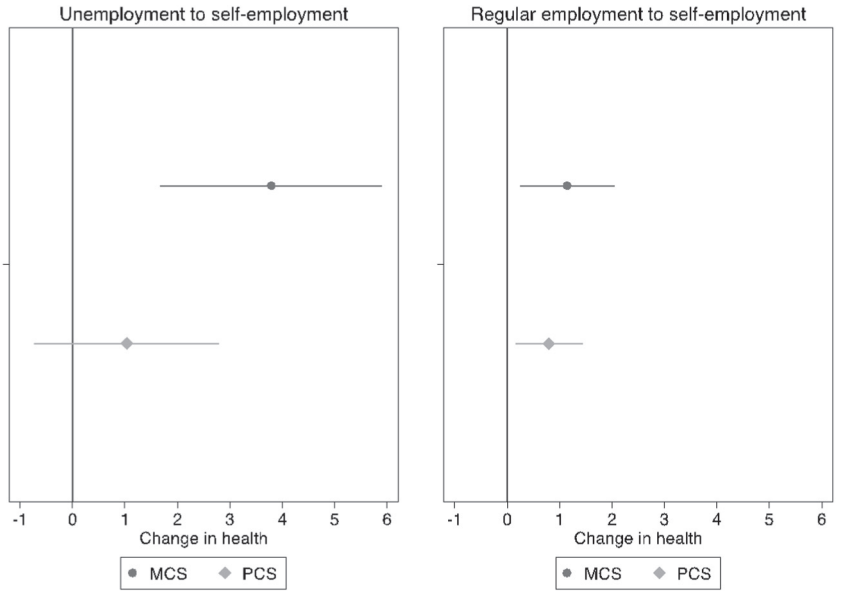
Source: Author's calculations based on SOEP 2002-2014

Fig. 4. Average Physical Component Scale (PCS) scores, treated and comparison groups, with 95% confidence intervals, opportunity entrepreneurship.

entrepreneurship exceed the physical health ones (PCS).[29] The physical and mental health enhancements for opportunity entrepreneurs are also graphically evident in Figs. 3–4 and in the right panel in Fig. 5. Thus, these findings provide empirical support for Hypotheses 2a and 2b.

The results from Table 3 can be summarized as follows: opportunity entrepreneurship improves both mental and physical health, while necessity entrepreneurship brings no physical benefits but large mental health gains. For both opportunity entrepreneurs, the changes in mental health are larger in magnitude than those in physical health. Furthermore, comparing the magnitude of the

[29] The *p*-value associated with the χ^2 test for the equality of coefficient estimates performed from Models (1) and (2) in Panel B after the seemingly unrelated regressions is 0.014.



Source: Author's calculations based on SOEP 2002-2014
Notes: Difference-in-Difference estimates based on Table 3, Panel A (necessity entrepreneurship, left hand side) and Panel B (opportunity entrepreneurship, right hand side). MCS= Mental Component Scale, PCS=Physical Component Scale. See the notes below Table 3

Fig. 5. Mental and physical health changes due to necessity and opportunity entrepreneurship, with 95% confidence intervals.

coefficient estimates in Model (1) across Panels A and B reveals that the mental health benefits are greater for necessity than for opportunity entrepreneurs.[30]

The finding that those who switch from unemployment to self-employment experience no improvements in physical health is likely due to the fact that both groups of individuals have flexibility to incorporate health behaviors or sport regimes in their daily routines. Regular full-time employees, by contrast, have to abide by standard business hours and often commute to work, which may leave little room for exercise and a healthy diet. It is not surprising, therefore, that the physical health benefits are exclusively felt by opportunity but not necessity entrepreneurs as necessity entrepreneurs are giving up leisure to work.

Finally, I tested whether the main results in Table 3 differ according to whether the entrepreneurs employ others or not (the results are available Table A5).[31] Given the evidence in Blanchflower (2004) and Hessels et al. (2017b) that the self-employed with employees experience higher stress, exhaustion, depression, and lower satisfaction with working conditions than regular employees and solo entrepreneurs, it is reasonable to expect that the self-employed with employees will have worse mental and physical health outcomes compared to solo entrepreneurs.[32] To test this, I recode the "Treatment" variable as 1 for the comparison group, 2 for the self-employed without employees, and 3 for the self-employed with employees. Thus, the reference (omitted) category in these regressions is individuals who remain in the original labor market condition (unemployment in Panel A and regular employment in

[30] I tested for the equality of coefficients across the models assuming the samples are independent (Gelman and Stern, 2006; Paternoster et al., 1998). The resulting z-statistic is 2.25 and I reject the null hypotheses that the two estimates are the same and conclude that necessity entrepreneurship leads to greater mental health benefits than opportunity entrepreneurship. Nevertheless, I fail to reject the hypothesis for the equality of the coefficient estimates in Model (2) across Panel A and B, and I cannot conclude that entrepreneurship differentially affects the physical health of opportunity and necessity entrepreneurs. The resulting z-statistic is 0.025.

[31] Table A4 in the Appendix demonstrates that more than half of the unemployed who start their own businesses employ no other people. At the same time, about 70% of opportunity entrepreneurs are job-creators.

[32] Using Eurobarometer data for 1996, Blanchflower (2004) shows that the self-employed with employees are more satisfied with their jobs compared to the self-employed without employees. Meanwhile, the self-employed without employees were less likely to find their work stressful, report that they were exhausted and tired, unhappy or depressed, compared with the self-employed who employ others. Furthermore, Hessels et al. (2017b) demonstrate that the self-employed with employees experience higher stress levels compared to the self-employed without employees, which is in part due to differences in job demands. These findings suggest that job creators and solo entrepreneurs may differ along the job demands and control they have as well as in terms of the procedural utility they derive from being self-employed. The self-employed with employees may have to act as managers, recruiters, and accountants, and may have to organize and delegate the work, as well as create the organizational routines and bureaucracy (Hessels et al., 2017b). These high job demands may increase exhaustion (Demerouti et al., 2001b) and lead to health impairments (Demerouti et al., 2001a). By contrast, the self-employed working for themselves may face fewer of these pressures and thus exercise more control over their work as well as their daily routines, which may help them manage or cultivate health habits, make time for workouts, and enjoy less stressful work styles.

Panel B – see Table A5). The findings in Table A5 suggest that there are no statistically significant differences in terms of the physical or mental health outcomes of entrepreneurs with or without employees.[33] These findings could be due to the lack of statistical power given the small number of observations in the respective categories, and as such should be investigated in future research.

7.2. Channels: escaping unemployment, job changes, and the role of income and working conditions

Table 3 showed that necessity entrepreneurs realize relatively large mental health gains from escaping unemployment. To better understand whether these mental health gains are due to *self-employment* or *working* per se, I also study transitions from unemployment to *regular* employment.[34] Table 4 details the results, whereby, for ease of interpretation, Panel A in Table 4 is the same as Panel A in Table 3 and details the health changes from switching from unemployment to self-employment. Panel B in Table 4 details the effects of switching from joblessness to paid full-time employment in the private sector.

Model (2) in Panel B demonstrates that switching from unemployment to employment is unassociated with physical health gains. Nevertheless, comparing the magnitudes of the coefficient estimates across Models (1) in Panel A and B, it is evident that switches to self-employment lead to higher increases in mental health compared to moving to a job in the private sector. Therefore, while work in and of itself is beneficial to the mental health of those who escape the misery of unemployment, there is an additional mental health gain from entering self-employment, which is likely due to the active job and procedural utility aspects of entrepreneurship.

Similarly, I check whether the health gains from opportunity entrepreneurship are due to the new job or are attributable to entrepreneurship per se. For example, Chadi and Hetschko (2018) demonstrate that voluntary job changes are associated with short-run increases in job satisfaction. Thus, it is possible that the effects I identify in Panel B in Table 3 are due to the new job rather than to self-employment. To that end, I study job changes – transitions from one regular full-time paid job to another regular full-time paid job. Table 5 first replicates Panel B from Table 3 (switches from regular employment to self-employment) and then details the health changes from switching from one regular job to another (job changes).[35] Comparing Panels A and B in Table 5, it is obvious that the mental health gains from self-employment are not due to job changes per se. Specifically, job changes in the private sector are unassociated with mental health gains. Thus, the mental health changes for opportunity entrepreneurs are due to self-employment itself and not to the "honeymoon" effect of changing to a new job. Interestingly, however, the physical health benefits from entrepreneurship are also almost identical to those from job changes (comparing Models (2) across Panels A and B in Table 5). Additional analyses, available upon request, reveal that the physical health improvements evident in Model (2) in Panel B (Table 5) are not due to income changes and changes in working conditions, moreover. Nevertheless, it appears that the physical health benefits of entrepreneurship could be due to the job change itself, a result which is interesting and worthy of further investigations.

Next, I tested to what extent income and working conditions are responsible for the main estimates. From an identification perspective, if changes in income or working conditions trigger both transitions in and out of self-employment *and* changes in mental and physical health, they will bias the true effects of entrepreneurship entry.[36]

First, in Table 6, I control for the change in disposable household income and that in household income from asset flows (savings, dividends, and rents).[37] Controlling for changes in household income allows to distinguish between the non-pecuniary effect of switching to self-employment from that of the change in income related to entering self-employment (Hetschko et al., 2017). Furthermore, in Panel B, I test whether changes in autonomy, working hours, and firm size explain the findings (see Table 2 for variable definitions).[38]

[33] The results in Panel A in Table A5 show that both the self-employed employed with and without employees have better mental health than the continuously unemployed. It also appears that the overall mental health benefits (MCS) are lower for solo entrepreneurs (coeff. estimate = 3.2) compared to those for job creators (coeff. estimate = 5.2). Nevertheless, the F-tests results suggest that the equality of coefficients could not be rejected (p-value = 0.208), implying that I cannot conclude that solo entrepreneurs benefit less from self-employment in terms of their overall mental health compared to job creator entrepreneurs. Moreover, Model (2) in Panel A shows that there are no statistically significant physical health benefits from entrepreneurship for either solo entrepreneurs or for the self-employed with employees. I failed to reject the hypothesis for the equality of the coefficient estimates for the entrepreneurs with and without employees in Panel A Model (2) (p-value = 0.388). Furthermore, at first sight, the results in Panel B seem to suggest that the self-employed without employees benefit in terms of mental health from switching from regular employment (Model (1)). At the same time, entrepreneurs who employ others seem to be gaining in terms of their overall physical health (PCS). Nevertheless, the F-tests show that I fail to reject the hypothesis of the equality of means and thus we cannot conclude that there are any significant differences between entrepreneurs with and without employees in terms of either physical or mental health.

[34] The balancing tests for the unemployed who transition into regular employment are available in Table A6.

[35] The balancing tests are available in Table A7 in the appendix.

[36] Another way of thinking about income and working conditions is as omitted variables, which, when included may help explain away the relationship between health and entrepreneurship.

[37] By being a non-labor income, household income from income flows is arguably more exogenous to job change and self-employment entry (Nikolova and Ayhan, 2018). The number of observations in Table is slightly smaller than that in the main analyses due to missing observations for the firm size and hours worked variables.

[38] The autonomy variable is created by the SOEP team and reflects occupational position, education and task content of the job. The self-employed are categorized according to the size of the firm and regular workers are differentiated according to their vocational training and level of responsibility assumed in their tasks. The scale ranges from 0 (apprentice) to 5 (high autonomy), with 1 assigned to manual workers, 2 to those working in production or services with minimum level of specialization. Jobs requiring a middle track of secondary education and limited amount of responsibility are assigned to group 3, while group 4 includes those who have a higher education degree. Group 5 comprises managers. The self-employed are in either groups 3, 4, or 5, depending on the number of employees (SOEPGroup, 2017). I note that this variable is a crude proxy of autonomy and is unlikely to capture all procedural aspects of autonomy at work. See Table 2 for variable definitions.

Table 4
Entropy balancing DID results, switches from unemployment to self-employment and from unemployment to regular employment.
Source: Author's calculations based on SOEP 2002–2014.

Panel A: Unemployment to Self-Employment		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	3.789***	1.034
	(1.082)	(0.900)
Pre-treatment covariates	Yes	Yes
Number of individuals	1652	1652
R^2	0.470	0.393
Panel B: Unemployment to Regular Employment		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	1.738***	0.600
	(0.527)	(0.406)
Pre-treatment covariates	Yes	Yes
Number of individuals	2390	2390
R^2	0.381	0.299

Notes: Robust standard errors in parentheses. All regressions include the lagged pre-treatment characteristics (see Tables A1 and A2). In Panel A, "Treatment" is coded as "1" for those switching from unemployment to self-employment between two survey waves and 0 for those who remain continuously unemployed. In Panel B, "Treatment" is coded as "1" for those switching from unemployment to full-time regular employment between two survey waves and 0 for those who remain continuously unemployed. See Table 1 for detailed definitions.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

Table 5
Entropy balancing DID results, switches from regular employment to self-employment and from regular employment to regular employment (job change).
Source: Author's calculations based on SOEP 2002–2014.

Panel A: Regular Employment to Self-Employment (Opportunity Entrepreneurship)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	1.141**	0.795**
	(0.462)	(0.329)
Pre-treatment covariates	Yes	Yes
Number of individuals	21,711	21,711
R^2	0.318	0.354
Panel B: Regular Employment to Regular Employment (Job Change)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	−0.113	0.825***
	(0.300)	(0.213)
Pre-treatment covariates	Yes	Yes
Number of individuals	19,227	19,227
R^2	0.289	0.331

Notes: Robust standard errors in parentheses. All regressions include the lagged pre-treatment characteristics (see Tables 2 and 3). In Panel A, "Treatment" is coded as "1" for those switching from regular employment to self-employment between two survey waves and 0 for those who remain continuously unemployed. In Panel B, "Treatment" is coded as "1" for those switching from one regular full-time employment to another regular full-time employment (job changes) between two survey waves and 0 for those who remain continuously employed as full-time employees in the same job. Sees Tables 1 and 2 for detailed definitions.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

Table 6
Entropy balancing DID results, switches to entrepreneurship, controlling for changes in income and working conditions.
Source: Author's calculations based on SOEP 2002–2014.

Panel A: Necessity Entrepreneurship (Unemployment to Self-Employment)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	3.120***	1.117
	(1.152)	(0.947)
Δlog Household income	1.642*	−0.381
	(0.850)	(0.852)
Δlog Household asset income	−0.103	0.413*
	(0.256)	(0.225)
Pre-treatment covariates	Yes	Yes
Number of individuals	1652	1652
R^2	0.475	0.403
Panel B: Opportunity Entrepreneurship (Regular Employment to Self-Employment)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	1.025**	0.624*
	(0.493)	(0.366)
Δlog Household income	1.200	0.402
	(0.818)	(0.533)
Δlog Household asset income	0.116	0.033
	(0.097)	(0.092)
ΔWeekly work hours	−0.049	0.015
	(0.038)	(0.022)
ΔAutonomy	0.297	0.256
	(0.318)	(0.269)
ΔFirm size	0.262	−0.019
	(0.251)	(0.157)
Pre-treatment covariates	Yes	Yes
Number of individuals	21,479	21,479
R^2	0.324	0.345

Notes: Robust standard errors in parentheses. All regressions include the lagged pre-treatment characteristics. In Panel A, "Treatment" is coded as "1" for those switching from unemployment to self-employment between two survey waves and 0 for those who remain continuously unemployed. In Panel B, "Treatment" is coded as "1" for those switching from regular full-time employment to full-time self-employment between two survey waves and 0 for those who remain continuously employed as full-time employees. See Table 1 for detailed definitions.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

Comparing and contrasting the results in Tables 3 and 6 indicates that controlling for the changes in income and working conditions does not substantively alter the results. Indeed, F-tests conducted after running seemingly unrelated estimations indicate that in all cases, I fail to reject the null hypothesis for equality of coefficients: I tested whether the coefficient estimates for the treatment variable in both Panels are equal to each other. Specifically, I tested whether the coefficient estimate for the MCS variable in (1) in Panel A in Table 3 is equal to the coefficient estimate for the MCS variable in (1) in Panel A in Table 6. Similar tests were conducted for the PCS estimates and the *p*-values always exceeded the 0.10 threshold.

In summary, changes in objective conditions (income, assets, working hours, firm size, and autonomy) do not explain the health premium from entrepreneurship. These results imply that the health benefits of self-employment are largely non-pecuniary, which is in line with the procedural utility theory arguments (Benz and Frey, 2008a, 2008b; Fuchs-Schündeln, 2009; Hamilton, 2000). Thus, the results likely reflect the "psychic income" (Gimeno et al., 1997) related to being self-employed. While the mental health gains from both opportunity and necessity entrepreneurship are due to entrepreneurship per se, the physical health gains of entrepreneurship are similar to those from job changes, which further research should explore in greater detail.

8. Robustness checks

As a robustness check, I also include controls for the Big 5 personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism) and general risk preferences, which are important determinants of health behaviors and self-employment.

Thus, if the entropy balancing and DID effectively deal with unobserved heterogeneity, the results controlling for personality and risk should not differ from the main results in Table 3.[39]

The Big 5 personality traits are based on 15 survey statements in the SOEP (3 per each item) in 2003, 2005 and 2009 entry (See Table 2 for definitions). I sum the original items for each concept and standardize the sums to have a mean of 0 and standard deviation of 1.[40] Willingness to take risks, which is measured on a scale of 0–10, is available in 2004, 2006, 2008–2014. For all observations, I impute the 2002 value with the 2004 risk preferences. Following Dohmen et al. (2005) and Jaeger et al. (2010), to avoid differences in response styles over time, I dichotomize the risk preferences into a binary variable whereby 1 corresponds to values of 6 and above of the original 0–10 scale and 0 otherwise.

Table 7 shows the results including the personality traits and the risk preferences as part of the pre-treatment covariates. The sample sizes are not identical with those in Table 3 due to missing observations. Importantly, the overall pattern of the results and the magnitudes shown in Table 7 are very similar to those in Table 3, which confirms that the estimations are robust to controlling for personality traits and risk preferences.

Another sensitivity check, presented in Table 8, adds controls for local (Raumordnungregion or ROR-level) unemployment rates. This robustness test addresses the concern that region-specific labor market conditions, as proxied by the unemployment rate, influence both the decision to become self-employed and health changes. To that end, I merged the SOEP sample with unemployment data at the ROR-level from the INKAR database[41] and included as part of the covariates the pre-treatment unemployment rate. As before, the pre-treatment covariates include federal state fixed effects, which should mitigate concerns about state-specific heterogeneity in the economy.[42] Table 8 demonstrates that controlling for the local labor market conditions does not change the results in terms of their sign and magnitude and they remain comparable to those in Table 3.

9. Discussion

9.1. Implications for theory and practice

Overall, the findings furnish empirical support for the research hypotheses. Specifically, necessity entrepreneurs benefit in terms of mental but not physical health, while opportunity entrepreneurs gain in both physical and mental health. The results do not differ significantly when I compare entrepreneurs with and without employees, moreover. Thus, on the whole, self-employment improves mental health, and in the case of opportunity entrepreneurs, also physical health. These findings also provide support for the active jobs hypothesis from the Job Demand-Control model, suggesting that working in a high-demands but high-control environment leads to health improvements for entrepreneurs.

Furthermore, the finding that necessity entrepreneurship improves mental health – and does so independently of income changes – holds particular importance for policymakers. Given the large body of literature documenting the negative mental health consequences of unemployment, it is important to know that self-employment provides not only a livelihood but also psychological health gains to those who escape the misery of joblessness. These psychological health improvements could be due to avoiding the stigma of being unemployed or to the procedural benefits of or the identity boost from being self-employed.

Germany's Active Labor Market Policies offer start-up subsidies for the unemployed, which not only entail labor market reintegration for the new entrepreneurs but also potential job creation (Caliendo and Kritikos, 2010). These start-up subsidies became especially relevant as part of the major labor market reforms (Harz reforms), implemented in 2003, which also added a start-up subsidy ("*Existenzgründungszuschuss*," colloquially known as "*Ich-AG*" or "Me-Inc.") to the existing start-up bridging allowance (*Überbrückungsgeld*). Research finds that these programs were quite successful in terms of survival rates, incomes, and job creation (Caliendo and Kritikos, 2010; Caliendo and Künn, 2011).[43] In some cases, these start-ups also generated an income that was greater than that in the previous employment. In 2006, both programs were replaced with a new start-up subsidy *(Gründungszuschuss)*, whose effects have also been positive in terms of labor market integration and income (Caliendo et al., 2016). Adding to this literature, this paper demonstrates that encouraging the unemployed to start a business also has non-monetary benefits in terms of improving short-run mental health. Moreover, I also document that the mental health benefits from

[39] While the debate on whether personality traits are malleable over time remains unsettled, they can be treated as fixed over short time periods, which is the case given this paper's three-year treatment periods. Specifically for Germany, Specht et al. (2011) document that personality traits are associated with changes throughout the lifespan, while Boyce et al. (2015) reveal that they change due to unemployment. Using German panel data, moreover, Anger et al. (2017) find that job loss is causally linked to changes in openness but no other personality traits.

[40] For the 2002–2004, 2004–2006 and 2006–2008 periods, I use the 2003 values of the Big 5; for the 2008–2010 and 2010–2012 periods, I use the 2009 values of the Big 5, and for the 2012–2014 period, I rely on the 2013 values of the Big 5.

[41] http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html.

[42] Ideally, I would have wanted to also include dummy variables for the 96 RORs in Germany, but unfortunately not all RORs have treated individuals (i.e., individuals who switch to self-employment).

[43] For example, between 2003 and 2006, about 1 million unemployed started their own business, with the survival rates being at 70% 2.5–5 years after starting the business and only about 15–20% of recipients returning to unemployment (Caliendo and Kritikos, 2010). For an overview of the labor market reforms in Germany, see (Caliendo and Hogenacker, 2012).

Table 7
Entropy balancing DID results, switches to entrepreneurship, with risk preferences and personality traits.
Source: Author's calculations based on SOEP 2002–2014.

Panel A: Necessity Entrepreneurship (Unemployment to Self-Employment)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	4.011***	0.624
	(1.164)	(0.922)
Pre-treatment covariates	Yes	Yes
Pre-treatment risk preferences	Yes	Yes
Pre-treatment personality traits	Yes	Yes
Number of individuals	1566	1566
R^2	0.494	0.435
Panel B: Opportunity Entrepreneurship (Regular Employment to Self-Employment)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	1.127**	0.612*
	(0.460)	(0.342)
Pre-treatment covariates	Yes	Yes
Pre-treatment risk preferences	Yes	Yes
Pre-treatment personality traits	Yes	Yes
Number of individuals	20,464	20,464
R^2	0.339	0.375

Notes: Robust standard errors in parentheses. All regressions include the lagged pre-treatment characteristics. In Panel A, "Treatment" is coded as "1" for those switching from unemployment to self-employment between two survey waves and 0 for those who remain continuously unemployed. In Panel B, "Treatment" is coded as "1" for those switching from regular full-time employment to full-time self-employment between two survey waves and 0 for those who remain continuously employed as full-time employees.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

switching from unemployment to self-employment are greater than those associated with transitioning from unemployment to regular employment, which implies that necessity entrepreneurs gain not only from working but also from the process of being entrepreneurs. Thus, being an entrepreneur has non-pecuniary benefits that extend beyond the mental health benefits of escaping the misery of unemployment.

Self-employment is also beneficial to the health of those switching from full-time jobs in the private sector, which suggests that there are also gains to be made on that margin. The self-employed have more flexibility to arrange their working days, which may better position them to engage in health-enhancing behaviors. Given that the mental health benefits of entrepreneurship exceed the physical ones, the positive consequences of self-employment appear to work through psychological mechanisms, which should be further explored in future research. While self-employment is not a silver bullet, these results show that in the short run, it can enhance social welfare by not only contributing to growth and innovation, but also to health.[44]

9.2. Limitations and suggestions for future research

This paper furnishes the first causal evidence of the physical and mental health consequences of necessity and opportunity entrepreneurship. Nevertheless, it has several limitations, which further research should address. First, I only examine the health consequences of self-employment on the individual entrepreneur but not on his or her family or social network. Specifically, given spillovers of mental health within couples (Fletcher, 2009), future work should consider the health consequences of self-employment at the family level.

Second, as it relies on within-country data for Germany only, the paper's external validity is limited. Further research should investigate whether the findings apply in contexts with different institutional environments and entrepreneurial cultures, especially in light of the evidence that the latter indirectly influence entrepreneurship (Stephan and Pathak, 2016). Third, due to limited number of observations, I only provide the short-run effects of switching to self-employment but it is also important to understand whether these effects persist over time. Fourth, in light of recent research showing that losing self-employment may lead to greater

[44] Nonetheless, this paper's findings should be weighed against the evidence that necessity entrepreneurship is unassociated with life satisfaction gains (Binder and Coad, 2013).

Table 8
Entropy balancing DID results, switches to entrepreneurship, with local (ROR)-level unemployment rates.
Source: Author's calculations based on SOEP 2002–2014.

Panel A: Necessity Entrepreneurship (Unemployment to Self-Employment)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	3.936***	0.929
	(1.076)	(0.924)
Regional unemployment rate	−0.013	0.157
	(0.305)	(0.270)
Pre-treatment covariates	Yes	Yes
Pre-treatment risk preferences	Yes	Yes
Pre-treatment personality traits	Yes	Yes
Number of individuals	1652	1652
R^2	0.478	0.394

Panel B: Opportunity Entrepreneurship (Regular Employment to Self-Employment)		
	(1) Δ Mental Component Scale	(2) Δ Physical Component Scale
Treatment	1.134**	0.798**
	(0.463)	(0.327)
Regional unemployment rate	−0.003	0.144
	(0.138)	(0.089)
Pre-treatment covariates	Yes	Yes
Pre-treatment risk preferences	Yes	Yes
Pre-treatment personality traits	Yes	Yes
Number of individuals	21,711	21,711
R^2	0.318	0.356

Notes: Robust standard errors in parentheses. All regressions include the lagged pre-treatment characteristics. Models (2)–(5) and (7)–(10) also include a lagged dependent variable. In Panel A, "Treatment" is coded as "1" for those switching from unemployment to self-employment between two survey waves and 0 for those who remain continuously unemployed. In Panel B, "Treatment" is coded as "1" for those switching from regular full-time employment to full-time self-employment between two survey waves and 0 for those who remain continuously employed as full-time employees.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

life satisfaction declines compared to losing a regular job (Hetschko, 2016), the health consequences of self-employment exit and the role played by the self-employed duration remain open questions. Future research efforts should also elucidate which occupations benefit the most and the least in terms of health and if and how the effects differ along the health distribution. Subsequent studies should also address heterogeneity in the relationship between self-employment and health and seek to tease out the channels leading to entrepreneurial health.

Finally, while the estimation strategy allows eliminating some challenges related to self-selection and reverse causality, as with any paper using observational data, issues related to time-variant unobservables remain. I mitigate these concerns by also conditioning on personality traits and risk preferences, as well as by controlling for the local unemployment rates.

9.3. Conclusion

This paper studies how transitions from unemployment to self-employment and switches from private employment to self-employment affect physical and mental health. Drawing on the Job Demands-Control model and employing an empirical strategy based on difference-in-differences applied after entropy balancing, I show that transitions from unemployment to self-employment (necessity entrepreneurship) lead to relatively large mental health increases but have no corresponding physical health improvements. I further find that those switching from regular employment to self-employment experience both improvements in mental and physical health, with the former gains being larger than the latter. The results are not driven by income changes or personality and risk preferences or the selection of relatively healthy individuals into self-employment. These findings provide support for the "active jobs" hypothesis from the Job Demands-Control model. Thus, the combination of high job demands and high job control enables entrepreneurs to experience positive health benefits overall.

Appendix A

Table A1
Descriptive statistics before treatment, selected variables, before and after matching, unemployment to self-employment (necessity entrepreneurs) sample.
Source: Author's calculations based on SOEP 2002–2014.

	Treated		Controls Unmatched		Controls Matched		Standardized Bias %	
	Mean	Variance	Mean	Variance	Mean	Variance	Unmatched	Matched
Age	38.488	73.970	43.116	113.263	38.380	73.747	−0.538	0.013
Migration background	0.267	0.198	0.223	0.173	0.267	0.196	0.100	0.000
Male	0.744	0.193	0.480	0.250	0.742	0.192	0.601	0.005
Married	0.500	0.253	0.435	0.246	0.499	0.250	0.130	0.003
Single	0.349	0.230	0.312	0.215	0.348	0.227	0.076	0.001
Years of education	12.140	7.080	10.903	3.876	12.106	7.060	0.465	0.013
Household size	2.791	2.120	2.802	2.077	2.783	2.114	−0.008	0.005
Number of children	0.744	1.016	0.743	1.230	0.742	1.013	0.001	0.002
Home ownership	0.291	0.209	0.228	0.176	0.291	0.206	0.137	0.000
Disposable income (log)	10.231	0.431	9.817	0.540	10.202	0.429	0.631	0.044
Windfall income	0.023	0.023	0.012	0.012	0.023	0.023	0.073	0.000
Disabled	0.035	0.034	0.102	0.091	0.035	0.034	−0.361	−0.001
Number of doctor visits	7.581	91.117	10.830	364.146	7.561	90.871	−0.340	0.002
Mental Component Scale (MCS)	48.610	124.204	47.599	126.620	48.473	123.832	0.091	0.012
Physical Component Scale (PCS)	52.705	80.218	48.322	115.763	52.558	79.973	0.489	0.017
Life satisfaction	6.128	5.172	5.554	4.163	6.111	5.157	0.253	0.008
Work experience	13.947	85.949	14.918	114.039	13.907	85.701	−0.105	0.004
Unemployment experience	2.628	12.646	5.668	18.566	2.621	12.610	−0.855	0.002

Notes: N = 86 for the treated and 1566 for the comparison group. The last two columns display the percent standardized bias, which is a measure of matching quality. It is calculated as the difference of the sample means in the treatment and the controls as a square root of the average of the sample variance in both groups. MCS = Mental Component Scale, PCS = Physical Component Scale. See Table 1 for detailed definitions.

Table A2
Descriptive statistics before treatment, selected variables, before and after matching, private employment to self-employment (opportunity entrepreneurs) sample.
Source: Author's calculations based on SOEP 2002–2014.

	Treated		Controls Unmatched		Controls Matched		Standardized Bias %	
	Mean	Variance	Mean	Variance	Mean	Variance	Unmatched	Matched
Age	40.138	74.966	41.849	87.145	40.086	74.866	−0.198	0.006
Migration background	0.146	0.125	0.181	0.148	0.146	0.124	−0.101	0.000
Male	0.774	0.176	0.683	0.217	0.773	0.175	0.217	0.002

(continued on next page)

Table A2 (*continued*)

	Treated		Controls Unmatched		Controls Matched		Standardized Bias %	
	Mean	Variance	Mean	Variance	Mean	Variance	Unmatched	Matched
Married	0.586	0.244	0.616	0.237	0.585	0.243	−0.061	0.002
Single	0.291	0.207	0.268	0.196	0.291	0.206	0.052	0.000
Years of education	13.707	8.613	12.671	6.969	13.689	8.601	0.353	0.006
Household size	3.027	1.588	2.823	1.587	3.023	1.586	0.162	0.003
Number of children	0.782	1.064	0.628	0.865	0.781	1.062	0.149	0.001
Home ownership	0.594	0.242	0.522	0.250	0.593	0.241	0.146	0.002
Disposable income (log)	10.794	0.316	10.613	0.231	10.780	0.315	0.322	0.025
Windfall income	0.057	0.054	0.040	0.039	0.057	0.054	0.074	0.000
Disabled	0.031	0.030	0.045	0.043	0.031	0.030	−0.081	0.000
Number of doctor visits	6.483	114.305	6.700	126.703	6.474	114.160	−0.020	0.001
Mental Component Scale (MCS)	51.042	71.822	50.339	81.382	50.975	71.724	0.083	0.008
Physical Component Scale (PCS)	54.212	52.785	52.845	57.594	54.142	52.712	0.188	0.010
Life satisfaction	7.536	1.927	7.138	2.368	7.527	1.924	0.287	0.007
Agriculture, energy, mining	0.184	0.151	0.253	0.189	0.184	0.150	−0.179	0.000
Manufacturing	0.180	0.148	0.170	0.141	0.180	0.148	0.026	0.000
Construction	0.184	0.151	0.114	0.101	0.184	0.150	0.180	0.000
Trade	0.042	0.041	0.064	0.060	0.042	0.040	−0.110	0.000
Transport	0.065	0.061	0.056	0.053	0.065	0.061	0.036	0.000
Banking, insurance	0.337	0.224	0.310	0.214	0.337	0.223	0.057	0.000
Work experience	16.844	79.877	19.436	95.344	16.823	79.773	−0.290	0.002
Unemployment experience	0.415	1.719	0.427	1.259	0.415	1.717	−0.009	0.000
Length of time with firm	8.697	62.692	11.608	88.106	8.685	62.612	−0.368	0.001
Actual weekly work hours	48.095	99.134	43.744	48.987	48.033	99.001	0.437	0.006
Desired weekly work hours	40.077	90.119	38.554	39.100	40.024	89.999	0.160	0.005
No job security worries	0.460	0.249	0.386	0.237	0.459	0.248	0.147	0.001
Firm size: < 20	0.490	0.251	0.179	0.147	0.490	0.250	0.621	0.001
Firm size: 20–199	0.234	0.180	0.300	0.210	0.234	0.179	−0.157	0.000
Firm size: 200–1999	0.123	0.108	0.264	0.194	0.123	0.108	−0.429	0.000
Firm size: > 1999	0.146	0.125	0.257	0.191	0.146	0.124	−0.314	0.000

Notes: N = 261 for the treated and 21,450 for the controls. The last two columns display the percent standardized bias, which is a measure of matching quality. It is calculated as the difference of the sample means in the treatment and the controls as a square root of the average of the sample variance in both groups.

Table A3
Entropy balancing DID results, switches to entrepreneurship, results including the sub-components of the Mental Component Scale and the Physical Component Scale.
Source: Author's calculations based on SOEP 2002–2014.

Panel A: Necessity Entrepreneurship (Unemployment to Self-Employment)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Δ Mental Component Scale	Δ Mental Health	Δ Vitality	Δ Role Emotional	Δ Social Functioning	Δ Physical Component Scale	Δ No Bodily Pain	Δ General Health	Δ Role Physical	Δ Physical Functioning
Treatment	3.789***	2.524**	3.211***	3.267***	3.645***	1.034	0.733	2.571***	2.777***	1.352
	(1.082)	(1.171)	(1.025)	(1.104)	(1.156)	(0.900)	(1.072)	(0.967)	(0.935)	(0.951)
Pre-treatment covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652
R^2	0.470	0.464	0.529	0.437	0.479	0.393	0.396	0.440	0.427	0.423

Panel B: Opportunity Entrepreneurship (Regular Employment to Self-Employment)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Δ Mental Component Scale	Δ Mental Health	Δ Vitality	Δ Role Emotional	Δ Social Functioning	Δ Physical Component Scale	Δ No Bodily Pain	Δ General Health	Δ Role Physical	Δ Physical Functioning
Treatment	1.141**	0.473	2.241***	0.819*	1.167***	0.795**	1.212***	0.848**	0.528	0.814***
	(0.462)	(0.463)	(0.471)	(0.434)	(0.406)	(0.329)	(0.426)	(0.406)	(0.414)	(0.302)
Pre-treatment covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	21,711	21,711	21,711	21,711	21,711	21,711	21,711	21,711	21,711	21,711
R^2	0.318	0.370	0.338	0.352	0.346	0.354	0.371	0.314	0.381	0.297

Notes: Robust standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. All regressions include the lagged pre-treatment characteristics. Models (2)–(5) and (7)–(10) also include the respective lagged dependent variable. In Panel A, "Treatment" is coded as "1" for those switching from unemployment to self-employment between two survey waves and 0 for those who remain continuously unemployed. In Panel B, "Treatment" is coded as "1" for those switching from regular full-time employment to full-time self-employment between two survey waves and 0 for those who remain continuously employed as full-time employees. MCS = Mental Component Scale, PCS = Physical Component Scale. See Table 1 for detailed definitions.

Commentary on the coefficient estimates in Models (2)–(5) and (7)–(10) in Table A3

The main finding in Table A3 is that necessity entrepreneurship brings mental health benefits but not necessarily physical ones, while opportunity entrepreneurship leads to both physical and health gains. Focusing on the different sub-components of the Mental Component Scale (MCS) and Physical Component Scale (PCS) paints a more nuanced picture. Regarding the mental health components, switching form unemployment to self-employment is clearly associated with positive changes in mental health (Column (2)), vitality (Column (3)), role emotional (Column (4)), and social functioning (Column (5)). Opportunity entrepreneurship (Panel B) is associated with improvements in role emotional (marginally significant), vitality, and social functioning, but the magnitudes of the associated increases are much lower than those for necessity entrepreneurship.

Concerning physical health, Panel A demonstrates that necessity entrepreneurship leads to improvements in role physical only. Panel B further shows that the improvements in the PCS for opportunity entrepreneurs is primarily driven by improvements in bodily pain, general health, and physical functioning. The finding that only opportunity relationship improves general health corroborates the results in Binder and Coad (2016).

Table A4
Firm size after switching to self-employment.
Source: Author's calculations based on SOEP 2002–2014.

	Unemployment to self-employment (necessity entrepreneurship)		Regular employment to self-employment (opportunity entrepreneurship)	
	Number	Percent	Number	Percent
No other employees	50	58.14	71	27.20
< 20	32	37.21	153	58.62
20–199	1	1.16	18	6.90
200–1999	1	1.16	4	1.53
> 1999	–	–	10	3.83
No information	2	2.33	5	1.92
Total	86	100.00	261	100.00

Table A5
Entropy balancing DID results, switches to entrepreneurship, by whether the self-employed has or does not have employees.
Source: Author's calculations based on SOEP 2002–2014.

Panel A: Necessity Entrepreneurship (Unemployment to Self-Employment)

	(1)	(2)
	Δ Mental Component Scale	Δ Physical Component Scale
Treatment (Ref: Continuously unemployed)		
Self-employed without employees	3.234***	0.744
	(1.193)	(1.060)
Self-employed with employees	5.209***	2.017
	(1.483)	(1.267)
Pre-treatment covariates	Yes	Yes
Number of individuals	1650	1650
R^2	0.470	0.390

Panel B: Opportunity Entrepreneurship(Regular Employment to Self-Employment)

	(1)	(2)
	Δ Mental Component Scale	Δ Physical Component Scale
Treatment (Ref: Continuously employed)		
Self-employed without employees	1.601*	0.476
	(0.894)	(0.574)
Self-employed with employees	0.909	0.906**

(*continued on next page*)

Table A5 (*continued*)

Panel B: Opportunity Entrepreneurship(Regular Employment to Self-Employment)

	(1)	(2)
	Δ Mental Component Scale	Δ Physical Component Scale
	(0.558)	(0.404)
Pre-treatment covariates	Yes	Yes
Number of individuals	21,706	21,706
R^2	0.321	0.354

Notes: Robust standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. All regressions include the lagged pre-treatment characteristics. In Panel A, "Treatment" is coded 1 for those who remain continuously unemployed, 2 for those switching from unemployment to self-employment without employees, and 3 for those switching from unemployment to self-employment with employees. In Panel B, "Treatment" is coded 1 for those who remain continuously employed as private employees, 2 for those switching from regular employment to self-employment without employees, and 3 for those switching from regular employment to self-employment with employees. The analysis sample excludes 2 self-employed individuals in Panel A and 5 individuals in Panel B who did not report information on the number of employees. See Table 1 for detailed definitions.

Table A6
Descriptive statistics before treatment, selected variables, before and after matching, unemployment to regular employment sample. Source: Author's calculations based on SOEP 2002–2014.

	Treated		Controls Unmatched		Controls Matched		Standardized Bias %	
	Mean	Variance	Mean	Variance	Mean	Variance	Unmatched	Matched
Age	37.803	120.877	42.895	115.145	37.793	120.844	−0.463	0.001
Migration background	0.227	0.176	0.224	0.174	0.227	0.176	0.007	0.000
Male	0.709	0.207	0.495	0.250	0.708	0.207	0.469	0.000
Married	0.464	0.249	0.437	0.246	0.464	0.249	0.054	0.000
Single	0.389	0.238	0.317	0.216	0.389	0.238	0.148	0.000
Years of education	11.590	4.591	10.908	3.782	11.587	4.589	0.318	0.001
Household size	2.824	1.633	2.794	2.026	2.824	1.632	0.024	0.001
Number of children	0.611	0.850	0.727	1.184	0.611	0.850	−0.126	0.000
Home ownership	0.376	0.235	0.231	0.178	0.376	0.235	0.298	0.000
Disposable income (log)	10.156	0.458	9.833	0.528	10.154	0.458	0.478	0.004
Windfall income	0.024	0.024	0.014	0.013	0.024	0.024	0.069	0.000
Disabled	0.050	0.048	0.098	0.088	0.050	0.048	−0.218	0.000
Number of doctor visits	8.154	204.268	10.712	352.918	8.152	204.214	−0.179	0.000
Mental Component Scale (MCS)	48.892	109.855	47.531	127.596	48.879	109.826	0.130	0.001
Physical Component Scale (PCS)	52.601	74.323	48.463	113.315	52.587	74.304	0.480	0.002
Life satisfaction	5.734	3.932	5.541	4.171	5.733	3.931	0.097	0.001
Work experience	13.672	112.711	14.973	115.179	13.668	112.681	−0.123	0.000
Unemployment experience	2.600	8.719	5.481	18.268	2.599	8.717	−0.976	0.000

Notes: N = 700 for the treated and 1690 for the comparison group. The last two columns display the percent standardized bias, which is a measure of matching quality. It is calculated as the difference of the sample means in the treatment and the controls as a square root of the average of the sample variance in both groups. See Table 1 for detailed definitions.

Table A7
Descriptive statistics before treatment, selected variables, before and after matching, private employment to private employment sample (job changes).
Source: Author's calculations based on SOEP 2002–2014.

	Treated		Controls Unmatched		Controls Matched		Standardized Bias %	
	Mean	Variance	Mean	Variance	Mean	Variance	Unmatched	Matched
Age	38.336	80.535	42.764	80.252	38.319	80.498	−0.493	0.002
Migration background	0.164	0.138	0.181	0.148	0.164	0.137	−0.046	0.000
Male	0.721	0.202	0.684	0.216	0.720	0.201	0.082	0.001
Married	0.559	0.247	0.642	0.230	0.559	0.247	−0.168	0.001
Single	0.350	0.228	0.239	0.182	0.350	0.228	0.233	0.000
Years of education	13.147	7.556	12.597	6.818	13.141	7.553	0.200	0.002
Household size	2.799	1.444	2.835	1.596	2.798	1.444	−0.030	0.001
Number of children	0.661	0.824	0.636	0.878	0.661	0.824	0.028	0.000
Home ownership	0.450	0.248	0.539	0.248	0.450	0.248	−0.179	0.000
Disposable income (log)	10.610	0.259	10.631	0.207	10.605	0.259	−0.041	0.010
Windfall income	0.047	0.045	0.039	0.037	0.047	0.045	0.038	0.000
Disabled	0.039	0.038	0.047	0.045	0.039	0.038	−0.039	0.000
Number of doctor visits	7.297	260.629	6.772	125.029	7.294	260.509	0.033	0.000
Mental Component Scale (MCS)	49.933	84.493	50.381	80.796	49.910	84.453	−0.049	0.002
Physical Component Scale (PCS)	53.477	54.049	52.614	58.428	53.452	54.024	0.117	0.003
Life satisfaction	7.057	2.431	7.144	2.346	7.054	2.430	−0.056	0.002
Agriculture, energy, mining	0.225	0.175	0.261	0.193	0.225	0.174	−0.085	0.000
Manufacturing	0.171	0.142	0.169	0.140	0.171	0.142	0.005	0.000
Construction	0.135	0.117	0.112	0.100	0.135	0.117	0.068	0.000
Trade	0.077	0.071	0.063	0.059	0.077	0.071	0.054	0.000
Transport	0.058	0.055	0.058	0.054	0.058	0.055	0.002	0.000
Banking, insurance	0.308	0.214	0.306	0.212	0.308	0.213	0.005	0.000
Work experience	15.618	82.622	20.458	88.548	15.611	82.584	−0.533	0.001
Unemployment experience	0.488	1.460	0.376	1.067	0.488	1.459	0.093	0.000
Length of time with firm	7.917	49.638	12.912	84.629	7.913	49.616	−0.709	0.001
Actual weekly work hours	45.318	57.816	43.564	47.155	45.297	57.789	0.231	0.003
Desired weekly work hours	39.349	42.111	38.405	38.246	39.331	42.091	0.145	0.003
No job security worries	0.335	0.223	0.391	0.238	0.335	0.223	−0.119	0.000
Firm size: < 20	0.219	0.171	0.168	0.140	0.219	0.171	0.122	0.000
Firm size: 20–199	0.290	0.206	0.300	0.210	0.289	0.206	−0.024	0.000
Firm size: 200–1999	0.210	0.166	0.272	0.198	0.210	0.166	−0.152	0.000
Firm size: > 1999	0.282	0.203	0.259	0.192	0.282	0.202	0.050	0.000

Notes: N = 791 for the treated and 21,450 for the comparison group. The last two columns display the percent standardized bias, which is a measure of matching quality. It is calculated as the difference of the sample means in the treatment and the controls as a square root of the average of the sample variance in both groups.

References

Aday, L.A., Cornelius, L.J., 2006. Designing and Conducting Health Surveys: A Comprehensive Guide. John Wiley & Sons.

Andersen, H.H., Mühlbacher, A., Nübling, M., Schupp, J., Wagner, G.G., 2007. Computation of standard values for physical and mental health scale scores using the SOEP version of SF-12v2. Schmollers Jahr. 127 (1), 171–182.

Andersson, P., 2008. Happiness and health: well-being among the self-employed. J. Socio-Econ. 37 (1), 213–236.

Anger, S., Camehl, G., Peter, F., 2017. Involuntary job loss and changes in personality traits. J. Econ. Psychol. 60, 71–91.

Baron, R.A., Franklin, R.J., Hmieleski, K.M., 2016. Why entrepreneurs often experience low, not high, levels of stress: the joint effects of selection and psychological capital. J. Manag. 42 (3), 742–768.

Benz, M., Frey, B.S., 2008a. Being independent is a great thing: subjective evaluations of self-employment and hierarchy. Economica 75 (298), 362–383.

Benz, M., Frey, B.S., 2008b. The value of doing what you like: evidence from the self-employed in 23 countries. J. Econ. Behav. Organ. 68 (3/4), 445–455. https://doi.org/10.1016/j.jebo.2006.10.014.

Binder, M., Coad, A., 2013. Life satisfaction and self-employment: a matching approach. Small Bus. Econ. 40 (4), 1009–1033.

Binder, M., Coad, A., 2016. How satisfied are the self-employed? A life domain view. J. Happiness Stud. 17 (4), 1409–1433.

Black, S.E., Devereux, P.J., Salvanes, K.G., 2015. Losing heart? The effect of job displacement on health. ILR Review 68 (4), 833–861.

Blanchflower, D.G., 2004. Self-employment: More May Not Be Better. NBER Working Paper 10286. http://www.nber.org/papers/w10286.

Blanchflower, D.G., Oswald, A.J., 1998. What makes an entrepreneur? J. Labor Econ. 16 (1), 26–60.

Block, J., Koellinger, P., 2009. I Can't get no satisfaction—necessity entrepreneurship and procedural utility. Kyklos 62 (2), 191–209. https://doi.org/10.1111/j.1467-

6435.2009.00431.x.
Block, J., Sandner, P., 2009. Necessity and opportunity entrepreneurs and their duration in self-employment: evidence from German micro data. J. Ind. Compet. Trade 9 (2), 117–137. https://doi.org/10.1007/s10842-007-0029-3.
Bogan, V. L., Fertig, A. R., & Just, D. R. (2014). Self-employment and mental health. Available at: https://ssrn.com/abstract=2259765 or https://doi.org/10.2139/ssrn.2259765.
Bowling, A., 2005. Measuring Health: A Review of Quality of Life Measurement Scales, 3rd ed. McGraw-Hill Education, Maidenhead, Berkshire, England, pp. 43–77.
Boyce, C.J., Wood, A.M., Daly, M., Sedikides, C., 2015. Personality change following unemployment. J. Appl. Psychol. 100 (4), 991.
Browning, M., Moller Dano, A., Heinesen, E., 2006. Job displacement and stress-related health outcomes. Health Econ. 15 (10), 1061–1075. https://doi.org/10.1002/hec.1101.
de Bruin, S.R., Heijink, R., Lemmens, L.C., Struijs, J.N., Baan, C.A., 2011. Impact of disease management programs on healthcare expenditures for patients with diabetes, depression, heart failure or chronic obstructive pulmonary disease: a systematic review of the literature. Health Policy 101 (2), 105–121. https://doi.org/10.1016/j.healthpol.2011.03.006.
Bubonya, M., Cobb-Clark, D.A., Wooden, M., 2017. Job loss and the mental health of spouses and adolescent children. J. Labor Econ. 6 (1), 6. https://doi.org/10.1186/s40172-017-0056-1.
Buttner, E.H., 1992. Entrepreneurial stress: is it hazardous to your health? J. Manag. Issues 223–240.
Caliendo, M., Hogenacker, J., 2012. The German labor market after the Great Recession: successful reforms and future challenges. IZA J. Eur. Labor Stud. 1 (1), 3. https://doi.org/10.1186/2193-9012-1-3.
Caliendo, M., Kritikos, A.S., 2010. Start-ups by the unemployed: characteristics, survival and direct employment effects. Small Bus. Econ. 35 (1), 71–92.
Caliendo, M., Künn, S., 2011. Start-up subsidies for the unemployed: long-term evidence and effect heterogeneity. J. Public Econ. 95 (3), 311–331. https://doi.org/10.1016/j.jpubeco.2010.11.003.
Caliendo, M., Fossen, F., Kritikos, A.S., 2014. Personality characteristics and the decisions to become and stay self-employed. Small Bus. Econ. 42 (4), 787–814.
Caliendo, M., Künn, S., Weißenberger, M., 2016. Personality traits and the evaluation of start-up subsidies. Eur. Econ. Rev. 86, 87–108. https://doi.org/10.1016/j.euroecorev.2015.11.008.
Card, D., Ibarrarán, P., Villa, J.M., 2011. Building in an Evaluation Component for Active Labor Market Programs: A practitioner's Guide. IZA DP (No. 6085).
Cardon, M.S., Patel, P.C., 2015. Is stress worth it? Stress-related health and wealth trade-offs for entrepreneurs. Appl. Psychol. 64 (2), 379–420. https://doi.org/10.1111/apps.12021.
Chadi, A., Hetschko, C., 2017a. Income or Leisure? On the Hidden Benefits of (Un-)employment. Institute of Labour Law and Industrial Relations in the European Union (IAAEU) Working Paper No. 06/2017.
Chadi, A., Hetschko, C., 2017b. The magic of the new: how job changes affect job satisfaction. J. Econ. Manag. Strateg. (00), 1–17. https://doi.org/10.1111/jems.12217.
Chadi, A., Hetschko, C., 2018. The magic of the new: how job changes affect job satisfaction. J. Econ. Manag. Strateg. 27 (1), 23–39. https://doi.org/10.1111/jems.12217.
Chang, C.-K., Hayes, R.D., Perera, G., Broadbent, M.T., Fernandes, A.C., Lee, W.E., ... Stewart, R., 2011. Life expectancy at birth for people with serious mental illness and other major disorders from a secondary mental health care case register in London. PLoS One 6 (5), e19590.
Cobb-Clark, D.A., Kassenboehmer, S.C., Schurer, S., 2014. Healthy habits: the connection between diet, exercise, and locus of control. J. Econ. Behav. Organ. 98, 1–28.
De Neve, J.-E., Diener, E., Tay, L., Xuereb, C., 2013. The objective benefits of subjective well-being. In: Helliwell, J.F., Layard, R., Sachs, J. (Eds.), World Happiness Report, pp. 54–79.
Deb, P., Gallo, W.T., Ayyagari, P., Fletcher, J.M., Sindelar, J.L., 2011. The effect of job loss on overweight and drinking. J. Health Econ. 30 (2), 317–327. https://doi.org/10.1016/j.jhealeco.2010.12.009.
Demerouti, E., Bakker, A.B., de Jonge, J., Janssen, P.P.M., Schaufeli, W.B., 2001a. Burnout and engagement at work as a function of demands and control. Scand. J. Work Environ. Health 27 (4), 279–286.
Demerouti, E., Bakker, A.B., Nachreiner, F., Schaufeli, W.B., 2001b. The job demands-resources model of burnout. J. Appl. Psychol. 86 (3), 499.
van der Hulst, M., 2003. Long workhours and health. Scand. J. Work Environ. Health 29 (3), 171–188.
Desai, S., 2017. Measuring entrepreneurship: type, motivation, and growth. IZA World Labor 2017, 327. https://doi.org/10.15185/izawol.327.
Dohmen, T.J., Falk, A., Huffman, D., Sunde, U., Schupp, J., Wagner, G.G., 2005. Individual Risk Attitudes: New Evidence From a Large, Representative, Experimentally-validated Survey. IZA Discussion Paper No. 1730.
Edwards, J.R., Cooper, C.L., 1988. The impacts of positive psychological states on physical health: a review and theoretical framework. Soc. Sci. Med. 27 (12), 1447–1459.
Fairlie, R.W., Fossen, F.M., 2018. Opportunity Versus Necessity Entrepreneurship: Two Components of Business Creation. IZA Discussion Paper 11258.
Fletcher, J., 2009. All in the family: mental health spillover effects between working spouses. J. Econ. Anal. Policy 9 (1), 1. https://doi.org/10.2202/1935-1682.1967.
Freier, R., Schumann, M., Siedler, T., 2015. The earnings returns to graduating with honors — evidence from law graduates. Labour Econ. 34, 39–50. https://doi.org/10.1016/j.labeco.2015.03.001.
Frey, B.S., Benz, M., Stutzer, A., 2004. Introducing procedural utility: not only what, but also how matters. J. Inst. Theor. Econ. 377–401.
Fuchs-Schündeln, N., 2009. On preferences for being self-employed. J. Econ. Behav. Organ. 71 (2), 162–171. https://doi.org/10.1016/j.jebo.2009.03.024.
Gandek, B., Ware, J.E., Aaronson, N.K., Apolone, G., Bjorner, J.B., Brazier, J.E., ... Sullivan, M., 1998. Cross-validation of item selection and scoring for the SF-12 health survey in nine countries: results from the IQOLA project. J. Clin. Epidemiol. 51 (11), 1171–1178. https://doi.org/10.1016/S0895-4356(98)00109-7.
Gelman, A., Stern, H., 2006. The difference between "significant" and "not significant" is not itself statistically significant. Am. Stat. 60 (4), 328–331.
GEM, 2018. Global entrepreneurship monitoring report 2017/18. Retrieved from. http://gemconsortium.org/about/news.
Gerdtham, U.-G., Johannesson, M., 2003. A note on the effect of unemployment on mortality. J. Health Econ. 22 (3), 505–518. https://doi.org/10.1016/S0167-6296(03)00004-3.
Gimeno, J., Folta, T.B., Cooper, A.C., Woo, C.Y., 1997. Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. Adm. Sci. Q. 42 (4), 750–783. https://doi.org/10.2307/2393656.
Goldsby, M.G., Kuratko, D.F., Bishop, J.W., 2005. Entrepreneurship and fitness: an examination of rigorous exercise and goal attainment among small business owners. J. Small Bus. Manag. 43 (1), 78–92.
Hainmueller, J., 2012. Entropy balancing for causal effects: a multivariate reweighting method to produce balanced samples in observational studies. Polit. Anal. 20 (1), 25–46.
Hainmueller, J., Xu, Y., 2013. Ebalance: a Stata package for entropy balancing. J. Stat. Softw. 54 (7), 1–18.
Hamilton, B.H., 2000. Does entrepreneurship pay? An empirical analysis of the returns to self-employment. J. Polit. Econ. 108 (3), 604–631.
Hébert, R.F., Link, A.N., 1989. In search of the meaning of entrepreneurship. Small Bus. Econ. 1 (1), 39–49.
Heckman, J.J., Ichimura, H., Todd, P.E., 1997. Matching as an econometric evaluation estimator: evidence from evaluating a job training programme. Rev. Econ. Stud. 64 (4), 605–654.
Heinrich, C., Maffioli, A., Vazquez, G., 2010. A Primer for Applying Propensity-score Matching: Inter-American Development Bank. Office of Strategic Planning and Development Effectiveness (SPD).
Hessels, J., Arampatzi, E., van der Zwan, P., Burger, M., 2017a. Life satisfaction and self-employment in different types of occupations. Appl. Econ. Lett. 1–7. https://doi.org/10.1080/13504851.2017.1361003.
Hessels, J., Rietveld, C.A., van der Zwan, P., 2017b. Self-employment and work-related stress: the mediating role of job control and job demand. J. Bus. Ventur. 32 (2), 178–196.
Hetschko, C., 2016. On the misery of losing self-employment. Small Bus. Econ. 47 (2), 461–478.
Hetschko, C., Knabe, A., Schöb, R., 2014. Changing identity: retiring from unemployment. Econ. J. 124 (575), 149–166. https://doi.org/10.1111/ecoj.12046.

Hetschko, C., Schöb, R., Wolf, T., 2017. Income Support, (Un-)employment and Well-being. (Working Paper).
van Hoorn, A., Maseland, R., 2013. Does a Protestant work ethic exist? Evidence from the well-being effect of unemployment. J. Econ. Behav. Organ. 91, 1–12. https://doi.org/10.1016/j.jebo.2013.03.038.
Hundley, G., 2001. Why and when are the self-employed more satisfied with their work? Ind. Relat. 40 (2), 293–316.
Hurst, E., Lusardi, A., 2004. Liquidity constraints, household wealth, and entrepreneurship. J. Polit. Econ. 112 (2), 319–347. https://doi.org/10.1086/381478.
Jaeger, D.A., Dohmen, T., Falk, A., Huffman, D., Sunde, U., Bonin, H., 2010. Direct evidence on risk attitudes and migration. Rev. Econ. Stat. 92 (3), 684–689.
Jamal, M., 1997. Job stress, satisfaction, and mental health: an empirical examination of self-employed and non-self-employed Canadians. J. Small Bus. Manag. 35 (4), 48.
Karasek, R.A., 1979. Job demands, job decision latitude, and mental strain: implications for job redesign. Adm. Sci. Q. 24 (2), 285–308. https://doi.org/10.2307/2392498.
Kautonen, T., Palmroos, J., 2010. The impact of a necessity-based start-up on subsequent entrepreneurial satisfaction. Int. Entrep. Manag. J. 6 (3), 285–300.
Knabe, A., Rätzel, S., 2011. Scarring or scaring? The psychological impact of past unemployment and future unemployment risk. Economica 78 (310), 283–293. https://doi.org/10.1111/j.1468-0335.2009.00816.x.
Kreif, N., Grieve, R., Hangartner, D., Turner, A.J., Nikolova, S., Sutton, M., 2016. Examination of the synthetic control method for evaluating health policies with multiple treated units. Health Econ. 25 (12), 1514–1528. https://doi.org/10.1002/hec.3258.
Kritikos, A.S., 2014. Entrepreneurs and their impact on jobs and economic growth. IZA World Labor. https://doi.org/10.15185/izawol.8.
Kuhn, A., Lalive, R., Zweimüller, J., 2009. The public health costs of job loss. J. Health Econ. 28 (6), 1099–1115.
Kunze, L., Suppa, N., 2017. The Effect of Unemployment on Social Participation of Spouses–Evidence From Plant Closures in Germany. SOEP Paper No. 898.
Larsson, J.P., Thulin, P., 2017. Life Satisfaction of Necessity and Opportunity Entrepreneurs in 70 Countries. Swedish Entrepreneurship Forum Working Paper 55. pp. 1–31.
Lechner, M., 2011. The Estimation of Causal Effects by Difference-in-Difference Methods. Department of Economics, University of St. Gallen, St. Gallen, Switzerland.
Lewin-Epstein, N., Yuchtman-Yaar, E., 1991. Health risks of self-employment. Work. Occup. 18 (3), 291–312.
Lindh, T., Ohlsson, H., 1996. Self-employment and windfall gains: evidence from the Swedish lottery. Econ. J. 106 (439), 1515–1526. https://doi.org/10.2307/2235198.
Marcus, J., 2013. The effect of unemployment on the mental health of spouses – evidence from plant closures in Germany. J. Health Econ. 32 (3), 546–558. https://doi.org/10.1016/j.jhealeco.2013.02.004.
Marcus, J., 2014. Does job loss make you smoke and gain weight? Economica 81 (324), 626–648.
McEwen, B.S., 2000. The neurobiology of stress: from serendipity to clinical relevance1. Brain Res. 886 (1–2), 172–189.
McEwen, B.S., 2005. Stressed or stressed out: what is the difference? J. Psychiatry Neurosci. 30 (5), 315.
McEwen, B.S., Stellar, E., 1993. Stress and the individual: mechanisms leading to disease. Arch. Intern. Med. 153 (18), 2093–2101. https://doi.org/10.1001/archinte.1993.00410180039004.
McMullen, J.S., Shepherd, D.A., 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. Acad. Manag. Rev. 31 (1), 132–152.
Millán, J.M., Hessels, J., Thurik, R., Aguado, R., 2013. Determinants of job satisfaction: a European comparison of self-employed and paid employees. Small Bus. Econ. 40 (3), 651–670.
Nikolova, M., Ayhan, S.H., 2018. Your spouse is fired! How much do you care? J. Popul. Econ. https://doi.org/10.1007/s00148-018-0693-0.
Nikolova, M., Graham, C., 2014. Employment, late-life work, retirement, and well-being in Europe and the U.S. IZA J. Eur. Labor Stud. 3 (5), 1–30.
OECD. (2017). Self-employment Rate (Indicator). doi: https://doi.org/10.1787/fb58715e-en (Accessed on 06 June 2017).
Ohrnberger, J., Fichera, E., Sutton, M., 2017. The relationship between physical and mental health: a mediation analysis. Soc. Sci. Med. 195, 42–49. https://doi.org/10.1016/j.socscimed.2017.11.008.
O'leary, A., 1990. Stress, emotion, and human immune function. Psychol. Bull. 108 (3), 363.
O'Neill, S., Kreif, N., Grieve, R., Sutton, M., Sekhon, J.S., 2016. Estimating causal effects: considering three alternatives to difference-in-differences estimation. Health Serv. Outcome Res. Methodol. 16 (1–2), 1–21.
Pagán, R., 2009. Self-employment among people with disabilities: evidence for Europe. Disabil. Soc. 24 (2), 217–229.
Parker, S., 2009. Introduction. In: Parker, S.C. (Ed.), The Economics of Entrepreneurship. Cambridge University Press, Cambridge, pp. 1–28.
Paternoster, R., Brame, R., Mazerolle, P., Piquero, A., 1998. Using the correct statistical test for the equality of regression coefficients. Criminology 36 (4), 859–866.
Patzelt, H., Shepherd, D.A., 2011. Negative emotions of an entrepreneurial career: self-employment and regulatory coping behaviors. J. Bus. Ventur. 26 (2), 226–238. https://doi.org/10.1016/j.jbusvent.2009.08.002.
Powdthavee, N., Vernoit, J., 2013. Parental unemployment and children's happiness: a longitudinal study of young people's well-being in unemployed households. Labour Econ. 24, 253–263.
van Praag, C.M., 1999. Some classic views on entrepreneurship. De Economist 147 (3), 311–335. https://doi.org/10.1023/a:1003749128457.
van Praag, C.M., Versloot, P.H., 2007. What is the value of entrepreneurship? A review of recent research. Small Bus. Econ. 29 (4), 351–382.
Prottas, D.J., Thompson, C.A., 2006. Stress, satisfaction, and the work-family interface: a comparison of self-employed business owners, independents, and organizational employees. J. Occup. Health Psychol. 11 (4), 366.
Reynolds, P., Bosma, N., Autio, E., Hunt, S., Bono, N.D., Servais, I., ... Chin, N., 2005. Global entrepreneurship monitor: data collection design and implementation 1998–2003. Small Bus. Econ. 24 (3), 205–231. https://doi.org/10.1007/s11187-005-1980-1.
Rietveld, C.A., Kippersluis, H., Thurik, A.R., 2015. Self-employment and health: barriers or benefits? Health Econ. 24 (10), 1302–1313.
Robson, D., Gray, R., 2007. Serious mental illness and physical health problems: a discussion paper. Int. J. Nurs. Stud. 44 (3), 457–466.
Ryan, A.M., Burgess, J.F., Dimick, J.B., 2015. Why we should not be indifferent to specification choices for difference-in-differences. Health Serv. Res. 50 (4), 1211–1235. https://doi.org/10.1111/1475-6773.12270.
Salyers, M.P., Bosworth, H.B., Swanson, J.W., Lamb-Pagone, J., Osher, F.C., 2000. Reliability and validity of the SF-12 health survey among people with severe mental illness. Med. Care 38 (11), 1141–1150.
Schmitz, H., 2011. Why are the unemployed in worse health? The causal effect of unemployment on health. Labour Econ. 18 (1), 71–78. https://doi.org/10.1016/j.labeco.2010.08.005.
Shane, S., 2009. Why encouraging more people to become entrepreneurs is bad public policy. Small Bus. Econ. 33 (2), 141–149. https://doi.org/10.1007/s11187-009-9215-5.
Shepherd, D.A., Patzelt, H., 2015. The “heart” of entrepreneurship: the impact of entrepreneurial action on health and health on entrepreneurial action. J. Bus. Ventur. Insights 4, 22–29.
Shepherd, D.A., Patzelt, H., 2017. Researching the Inter-relationship of Health and Entrepreneurship Trailblazing in Entrepreneurship. Springer, pp. 209–256.
Shir, N., 2015. Entrepreneurial Well-being: The Payoff Structure of Business Creation. Stockholm School of Economics.
Simmons, B.L., Nelson, D.L., 2001. Eustress at work: the relationship between hope and health in hospital nurses. Health Care Manag. Rev. 26 (4), 7–18.
SOEPGroup, 2017. SOEP-Core v32 – documentation of person-related status and generated variables in $PGEN. In: SOEP Survey Papers 411: Series D – Variable Descriptions and Coding. DIW Berlin/SOEP, Berlin.
Specht, J., Egloff, B., Schmukle, S.C., 2011. Stability and change of personality across the life course: the impact of age and major life events on mean-level and rank-order stability of the Big Five. J. Pers. Soc. Psychol. 101 (4), 862.
Stephan, U., Pathak, S., 2016. Beyond cultural values? Cultural leadership ideals and entrepreneurship. J. Bus. Ventur. 31 (5), 505–523. https://doi.org/10.1016/j.jbusvent.2016.07.003.
Stephan, U., Roesler, U., 2010. Health of entrepreneurs versus employees in a national representative sample. J. Occup. Organ. Psychol. 83 (3), 717–738.
Sullivan, D., Von Wachter, T., 2009. Job displacement and mortality: an analysis using administrative data. Q. J. Econ. 124 (3), 1265–1306.
Surtees, P., Wainwright, N., Luben, R., Wareham, N., Bingham, S., Khaw, K.-T., 2008. Psychological distress, major depressive disorder, and risk of stroke. Neurology

70 (10), 788–794.
Taris, T.W., Geurts, S.A., Schaufeli, W.B., Blonk, R.W., Lagerveld, S.E., 2008. All day and all of the night: the relative contribution of two dimensions of workaholism to well-being in self-employed workers. Work Stress. 22 (2), 153–165.
Theorell, T., Karasek, R.A., 1996. Current issues relating to psychosocial job strain and cardiovascular disease research. J. Occup. Health Psychol. 1 (1), 9.
Uy, M.A., Foo, M.-D., Song, Z., 2013. Joint effects of prior start-up experience and coping strategies on entrepreneurs' psychological well-being. J. Bus. Ventur. 28 (5), 583–597. https://doi.org/10.1016/j.jbusvent.2012.04.003.
Verme, P., 2009. Happiness, freedom and control. J. Econ. Behav. Organ. 71 (2), 146–161. https://doi.org/10.1016/j.jebo.2009.04.008.
Wagner, G., Frick, J.R., Schupp, J., 2007. The German socio-economic panel study (SOEP)-scope, evolution and enhancements. Schmollers Jahr. 127 (1), 139–169.
Ware, J.E., Kosinski, M., Keller, S.D., 1996. A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. Med. Care 34 (3), 220–233.
Wiklund, J., Yu, W., Tucker, R., Marino, L.D., 2017. ADHD, impulsivity and entrepreneurship. J. Bus. Ventur. 32 (6), 627–656. https://doi.org/10.1016/j.jbusvent.2017.07.002.
Winkelmann, R., 2014. Unemployment and Happiness. 94 IZA World of Laborhttps://doi.org/10.15185/izawol.94.
Witte, H.D., 1999. Job insecurity and psychological well-being: review of the literature and exploration of some unresolved issues. Eur. J. Work Organ. Psy. 8 (2), 155–177.
Wolfe, M.T., Patel, P.C., 2017. Persistent and repetitive: obsessive-compulsive personality disorder and self-employment. J. Bus. Ventur. Insights 8, 125–137.