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Self-Employment Can Be Good for Your Health

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Abstract

Drawing upon 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. Specifically, I utilize German longitudinal data for the period 2002-2014 and difference-in-differences estimations and find that both switches from unemployment to self-employment (necessity entrepreneurship) and transitions from regular employment to self-employment (opportunity entrepreneurship) lead to health enhancements for entrepreneurs with and without employees. Specifically, necessity entrepreneurs experience improvements in mental but not physical health, while opportunity entrepreneurship is associated with both physical and mental health gains, which is in line with the theoretical predictions. 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. The results have implications for entrepreneurship theory and practice, current and would-be entrepreneurs as well as policy-makers.

Keywords: mental health, physical health, self-employment, difference-in-differences

JEL Codes: I10, J01, L26

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1. Executive summary

Entrepreneurs add to economic growth and prosperity, create jobs for themselves and others, and contribute to innovation and public finances. As such, governments around the world encourage entrepreneurial activities through subsidies and start-up grants. Moreover, a myriad of studies finds that the self-employed enjoy favorable working conditions related to being their own boss and having control over their jobs that enhance their job satisfaction compared to similar salaried workers (Benz & Frey, 2008a, 2008b; Hundley, 2001).

Nonetheless, the question of how entrepreneurship affects physical and mental health has received relatively less attention (Shepherd & 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 & 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 entrepreneurship. A distinct feature of this research is the attention paid to the role of heterogeneity – both in terms of self-employment entry motives and in terms of whether the self-employed employ others or not. Specifically, the longitudinal dimension of my data allows me to study individuals who transition from unemployment to self-employment separately from those who were initially regular paid employees before becoming entrepreneurs. I also highlight the distinction between employees who only work by themselves from the job creators who employ others.

I find that both switches from unemployment to self-employment (necessity entrepreneurship) and transitions from regular employment to self-employment (opportunity entrepreneurship) lead to health enhancements for entrepreneurs with and without employees. Specifically, necessity entrepreneurs experience improvements in their mental but not physical health, while opportunity entrepreneurship leads to both physical and mental health gains, which is in line with the theoretical predictions. Importantly, the health improvements cannot be explained by changes in income or changes in working conditions alone and are not driven by personality and risk preferences or local unemployment conditions. As such, the results highlight the non-pecuniary benefits of entrepreneurship.

My results imply that because self-employment is conducive to better health outcomes, policy instruments such as start-up grants that encourage entrepreneurship can also improve mental and physical health outcomes in society. Given that self-employment is about ten percent of total employment in Germany (OECD, 2017) and that about five percent of the population being the owner/manager of a new enterprise or in the process of starting a business (GEM, 2018), this paper's findings have implications for entrepreneurs and would-be entrepreneurs and policymakers.

This study makes three broad contributions to the literature. 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. I also study the health consequences for the self-employed with and without employees. 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

A relatively large scholarship in the fields of economics, psychology, and entrepreneurship has documented that the self-employed have higher levels of job satisfaction than regular workers in advanced countries. This finding holds even after controlling for income (Binder & Coad, 2013, 2016; Blanchflower & Oswald, 1998; Nikolova & Graham, 2014) and occupation and skill levels (Hessels, Arampatzi, van der Zwan, & Burger, 2017). This work satisfaction premium among the self-employed is mainly attributed to the non-pecuniary benefits of doing interesting work and the autonomy that often come with being your own boss (Benz & 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 & Patzelt, 2015, 2017).[1] Theoretically, it is possible that self-employment hinders or improves health, or that it affects mental and physical health differentially. On the one hand, the self-employed may derive physical and mental health benefits from having greater autonomy and flexibility. On the other hand, entrepreneurship may worsen health if it is associated with longer conflicting job demands, working hours, stress, and loneliness. The heterogeneity in terms of the labor market circumstances before starting a new business also likely plays a role for the health outcomes. Specifically, given the high mental health and subjective well-being costs of unemployment (Kuhn, Lalive, & Zweimüller, 2009; Marcus, 2013; Winkelmann, 2014), individuals who manage to escape the precariousness of joblessness through becoming self-employed likely benefit more in terms of mental health compared to physical health. At the same time, regular workers who start their own business gain in terms of their mental health if their new entrepreneurial careers allow them to derive utility from the process of being self-employed and enjoying autonomy and flexibility. In addition, these mental health benefits from the "procedural utility" (Benz & Frey, 2008a, 2008b) associated with self-employment likely bring physical health benefits. The health implications of entrepreneurship also likely vary depending on whether the self-employed are job creators or not. Specifically, entrepreneurs who employ others may have more stressful and complex jobs, which may also lead to exhaustion and thus increased health risks compared with solo entrepreneurs.

This paper broadly contributes to the literatures on the well-being consequences of entrepreneurship (Andersson, 2008; Baron, Franklin, & Hmieleski, 2016; Kautonen, Kibler, & Minniti, 2017; Patzelt & Shepherd, 2011; Shir, 2015; Uy, Foo, & Song, 2013) and specifically the scholarship on entrepreneurship and health (Rietveld, Kippersluis, & Thurik, 2015; Shepherd & Patzelt, 2015, 2017; Stephan & Roesler, 2010). Drawing upon theoretical perspectives from the Job Demand-Control model (Karasek, 1979; Theorell & Karasek, 1996), and relying on German panel data, this paper furnishes the first causal estimate of the mental and physical consequences self-

[1] There is no uniform definition of the term entrepreneurship. The operationalization of the concept varies across the different disciplines and is often constrained by data availability (Parker, 2009b). For example, on the one hand, business scholars define entrepreneurship in terms of opportunity recognition and venture creation (Parker, 2009b; Reynolds et al., 2005; Shir, 2015), especially in conditions of uncertainty (McMullen & Shepherd, 2006). On the other hand, economists conceive entrepreneurship narrowly in terms of self-employment and business ownership. The Global Entrepreneurship Monitor (GEM) defines entrepreneurs as the creators of new ventures within the last 42 months. Yet, even this definition is not without its problems. Parker (2009b) furnishes further details and nuances as well as discusses the main critiques of the frequently used definitions of entrepreneurship. While providing a uniform definition of entrepreneurship is beyond the scope of this study, 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. For a historical view on the definition and conceptualization of entrepreneurship in economics see van Praag (1999) and Hébert and Link (1989).

employment. A distinct feature of this research is the attention paid to heterogeneity – both in terms of self-employment entry motives and whether the self-employed employ others or not.

Unlike other studies in the literature, which tend to use cross-sectional information, I utilize data that trace the same individuals over time, which, combined with the methodologically robust estimation strategy, allows me to offer causal estimates. 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 physical health. Individuals who transition from unemployment to self-employment (necessity entrepreneurs) realize large mental health gains but no overall physical health benefits, while individuals switching from regular employment to self-employment (opportunity entrepreneurs) benefit both in terms of 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 and research attention. The health improvements that I document 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. Thus, these results highlight the non-monetary benefits of entrepreneurship, especially for those escaping the misery of unemployment.

Studying the health-entrepreneurship nexus is policy-relevant for several reasons. First, entrepreneurship is important for economic growth and innovation (Kritikos, 2014; van Praag & Versloot, 2007)[2]; Second, if self-employment is also conducive to better health outcomes, then policy instruments such as start-up grants that stimulate entrepreneurship endeavors can also potentially improve mental and physical health outcomes in society. Given that self-employment is about 10 percent of total employment in Germany (OECD, 2017) and that about 5 percent of the population is an owner/manager of a new enterprise or in the process of starting a business (GEM, 2018), this paper's findings have implications for entrepreneurs and would-be entrepreneurs and policymakers.

The contributions of this paper are threefold. 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. I also distinguish conceptually and empirically between the self-employed with and without employees. Third, I utilize a methodologically robust approach that mitigates issues related to selection on observables, time-invariant unobservables, and differences in initial socio-demographic and health conditions, which to my knowledge, has not been applied to studying the health consequences of entrepreneurship before. As such, this paper is the first to offer a causal estimate of the health consequences of entrepreneurship. I also offer robustness checks controlling for personality traits, risk preferences, and local unemployment rates, which provide further confidence in the main findings. 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.

3. Theoretical background

3.1. The Job Demand-Control model

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

The Job Demand-Control model (Karasek, 1979; Theorell & Karasek, 1996) furnishes a powerful theoretical lens for conceptualizing self-employment's health implications. Broadly conceived, the theory postulates that a mismatch between *job demands* (perceived work intensity, time stress, workload, conflicting demands) and *job control* (the perceived control and authority over work and skill development) determines job strain, which influences health and longevity. Thus, the key implication of the Job Demand-Control model is that the job demands and control combinations result in different health outcomes.

In particular, the combination of high job demands and low job control will lead to high psychological strain and illness (the "high strain" hypothesis) (Karasek, 1979; Theorell & Karasek, 1996). At the same time, the combination of high job demands and high decision control ("active jobs") leads to "desirable stress" as it allows the worker to learn and better him/herself, develop new skills, and provides a feeling of mastery (Hessels, Rietveld, & van der Zwan, 2017; Stephan & Roesler, 2010; Theorell & Karasek, 1996). [3] Thus, entrepreneurs, who are "prototypes" of active jobs, should experience better health compared with employees (Stephan & Roesler, 2010). The "active jobs" hypothesis is conceptually similar to the "procedural utility" concept from the economics literature, which implies that individuals value not only the end result but also the conditions and processes that generate these outcomes (Frey, Benz, & Stutzer, 2004). Thus, the self-employed should have higher utility compared to regular employees because of the freedom, lack of hierarchy, and ability to achieve self-determination (Benz & Frey, 2008b). In other words, the self-employed should derive utility from the process of being self-employed and the autonomy, freedom, and flexibility that often come with it. The procedural utility benefits that entrepreneurs acquire from their active jobs may also have positive beneficial effects on their psychological well-being and thus on their physical health.

Entrepreneurship can thus enhance health through furnishing active jobs, procedural utility, and self-actualization opportunities. First, the entrepreneurial lifestyle may allow for more flexibility in terms of time organization and thus the ability to pursue health-enhancing behaviors such as physical exercise (Goldsby, Kuratko, & Bishop, 2005; Shepherd & Patzelt, 2017). Specifically, while entrepreneurs may 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.

Second, there may be psychological benefits that the self-employed derive from having autonomy and being their own boss, which may also turn into physical benefits. For example, research shows that freedom of choice is strongly related to happiness (Verme, 2009). In a similar vein, Shir (2015), who builds on self-determination theory (Deci & Ryan, 2000), posits that entrepreneurship positively affects well-being though its self-actualization and goal-oriented pro-activity aspects.[4] In economics, the procedural utility argument also provides a powerful explanation linking the

[3] 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 & Roesler, 2010; Theorell & Karasek, 1996).

[4] Self-determination theory (Deci & Ryan, 2000; R. M. Ryan & Deci, 2000) explains motivation and the pursuit of different activities. Specifically the psychological needs for competence, relatedness and autonomy explain the content and process of goal pursuits. Autonomy concerns the innate desire to self-organize and is about integration and freedom and as such is pivotal for a healthy functioning. Relatedness concerns the feeling of being attached to others and competence refers to pursuing activities that are valued in the social group and have an impact on one's environment. The choice of work activity and becoming an entrepreneur can be viewed as an action to satisfy the innate psychological needs of autonomy, relatedness, and competence (Kautonen et al., 2017).

importance of "doing what you like" among the self-employed and their experienced work satisfaction (Benz & Frey, 2008a, 2008b; Fuchs-Schündeln, 2009). Given that there is a causal link from subjective well-being to health (De Neve, Diener, Tay, & Xuereb, 2013), it may be that the well-being benefits derived from being one's own boss turn into mental and physical health.

Nonetheless, self-employment may also negatively affect mental and physical health if the job demands also entail reduced socialization and loneliness as well as longer working hours, and role ambiguity (Cardon & Patel, 2015). For example, the self-employed may face high job demands and time pressure, which may limit social activity and lead to isolation (Patzelt & Shepherd, 2011), especially if the self-employed work alone. Being your own boss thus may come at the cost of a heavy workload and loneliness. The mismatch between job demands and job control may in turn lead to stress, and unhealthy behaviors, which may affect health and longevity (Hessels, Rietveld, et al., 2017; Kouvonen, Kivimäki, Virtanen, Pentti, & Vahtera, 2005). Second, there may also be a blurring between the personal/family life and work life (Binder & Coad, 2016) and work-life conflict (Prottas & Thompson, 2006), which could lead to burnout and ill health. Finally, because the self-employed earn a lower income (Hamilton, 2000), they might face financial limitations related to investing in their health such as purchasing healthy foods or paying for gym memberships.

3.2. Self-employment and health: prior evidence

Several papers in the entrepreneurship literature rely on the Job Demand-Control model to formulate hypotheses about entrepreneurship and health (Hessels, Rietveld, et al., 2017; Stephan & Roesler, 2010).[5] For example, exploiting Australian longitudinal data for 2005-2013, Hessels et al. (2017) reveal that the self-employed experience less stress than regular employees, a finding that also holds cross-sectionally in 61 countries. This result is completely explained by job control perceptions, as measured by having freedom and say on the job. While job demands, measured by time pressure and work intensity, increase stress, this effect is offset through the mitigating influence of job control. In other words, the high (perceived) job control allows the self-employed to lessen the stressful consequences of work pressure. Furthermore, Stephan and Roesler (2010) discover that the self-employed have better health outcomes along some dimensions, which they interpret as support for the active jobs hypothesis.

Nevertheless, the literature examining the health consequences of entrepreneurship is still emerging (Shepherd & Patzelt, 2015, 2017).[6] Moreover, studies present conflicting evidence due to

[5] For a comprehensive overview of the literature on self-employment and stress, see Hessels et al. (2017), Table 1.

[6] There is a large and growing literature on the subjective well-being consequences of self-employment (Benz & Frey, 2008b; Krause, 2015; Ward & De Neve, 2017). The self-employed are more job satisfied than regular employees in (West) Germany (Benz & Frey, 2008a; Fuchs-Schündeln, 2009). While the higher job satisfaction among the self-employed compared with regular employees in developed countries is a stylized fact, the findings regarding self-employment's consequences for life satisfaction and those pertaining to developing countries are more mixed. The latest evidence from the Gallup World Poll is that self-employment is associated with higher life evaluations in Europe, the Former Soviet Union Countries, North America, and East Asia (compared with regular full-time employment) (Ward & De Neve, 2017). The self-employed in Latin America and the Caribbean and Sub-Saharan Africa have lower evaluations of their life as a whole, while the self-employed in the Middle East and North Africa, those in South and Southeast Asia, and Australia and New Zealand are no different than regular employees in terms of life evaluations (Ward & De Neve, 2017). In most world regions, however, the self-employed report higher negative affect than regular employees, with the

methodological limitations and diverging operationalizations of health. Some contributions (Baron et al., 2016; Binder & Coad, 2016; Hessels, Rietveld, et al., 2017) document a positive relationship between health outcomes and entrepreneurship, while others find a negative one (Blanchflower, 2004; Buttner, 1992; Jamal, 1997). Still others find a positive association between entrepreneurship and health in some dimensions but a negative in others (Stephan & Roesler, 2010). These mixed findings in the literature are due to the choice of the countries and years, the health outcomes measured, as well as the choice of the empirical strategies, most of which are based on cross-sectional data.

Using statistical matching, Binder and Coad (2016) find a positive link between being self-employed (rather than a regular employee) and subjective health in Germany for 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).[7] The self-employed experience more tiredness, yet fewer mental problems than regular employees in Sweden (Andersson, 2008).

Other studies relying on bivariate cross-sectional comparisons such as Buttner (1992), Jamal (1997) find that the self-employed have worse health outcomes than regular employees. 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. Rietveld et al. (2015) use longitudinal data from the US and find that individual heterogeneity and the selection of healthier individuals into self-employment largely explains the positive cross-sectional findings between health and self-employment. In fact, if the self-selection is taken into account, the association between self-employment and self-reported health could even be negative.

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exceptions being South and Southeast Asia (Ward & De Neve, 2017). Self-employment is likely associated with lower life satisfaction levels in developing countries because of the precarious nature of entrepreneurship in these regions (Aguilar, Garcia Munoz, & Moro-Egido, 2013; Graham & Felton, 2006; Graham & Pettinato, 2001). Several related studies empirically demonstrate the non-pecuniary benefits associated with self-employment. For example, Hamilton (2000) posits that the fact that most entrepreneurs become and remain self-employed despite the lower earnings in paid employment highlights the high non-monetary benefits of entrepreneurship. Using panel data from Germany, Switzerland, and Great Britain, Benz and Frey (2008b) empirically demonstrate that the self-employed are more satisfied with their jobs, which they explain as stemming from procedural utility. The result is partially explained by controlling for the size of the firm (a proxy for hierarchy), suggesting that workers in general dislike hierarchies. Yet, the job satisfaction premium for the self-employed is reduced by just one sixth in Germany after controlling for hierarchy, implying that the process of being independent is in and of itself valuable to the self-employed, even for those who work in similar-sized firms as their formally employed counterparts. Note that not all workers dislike hierarchy and that the gains from procedural utility and independence may be concentrated among those with strong preferences for independence (Fuchs-Schündeln, 2009).

[7] The self-employed also report higher life satisfaction as well as a lower number of sick days and physician visits compared with employees (Stephan & Roesler, 2010).

This paper builds upon the extant literature by investigating the mental and physical health consequences of self-employment using a large representative panel dataset for 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 as well as consider the heterogeneity between the self- employed with and without employees.

4. Hypotheses development

4.1. Transitioning from unemployment to self-employment vs. from regular employment to self-employment

There is important heterogeneity in the motivations to become self-employed (Desai, 2017; Fairlie & Fossen, 2018; Larsson & Thulin, 2017; Parker, 2009b; Reynolds et al., 2005). Some individuals choose entrepreneurship as a means to take advantage of business opportunities, while others start a business to escape the precariousness of unemployment (Parker, 2009b). 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 percent 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). In other words, 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 & Coad, 2013, 2016; Larsson & Thulin, 2017).

Scholars have taken different approaches when operationalizing the concepts of necessity vs. opportunity entrepreneurs (Fairlie & Fossen, 2018).[8] Contributions using the GEM cross-country data rely on variables constructed from self-reported questions asking respondents whether they are engaging in the start-up activity to take advantage of a business opportunity or because they have no better choice for work. This definition of opportunity vs. necessity entrepreneurship is, however, problematic, as it is based on retrospective self-reported answers, which may be more influenced by the business' success rather than the actual pre-startup-up motivations (Fairlie & Fossen, 2018).

Several studies utilize the GEM definition of necessity vs. opportunity entrepreneurship. For example, Larsson and Thulin (2017) empirically 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.

[8] 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 & Palmroos, 2010).

Other studies define necessity entrepreneurs as individuals who transition from unemployment to self-employment and opportunity entrepreneurship as those who switch from regular paid employment to self-employment (Binder & Coad, 2013, 2016; Block & Sandner, 2009; Fairlie & Fossen, 2018). Only opportunity but not necessity entrepreneurs in Britain experience life satisfaction benefits up to two years after (Binder & 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 & 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 & Coad, 2016). Specifically, if the self-employed derive procedural utility from their work, they may spend long working hours on the job, thus reducing their own leisure time or even neglecting their physical and mental health. In line with this explanation, research shows, for example, that the self-employed work very long hours and come home exhausted from work (Blanchflower, 2004).[9]

Given this literature, whether one becomes self-employed to escape unemployment or as an active career choice to pursue one's business ideas may 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 dcreases in their subjective well-being and mental health (Kuhn et al., 2009; Marcus, 2013; Winkelmann, 2014) that spill onto other family members (Bubonya, Cobb-Clark, & Wooden, 2017; Marcus, 2013; Nikolova & Ayhan, 2018; Powdthavee & Vernoit, 2013). These large declines are not due to the loss of income but are rather due to the fact that as an unemployed person one cannot comply with the social norm to work (Chadi & Hetschko, 2017a; Hetschko, Knabe, & Schöb, 2014; van Hoorn & Maseland, 2013; Winkelmann, 2014). Moreover, unemployment is a traumatic experience as it brings insecurity: past unemployment increases the risk and fear of future unemployment, which reduce psychological well-being (Knabe & Rätzel, 2011). Thus, switching from unemployment to self-employment is likely to provide mental health benefits through increased self-esteem, the opportunity to work and thus comply with society's work norms and avoid social stigma associated with social welfare receipt. The empirical evidence also suggests that the self-employed report that they are *less* likely to lose their jobs (Blanchflower, 2004; Hetschko, 2016; Hundley, 2001; Millán, Hessels, Thurik, & Aguado, 2013). Thus, necessity entrepreneurs may also psychologically benefit from this increased job security and knowing that their fate is in their own hands. While the empirical evidence suggests that necessity entrepreneurs do not derive job satisfaction benefits compared to regular employees, 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 the physical health consequences associated with unemployment is more mixed, with some studies finding no effects (Browning, Moller Dano, & Heinesen, 2006; Kuhn et al., 2009; Schmitz, 2011), while others reporting that job loss may lead to smoking and weight gain (Marcus, 2014) and worse physical health (Black, Devereux, & Salvanes, 2015).[10] Therefore, upon switching from unemployment to self-employment, individuals may abandon their unhealthy habits such as smoking, drinking, and overeating, which may increase their physical health. At the same time, however, compared to being unemployed, working is associated with less free time, thus potentially leaving less time for exercise and increasing stress and exhaustion. Thus,

[9] Practically, the self-employed may also have worsened health insurance access (Hamilton, 2000).
[10] In addition, Gerdtham and Johannesson (2003); Sullivan and Von Wachter (2009) find that unemployment increases mortality, which is a crude proxy for physical health.

switching from unemployment to self-employment is unlikely to be associated with large physical health benefits.

Hypothesis 1: Necessity entrepreneurs are expected to experience better mental health and few or no physical health benefits compared to those who remain continuously unemployed.

Furthermore, opportunity entrepreneurs are more likely to be satisfied with their job compared with their necessity counterparts (Binder & Coad, 2013). Thus, based on the active jobs hypothesis, it is reasonable to expect that opportunity entrepreneurs will experience mental health enhancements through procedural utility and the greater control over their work compared with those who remain regular employees. They may also experience physical health improvements through the flexibility to organize their work agenda and finding time for exercise. While there are negative channels through which self-employment can worsen health related to job strain and decreased socialization, given the 'active jobs' hypothesis, the procedural utility arguments, as well as the empirical literature, I propose that:

Hypothesis 2: Switching from regular employment to self-employment is expected to bring mental and physical health benefits relative to remaining a regular employee.

4.2. Self employment with and without employees

Some self-employed create jobs not just for themselves but also employ others, which may be one characteristic of successful entrepreneurs (Gindling & Newhouse, 2014) and be of particular interest to policymakers. Using Eurobarometer data for 1996, Blanchflower (2004) shows descriptive evidence that the self-employed with employees are more satisfied with their jobs compared to the self-employed without employees and compared to regular employees, a finding that also holds for West Germany. At the same time, compared with employees, the self-employed who employ other workers are more likely to report lower satisfaction with working hours and higher levels of unhappiness and depression. They are also more likely to state that their work is stressful, that they arrive home exhausted, as well as that their work interferes with their family lives (Blanchflower, 2004). 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. (2017) demonstrate that the self-employed with employees experience higher stress levels compared to the self-employed without employees and that part of the difference is attributable to differences in job demands between the two groups. Job control does not play a role in mediating the relationship between self-employment with and without employees and stress, meanwhile.[11]

These findings point to the fact 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. Specifically, entrepreneurs who employ others have higher job demands and lower job control than solo entrepreneurs. 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, Rietveld, et al., 2017). These high job demands may increase exhaustion (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) and lead to health impairments (Demerouti, Bakker, de Jonge, Janssen, & Schaufeli, 2001). By contrast, the self-

[11] These findings are based on the OLS estimates in Hessels et al. (2017), while their results in general become less robust to the inclusion of fixed effects.

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.

Yet, the self employed with employees may derive procedural utility and greater self-actualization from being in charge of these complex structures, as well as enjoy the process of working with others, which may also enhance their mental health. In addition, the self-employed with employees may also be better able to delegate tasks and responsibilities to others and be in control of their work agendas. Those working with employees may also be better able to tap into the resources of social support and greater intrinsic motivation (Van Yperen & Hagedoorn, 2003).

Given the evidence in Blanchflower (Blanchflower, 2004) and that in Hessels et al. (2017) revealing that the self-employed with employees experience higher stress, exhaustion, depression, and lower satisfaction with working conditions than regular employees and solo entrepreneurs, I propose that:

Hypothesis 3: Self-employed individuals without employees are expected to experience greater physical and mental health benefits compared to self-employed individuals with employees.

5. Methods

5.1. Methodological challenges

In an ideal setting, 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 treatment and comparison 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 comparison 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.[12] First, unobserved traits such as risk tolerance and personality traits (e.g. openness and extroversion) (Caliendo, Fossen, & Kritikos, 2014) not only influence the decision to become an entrepreneur but also health behaviors (Cobb-Clark, Kassenboehmer, & Schurer, 2014), and thus health outcomes. 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.[13] Alternatively, it may also be the case that relatively

[12] For a detailed discussion of the econometric issues involved in entrepreneurship research, see Parker (2009a).

[13] 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, the literature shows that 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. (2016) 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

healthy persons choose to be self-employed as entrepreneurs only earn an income when they are able to work. Third, while entrepreneurship may affect health, health influences entrepreneurial outcomes, which results in reverse causality.

Tackling these issues with standard econometric techniques is not straightforward. 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 non-trivial. Policy reforms regarding entrepreneurship that can be used as a natural experiment are also rare. Finally, while panel data tracing the same individuals year after year (Hessels, Rietveld, et al., 2017; 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 & Hetschko, 2017b; de Bruin, Heijink, Lemmens, Struijs, & Baan, 2011; Freier, Schumann, & Siedler, 2015; Hetschko, Schöb, & Wolf, 2016; Kunze & 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 main steps: (i) a data pre-processing to create comparable groups of individuals switching from the same initial health and labor market state (either unemployment or private employment) 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.[14] To increase precision in the DID regression, I also include as control variables all (pre-treatment) conditioning variables used in the matching step. This does not change the treatment effect because it is mean-independent of all conditioning variables but adds explanatory power and improves precision. The combination of difference-in-differences with entropy balancing is similar to the differences-in-differences matching estimator proposed by Heckman, Ichimura, and Todd (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).

First, the pre-processing step is based on entropy balancing, which is a novel non-parametric technique allowing to achieve balance on the different moments of the covariate distribution. As such, has some advantages over traditional matching methods such as propensity score matching (PSM) (Hainmueller, 2012). Specifically, the entropy balancing technique is more efficient and reduces the covariate imbalance. Unlike PSM, which requires an iterative trial and error process and researcher judgment regarding the tolerance and the covariates, entropy balancing achieves covariate balance by weighting the sample units. The procedure allows obtaining covariate balance

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al. (2017) demonstrate that ADHD symptoms are linked to entrepreneurial intentions and business startups among MBA graduates in the United States. Moreover, a working paper using panel data from the United States reveals that mental health affects self-employment entry (Bogan, Fertig, & Just, 2014).

[14]Note that the matching component does not comprise the main estimation strategy. Rather, it is a pre-processing step allowing to create 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).

and 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, which is applied after the entropy balancing, allows eliminating 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:

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

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

More formally:

$$\Delta H_i = \alpha + \beta S_i + \varepsilon_i.$$

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.

4.3. 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 (See Tables 2 and 3 for information on the pre-treatment characteristics).[15] The *treated* group thus 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 self-employment (necessity entrepreneurs) and (ii) those who switch from being regular private employees to being 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 subsequently regress the change in health status on the treatment indicator and control for the conditioning variables, which are measured at t_0. The conditioning variables are added 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.

The DID eliminates time-invariant heterogeneity, while the entropy balancing ensures that the self-employed are compared with similar individuals who start from the same initial labor market state, are on the same health track, and have similar socio-demographic characteristics. The main advantage of combining entropy balancing with DID is that it allows to tackle time-invariant

[15] I used the Stata user-written command –ebalance- for the entropy balancing (Hainmueller & Xu, 2013).

unobserved heterogeneity through the DID and selection on observables through the entropy balancing.

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), 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, Ibarrarán, & Villa, 2011; Heinrich, Maffioli, & Vazquez, 2010).

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

or

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

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 $EB(\boldsymbol{X})$ are the entropy-balanced covariates, including the pre-treatment levels of the health outcomes. This assumption is similar to the unconfoundedness assumption (Marcus, 2013). While fundamentally untestable, to make the assumption plausible, I ensure that the treated and comparison individuals: (i) were on a similar mental and physical health track before switching to self-employment, (ii) start from the same initial employment condition, (iii) have similar employment and unemployment histories and (iv) have similar socio-demographic characteristics. [16]

6. Data, variables, and analysis samples

6.1. Data

I rely on the German Socio-Economic Panel (SOEP) from 2002 through 2014 (Version 32.1), which is a representative household panel of individuals aged 18 and older (Wagner, Frick, & Schupp, 2007). The data offer a rich set of longitudinal information related to health and labor market characteristics, income, household composition and finances, as well as family biography. 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.[17] While the SOEP is available since 1984, the Health Module, which is utilized in this paper, was introduced in 2002 and is included every two years. 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

[16] Typically, DID estimators rely on the parallel trends assumption, stating that in the absence of treatment (self-employment), 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; A. M. Ryan, Burgess, & Dimick, 2015) although it is unlikely to hold in many health settings (O'Neill, Kreif, Grieve, Sutton, & Sekhon, 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).

[17] For further information about the SOEP, please see https://www.diw.de/en/diw_02.c.221178.en/about_soep.html.

health status information (Andersen, Mühlbacher, Nübling, Schupp, & Wagner, 2007).[18] The SF-12 questionnaire is a 12-item subset of the larger SF-36 health questionnaire and is typically used in large national surveys as a brief and reliable health measure (Andersen et al., 2007). The reliability and validity of the SF-12 questionnaire have been well-documented (Gandek et al., 1998; Salyers, Bosworth, Swanson, Lamb-Pagone, & Osher, 2000; Ware, Kosinski, & Keller, 1996) and are now a stylized fact.

6.2 Measures

6.2.1. Outcome variables: physical and mental health

The outcome variables comprise the components of the SF-12 scale, which are broad health measures rather than disease-specific indicators (Bowling, 2005). More precisely, *physical* health in the SF-12 is measured in four domains – bodily pain, general health, role physical, and physical functioning. Jointly, these four domains comprise the Physical Component Composite Scale (PCS). Similarly, the composite 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 1A). In separate regressions in the appendix, I also provide results using the sub-components of the PCS and MCS scales (Table A1 and A4). All outcome variables 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 estimate for the treatment across regressions.

6.2.2. Self-employment

The SOEP 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. In this paper, I limit the sample to the self-employed, the unemployed, and private employees.

The self-employed in this paper are individuals who work full-time and employ others or work as solo entrepreneurs.[19] I specifically exclude self-employed farmers and those helping in family businesses as these 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 set of conditioning variables, detailed in Table 1B, 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 such as the number of children, household size, real disposable household income, home ownership and place of residence (federal state), and whether the household had a windfall income in the previous year, initial health status, as well as survey year dummies. Given that liquidity constraints are important for the decision to become and remain self-employed (Blanchflower & Oswald, 1998; Hurst & Lusardi, 2004; Lindh & 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, controlling for the job security worries may be important as a way

[18] For a detailed discussion about designing and conducting health surveys, see Aday and Cornelius (2006).
[19] Specifically, I include the categories 420 to 433 from the "occupational position" variable in the SOEP.

of capturing certain unobserved heterogeneity related to occupational switches, especially given research showing that job security worries may be as detrimental for mental well-being as unemployment itself (Witte, 1999). All conditioning variables 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. In both samples, individuals are aged 18 to 60. 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.

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 original condition. The occupational transition can occur at any time between the two survey waves that include the health questions. I pool the estimation across five treatment periods: 2002-2004, 2004-2006, 2006-2008, 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). I also note that the estimated treatment effects are short-run effects only.

As explained above, the treated and comparison groups are constructed by entropy balancing based on a large number of covariates (Tables 2 and 3) that affect the entry into self-employment and health status. These variables include socio-demographic and household characteristics, labor force participation history, and time-invariant characteristics such as gender and migration background, as well as the pre-treatment values of the mental and physical health variables. All conditioning variables originate from the pre-treatment interview. For the transitions from private employment to self-employment, I include pre-treatment job characteristics and industry dummies. Due to small number of cases, the industries agriculture, mining and energy are combined. For the same reason, marital status categories belonging to divorced, separated or widowed are combined. Similarly, I combine Bremen with Lower Saxony and Hamburg with Schleswig Holstein. Tables 2 and 3 demonstrate that after matching, the treatment and comparison groups are similar along the matching covariates in terms of both the means and the standard deviations.

7. Results

7.1.Main results

7.1.2. Results regarding Hypotheses 1 and 2

Table 4 details the health effects stemming from transitions from unemployment to self-employment (Panel A) and changes from regular employment to self-employment (Panel B). The outcome variable Model (1) is the overall mental health and in Model (2), the overall physical health indicator (See Table 1A for variable definitions). Further results regarding the sub-

components of MCS and PCS are available in Table A1. In addition, as discussed, all regressions include all (pre-treatment) matching covariates as control variables.

First, Panel A in Table 4 demonstrates that transitioning from unemployment to self-employment (necessity entrepreneurship) is associated with improvements in overall mental health (MCS) but no corresponding changes in overall physical health (PCS).[20] Specifically, the overall mental health of those who switch from unemployment to self-employment is on average about 3.8 points higher compared to that of similar individuals who remain continuously unemployed. This result corresponds to a difference of about 38 percent of a standard deviation as the measure is standardized to have a mean of 50 and standard deviation of 10. Figure 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 4, however, is small and statistically insignificant, which implies that the self-employed experience no change in their physical health compared with those who remain continuously unemployed. This result is also graphically shown in Figure 2. Thus, Panel A in Table 4 furnishes empirical evidence in support of Hypothesis 1, namely that necessity entrepreneurship is associated with mental health benefits but not with physical health gains. This conclusion is also confirmed by formally testing for the equality of the two coefficient estimates using seemingly unrelated regressions.[21]

Second, I turn to Hypotheses 2, which concerns the physical and mental health gains from entrepreneurship for individuals who switch from regular employment. Model (1) in Table 4, Panel B demonstrates that opportunity entrepreneurship increases overall mental health (MCS) by about 11 percent 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 is also associated with overall physical health (PCS) improvements of about 8 percent of a standard deviation. The physical and mental health enhancements for opportunity entrepreneurs are also graphically evident in Figures 3-4. Thus, these findings provide support for Hypothesis 2, which is in line with the theoretical predictions. In fact, results from tests performed after seemingly unrelated regressions confirm that the mental health benefits (MCS) associated with opportunity entrepreneurship exceed the physical health ones (PCS).[22]

The results from Table 4, Models (1)-(2) in Panels A and B can be summarized as follows: transitioning from unemployment to self-employment (necessity entrepreneurship) is associated with improvements in both mental and physical health, while necessity entrepreneurship brings no physical benefits but relatively large mental health improvements. For both necessity and opportunity entrepreneurs, the improvements in mental health are larger in magnitude than the improvements in physical health. Comparing the magnitude of the coefficient estimates in Model (1) across Panels A and B reveals that the mental health benefits are greater for necessity than for

[20] The regression results concerning the different sub-domains of the Mental Component Scale (MCS) and the Physical Component Scale (PCS) are available in Table A1.

[21] 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.

[22] 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.

opportunity entrepreneurs.[23]

Finally, the physical health results emerging from Table 4 are interesting and deserve some attention. The finding that those who switch from unemployment to self-employment experience no improvement in physical health can be explained by 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 essentially giving up leisure time to work.

7.1.2. Results regarding Hypothesis 3

Table A2 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 percent of opportunity entrepreneurs are job-creators. Next, I test Hypothesis 3 in Table 5. 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 Panel B).

Turning to the results in Panel A, Table 5, 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.[24]

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.

All in all, the findings in Table 5 provide empirical evidence *against* Hypothesis 3, suggesting that there are no statistically significant differences in terms of the physical or mental health outcomes of entrepreneurs with or without employees. These findings could be due to the lack of statistical

[23] I tested for the equality of coefficients across the models assuming the samples are independent (Gelman & Stern, 2006; Paternoster, Brame, Mazerolle, & Piquero, 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.

[24] I also 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),

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 and the role of income and working conditions

The results in Table 4 suggested 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 conducted a separate set of analyses whereby I also study transitions from unemployment to regular employment.[25] Table 6 details the results, whereby, for ease of interpretation, Panel A is the same as Panel A in Table 4 and shows the health changes from switching from unemployment to self-employment. Panel B in Table 6 shows 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 for those entering self-employment, which is likely due to the active job and procedural utility aspects of entrepreneurship.

Next, I tested to what extent income explains the increases in mental health among necessity entrepreneurs and to what extent income and working conditions are responsible for the increases in both mental and physical health among opportunity entrepreneurs. According to Benz and Frey (2008b), the *outcome* utility of being self-employed is captured by income and working hours, with income being positively and working hours negatively correlated with job satisfaction in Germany, Great Britain, and Switzerland. If changes in income or working conditions trigger both changes in and out of self-employment *and* changes in mental and physical health, they will bias the true effects of entrepreneurship entry. 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.

To test the extent to which monetary concerns influence the results, in Table 7, I control for the change in disposable household income and changes in household income from asset flows (savings, dividends, and rents).[26] The number of observations is slightly smaller than that in the main analyses due to missing observations for the firm size and hours worked variables. 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., 2016). Furthermore, in Panel B, I test whether changes in autonomy help explain the findings by also including the change in working hours, autonomy, and firm size. Thus, I am trying to understand the extent to which the positive health outcomes could be attributed to changes in income and changes in working conditions that come with switching to self-employment. The autonomy variable is created by the SOEP team and reflects occupational position, education and task content of the job.[27] I note that this variable is a crude measure of autonomy and is unlikely to capture all procedural aspects of autonomy at work.

[25] The summary statistics for all matching covariates for the sample of unemployed who transition into regular employment are available in Table A3.
[26] The related results for all sub-components of MCS and PCS are available in Table A4.
[27] 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

Comparing and contrasting the results in Tables 4 and 7 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, we fail to reject the null hypothesis for equality of coefficients.[28]

In summary, I conclude that 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 & Frey, 2008a, 2008b; Fuchs-Schündeln, 2009; Hamilton, 2000). Further research should explore in greater detail the concrete channels leading to entrepreneurial health.

8. Robustness Checks

My empirical strategy mitigates biases related to selection on observables and time-invariant unobservables. 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 entry. If the strategy effectively deals with unobserved heterogeneity, the results with controls for personality and risk should not differ from the main results in Table 4.[29]

The Big 5 personality traits 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.[30] 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 8 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 4 due to missing

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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).

[28] I tested whether the coefficient estimates for the treatment variable in both Panels are equal to each other. For example, I tested whether the coefficient estimate for the MCS variable in (1) in Panel A in Table 4 is equal to the coefficient estimate for the MCS variable in (1) in Panel A in Table 7. These tests were conducted for each coefficient pair in tables 4 and 7.

[29] While the debate on whether personality traits are malleable over time remains unsettled,[29] they can be treated as fixed over short time periods, which is the case given the three-year treatment periods. Specifically for Germany, Specht, Egloff, and Schmukle (2011) show that personality traits are associated with changes throughout the lifespan, while Boyce, Wood, Daly, and Sedikides (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.

[30] 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.

observations. Importantly, the overall pattern of the results and the magnitudes shown in Table 8 are very similar to those in Table 4, which confirms that the estimations are robust to controlling for personality traits and risk preferences.

Another check, presented in Table 9, includes additional controls for local (Raumordnungregion or ROR-level) unemployment rates. This robustness check 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[31] and included as part of the covariates the pre-treatment unemployment rate and in the DID regressions. As before, the pre-treatment covariates include federal state fixed effects, which should mitigate concerns about state-specific heterogeneity in the economy.[32] Table 9 demonstrates that controlling for the local labor market conditions does not change the results. Both the direction and the magnitude of the coefficient estimates remain similar to those presented in Table 4.

9. Discussion

9.1. Implications for theory

Overall, the findings in this paper provide support for Hypothesis 1 and Hypothesis 2 but not Hypothesis 3. Specifically, necessity entrepreneurs benefit in terms of mental but not physical health, while opportunity entrepreneurs gain in both physical and mental health. The results further suggest that there are no differences between entrepreneurs with and without employees. It appears that the positive influence of job control factors, including the ability to be one's own boss and have flexibility and control over one's schedule, bring procedural utility benefits that outweigh the negative effects of job demands. Thus, on the whole, the self-employed are better off in terms of health compared to similar individuals who remain in the original labor market state. 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 opportunity entrepreneurs.

9.2. Implications for policy

The finding that necessity entrepreneurs gain substantially in terms of mental health – and do so independently of income changes – holds particular importance to policy-makers. 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 mental health gains to those who escape the misery of unemployment. These mental health improvements could be due to avoiding the stigma of being unemployed, the procedural benefits of self-employment, or the identity boost through being self-employed. Nonetheless, the findings in this paper should be taken together with and balanced against the findings in the literature, which show that necessity entrepreneurship is unassociated with life satisfaction gains.

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

[32] 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).

Moreover, I also show that the mental health benefits from 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 an entrepreneur. Thus, being an entrepreneur has non-pecuniary benefits that extend beyond the mental health benefits of escaping the misery of unemployment.

Germany's Active Labor Market Policies offer start-up subsidies for the unemployed, which not only entail labor market re-integration for the new entrepreneurs but also potential job creation (Caliendo & 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 & Kritikos, 2010; Caliendo & Künn, 2011). For example, between 2003 and 2006, about 1 million unemployed started their own business, with the survival rates being at 70 percent 2.5-5 years after starting the business and only about 15-20 percent of recipients returning to unemployment (Caliendo & Kritikos, 2010).[33] In some cases, these start-ups also generated an income that was greater than that in the previous employment, and contributed to job creation (though less so in the Ich-AG case). In 2006, both programs were replaced with a new start-up subsidy *(Gründungszuschus),* whose effects have also been positive in terms of labor market integration and income (Caliendo, Künn, & Weißenberger, 2016). Adding to this literature, this paper shows that encouraging the unemployed to start a business may also have non-monetary benefits in terms of improving short-run mental health, and as such is of particular importance to policymakers.

Given that the mental health benefits are substantively higher than the physical ones for both necessity and opportunity entrepreneurs, the positive consequences of self-employment appear to work through psychological mechanisms, which should be further explored in future research. Self-employment is also beneficial to the health of those switching from full-time private jobs, 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 make them better positioned to engage in health-enhancing behaviors. 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.

9.3. Limitations and suggestions for future research

To my knowledge, this paper is the first to provide a causal estimate of the physical and mental health consequences of entrepreneurship while considering necessity and opportunity entrepreneurs, as well as entrepreneurs with and without employees. Nevertheless, it leaves several questions and issues open and hopes to inspire further research efforts.

First, I only examine the health consequences of self-employment on the individual entrepreneur but not 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, given that this is a within-country analysis for Germany, the paper's external validity is limited. Further research is needed to understand whether the same findings apply in contexts with

[33] For an overview of the labor market reforms in Germany, see (Caliendo & Hogenacker, 2012).

different institutional environments and entrepreneurial cultures, especially in light of the evidence that entrepreneurial cultures indirectly influence entrepreneurship (Stephan & Pathak, 2016). Third, while I offer causal estimates, due to the nature of my empirical strategy, I only provide the short-run effects of switching to self-employment, while it is also important to understand whether these effects persist over time. In light of recent research showing that losing self-employment may be worse in terms of life satisfaction declines compared to becoming unemployed from a regular job (Hetschko, 2016), what happens to the health of entrepreneurs who exit self-employment and how the self employment duration affects the relationship 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.

Fourth, the finding that there were no statistically significant differences in terms of the health outcomes of the self-employed with and without employees deserves further investigation. Specifically, further research is needed to understand whether the non-statistically significant differences documented in this paper are due to the lack of statistical power or not.

Finally, while the estimation strategy allows us to eliminate some challenges related to self-selection and reverse causality, as with any paper using observational data, concerns related to time-variant unobservables remain. I mitigate these concerns by also conditioning on personality traits and risk preferences, as well as controlling for the local unemployment rates, which may be related to both the decision to become self-employed and health outcomes. Future studies should also address heterogeneity in the relationship between self-employment and health and seek to tease out the channels leading to entrepreneurial health.

9.4 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 an employing an empirical strategy based on difference-in-differences applied after entropy balancing, I show that transitions from unemployment to self-employment (necessity entrepreneurship) are linked with relatively large mental health increases but not with physical health improvements. The results are not driven by income changes or personality and risk preferences or the selection of relatively healthy individuals into self-employment. I further find that those switching from regular employment to self-employment experience both improvements in mental and physical health, with the former being larger than the latter. These findings provide support for the “active jobs” hypothesis derived from the Job Demands-Control model. Therefore, despite higher job demands and multiple tasks, entrepreneurs experience positive health benefits. Furthermore, he self-employed may derive procedural goods that fulfill their needs for relatedness, autonomy, and competence. These procedural aspects of self-employment may thus improve mental and physical health benefits.

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Table 1A: Dependent variables

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 better role emotional.
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 role emotional.
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 role physical.

Source: Author based on SOEP Codebooks

Table 1B: Conditioning variables

Variable	Definition
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
Disabled	1=disabled, 0=not disabled
Doctor visits	Number of annual doctor visits
Mental Component Scale	See table 1A
Physical Component Scale	See table 1A
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, 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.

Source: Author based on SOEP Codebooks

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

Table 2: Descriptive statistics before treatment, selected variables, before and after matching, unemployment to self-employment sample

	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

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

Notes: N=86 for the treated and 1,566 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 1A for detailed definitions.

Table 3: Descriptive statistics before treatment, selected variables, before and after matching, private employment to self-employment sample

	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
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: less than 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: 2000 or more	0.146	0.125	0.257	0.191	0.146	0.124	-0.314	0.000

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

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 4: Entropy balancing DID results, switches to entrepreneurship

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	1,652	1,652
R^2	0.470	0.393
Panel B: 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

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

Notes: Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. 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 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 1A for detailed definitions.

Table 5: Entropy balancing DID results, switches to entrepreneurship

Panel A: 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	Y	Y
Number of individuals	1,650	1,650
R^2	0.470	0.390
Panel B: 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** **
	(0.558)	**(0.404)**
Pre-treatment covariates	Y	Y
Number of individuals	21,706	21,706
R^2	0.321	0.354

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

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. See Table 1A for detailed definitions.

Table 6: Entropy balancing DID results, switches from unemployment to self-employment and regular employment

Panel A: Unemployment to Self-Employment		
	(1)	(2)
	Δ Mental Component Scale	Δ Physical Component Scale
Treatment	**3.789*** **	**1.034**
	(1.082)	**(0.900)**
Pre-treatment covariates	Yes	Yes
Number of individuals	1,652	1,652
R^2	0.470	0.393
Panel B: Unemployment to Regular Employment		
	(1)	(2)
	Δ Mental Component Scale	Δ Physical Component Scale
Treatment	**1.738*** **	**0.600**
	(0.527)	**(0.406)**
Pre-treatment covariates	Yes	Yes
Number of individuals	2,390	2,390
R^2	0.381	0.299

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

Notes: Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. 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 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 1A for detailed definitions. The analysis sample excludes 2 self-employed individuals in Panel A and 5 individuals in Panel 5 who did not report information on the number of employees.

Table 7: Entropy balancing DID results, switches to entrepreneurship, controlling for changes in income and working conditions

Panel A: Unemployment to Self-Employment		
	(1)	(2)
	Δ Mental Component Scale	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	1,652	1,652
R^2	0.475	0.403

Panel B: 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

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

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 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 1A for detailed definitions.

Table 8: Entropy balancing DID results, switches to entrepreneurship, with risk preferences and personality traits

Panel A: Unemployment to Self-Employment		
	(1)	(2)
	Δ Mental Component Scale	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	1,566	1,566
R^2	0.494	0.435
Panel B: Regular employment to Self-Employment		
	(1)	(2)
	Δ Mental Component Scale	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

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

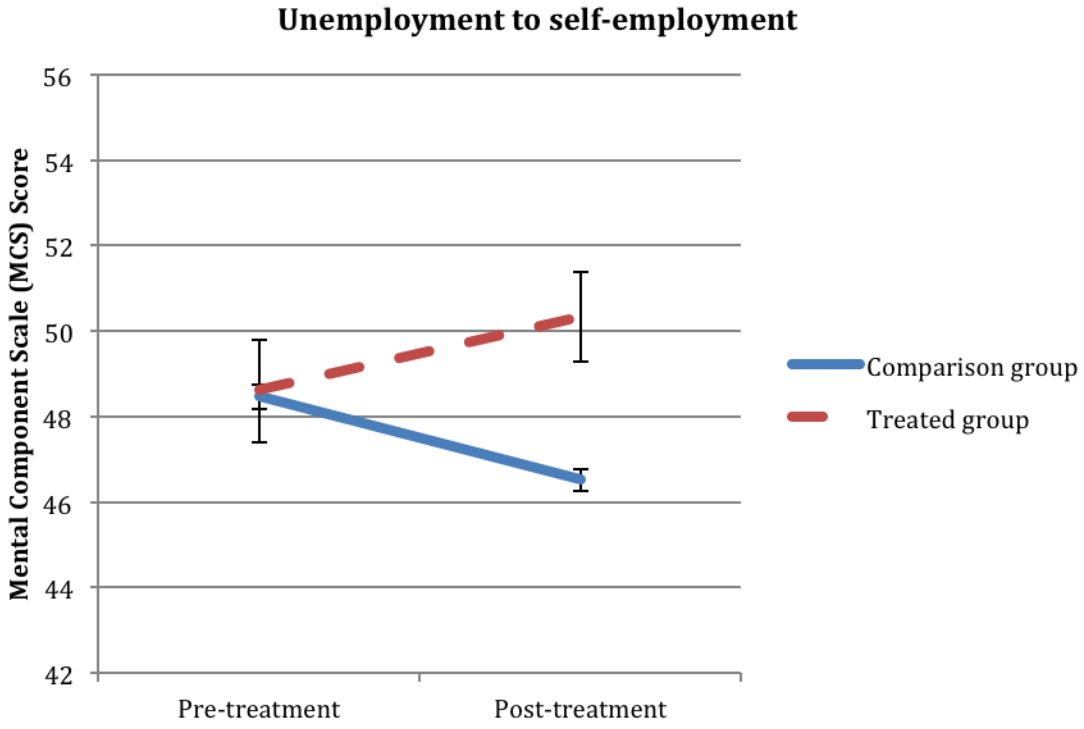
Notes: Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. All regressions include the lagged pre-treatment characteristics. Models (2)-(5) and (7)-(10) also include a lagged dependent variable. In Panel A, "Treatment" is coded as "1" for those switching from unemployment to self-employment 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.

Table 9: Entropy balancing DID results, switches to entrepreneurship, with ROR-level unemployment rates

Panel A: 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	1,652	1,652
R^2	0.478	0.394
Panel B: 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

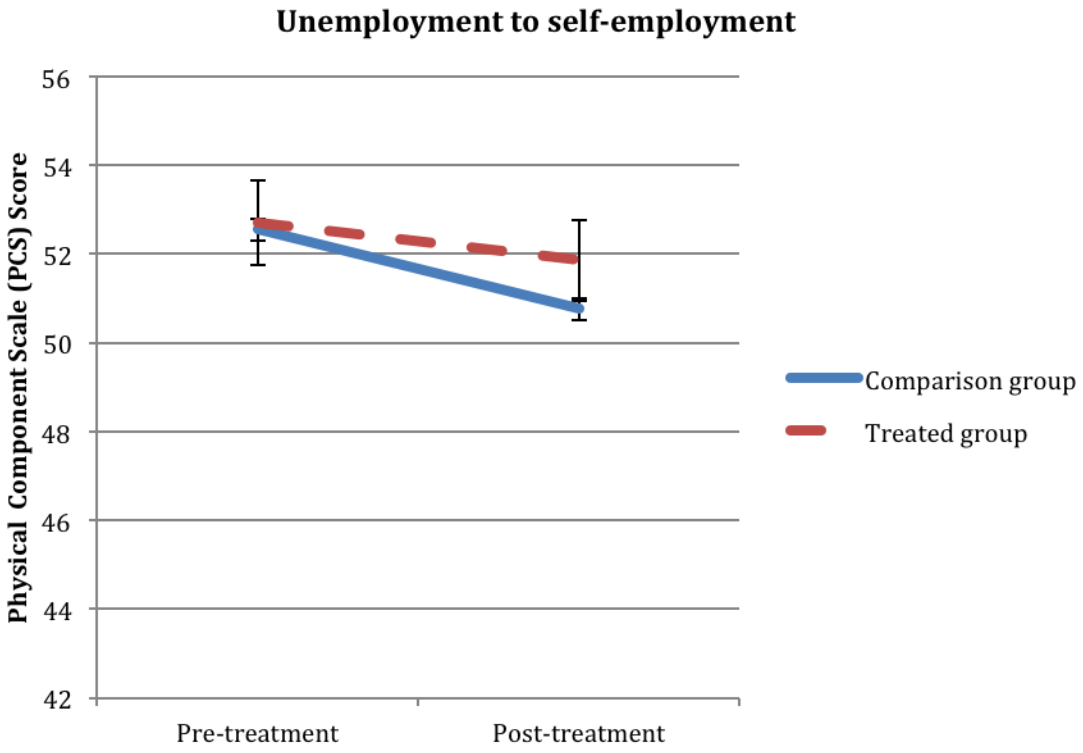
Source: Author's calculations based on SOEP 2002-2014
Notes: Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. All regressions include the lagged pre-treatment characteristics. Models (2)-(5) and (7)-(10) also include a lagged dependent variable. In Panel A, "Treatment" is coded 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.

Figure 1: Average Mental Component Scale (MCS) scores, treated and comparison groups, with 95% confidence intervals



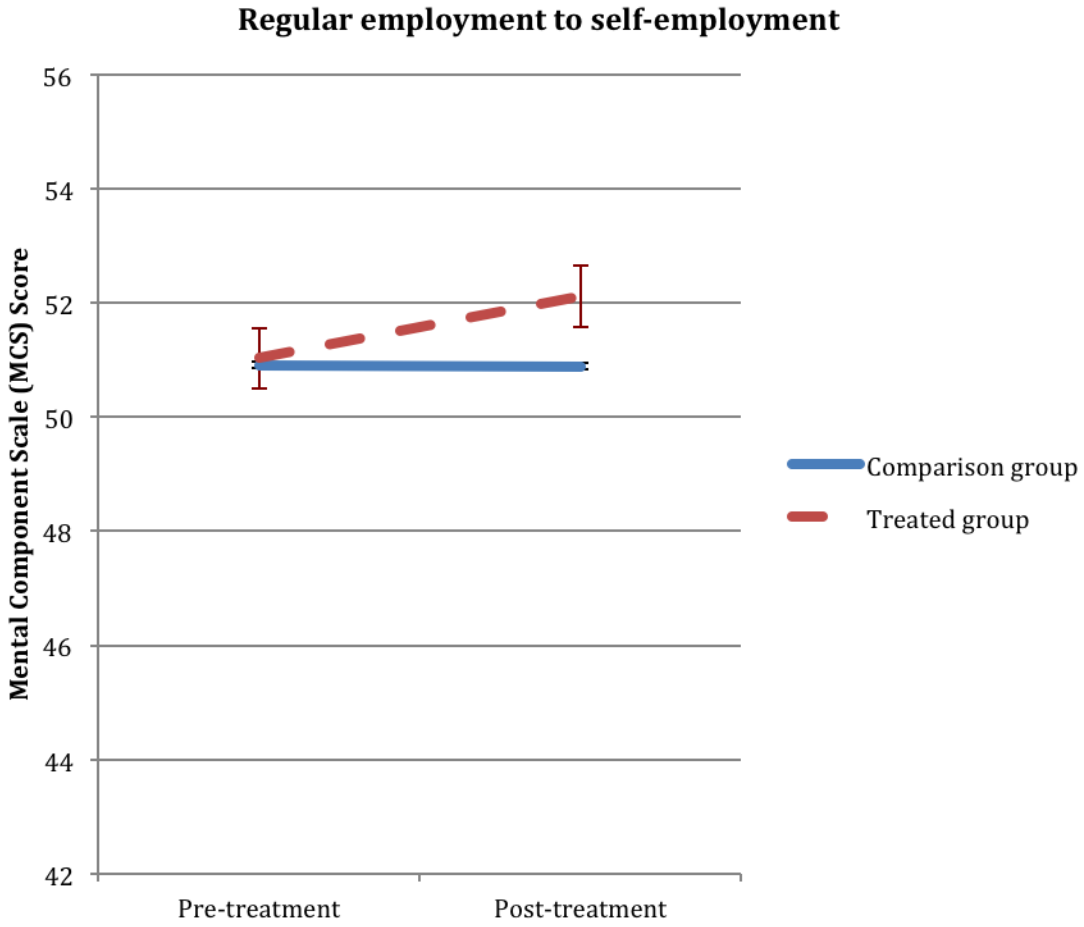
Source: Author's calculations based on SOEP 2002-2014

Figure 2: Average Physical Component Scale (PCS) scores, treated and comparison groups, with 95% confidence intervals



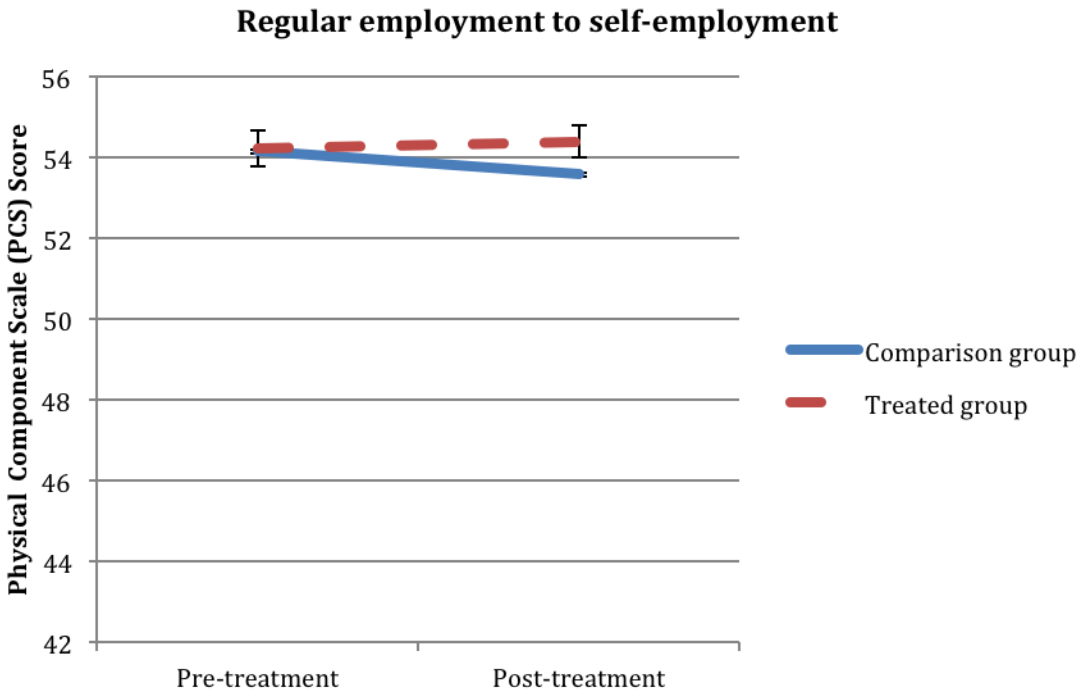
Source: Author's calculations based on SOEP 2002-2014

Figure 3: Average Mental Component Scale (MCS) scores, treated and comparison groups, with 95% confidence intervals



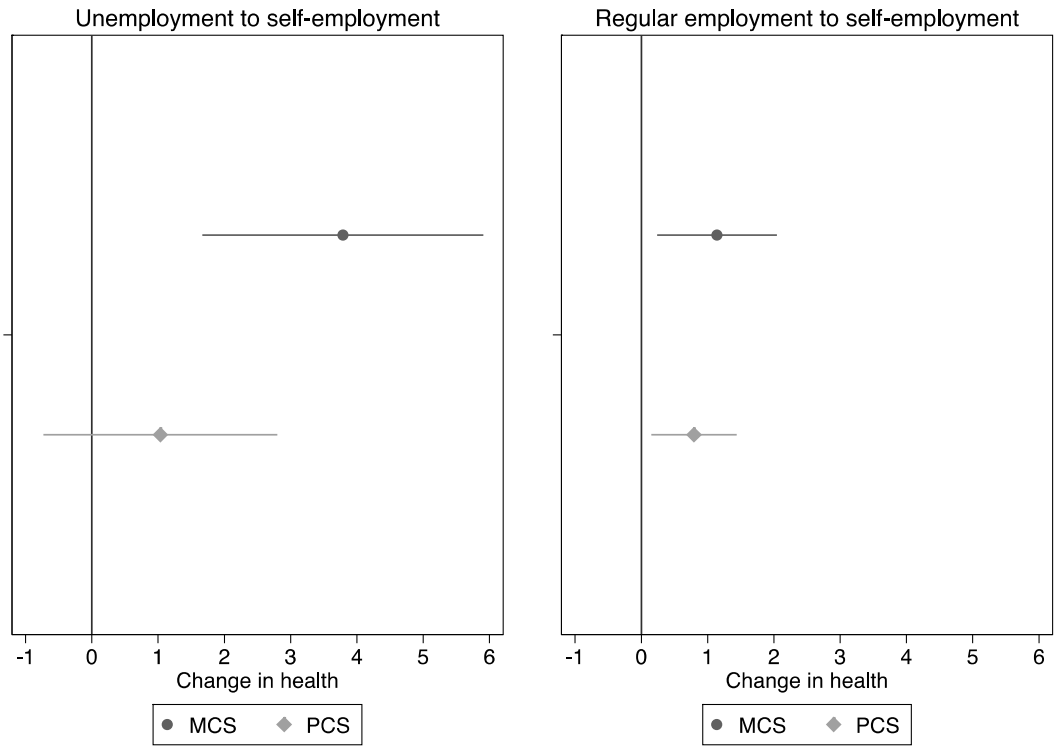
Source: Author's calculations based on SOEP 2002-2014

Figure 4: Average Physical Component Scale (PCS) scores, treated and comparison groups, with 95% confidence intervals



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

Figure 5: Mental and physical health changes due to entrepreneurship, with 95% confidence intervals



Source: Author's calculations based on SOEP 2002-2014
Notes: Difference-in-Difference estimates based on Table 4, Panel A (left hand side) and Panel B (right hand side). MCS= Mental Component Scale, PCS=Physical Component Scale. See the notes below Table 4

Table A1: Entropy balancing DID results, switches to entrepreneurship, full results

Panel A: Unemployment to Self-Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Δ MCS	Δ Mental Health	Δ Vitality	Δ Role Emotional	Δ Social Functioning	Δ PCS	Δ 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	1,652	1,652	1,652	1,652	1,652	1,652	1,652	1,652	1,652	1,652
R^2	0.470	0.464	0.529	0.437	0.479	0.393	0.396	0.440	0.427	0.423

Panel B: Regular employment to Self-Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Δ MCS	Δ Mental Health	Δ Vitality	Δ Role Emotional	Δ Social Functioning	Δ PCS	Δ 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

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

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 1A for detailed definitions.

Commentary on the coefficient estimates in Models (2)-(5) and (7)-(10) in Table A1.

The main finding in Table A1 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 MCS and 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 smaller improvements in role emotional (marginally significant), vitality and social functioning, and 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 A2: Firm size of the self-employed after switching to self-employment

	Unemployment to self-employment		Regular employment to self-employment	
	Number	**Percent**	**Number**	**Percent**
No other employees	50	58.14	71	27.20
Less than 20	32	37.21	153	58.62
20-199	1	1.16	18	6.90
200-1999	1	1.16	4	1.53
More than 1999	-	-	10	3.83
No information	2	2.33	5	1.92
Total	**86**	**100.00**	**261**	**100.00**

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

Table A4: Descriptive statistics before treatment, selected variables, before and after matching, unemployment to regular employment sample

	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

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

Notes: N= 700 for the treated and 1,690 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 1A for detailed definitions.

Table A3: Entropy balancing DID results, switches to entrepreneurship, controlling for changes in income and working conditions

Panel A: Unemployment to Self-Employment

	(1) Δ MCS	(2) Δ Mental Health	(3) Δ Vitality	(4) Δ Role Emotional	(5) Δ Social Functioning	(6) Δ PCS	(7) Δ Bodily Pain	(8) Δ General Health	(9) Δ Role Physical	(10) Δ Physical Functioning
Treatment	**3.120*** **	**2.520** **	**2.623** **	**2.163***	**3.222*** **	**1.117**	**0.257**	**2.898*** **	**2.819*** **	**1.139**
	(1.152)	**(1.271)**	**(1.065)**	**(1.124)**	**(1.193)**	**(0.947)**	**(1.124)**	**(0.988)**	**(0.980)**	**(1.021)**
Δlog Household income	1.642*	0.092	1.500**	2.600**	0.795	-0.381	1.079	-0.998	-0.382	0.508
	(0.850)	(0.827)	(0.727)	(1.032)	(0.873)	(0.852)	(0.754)	(0.766)	(0.782)	(0.998)
Δlog Household asset inc.	-0.103	-0.205	-0.366*	0.041	0.466	0.413*	0.110	0.498**	0.631***	0.004
	(0.256)	(0.251)	(0.212)	(0.299)	(0.323)	(0.225)	(0.265)	(0.207)	(0.195)	(0.240)
Pre-treatment covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	1,652	1,652	1,652	1,652	1,652	1,652	1,652	1,652	1,652	1,652
R^2	0.475	0.466	0.537	0.451	0.488	0.403	0.399	0.452	0.446	0.424

Panel B: Regular employment to Self-Employment

	(1) Δ MCS	(2) Δ Mental Health	(3) Δ Vitality	(4) Δ Role Emotional	(5) Δ Social Functioning	(6) Δ PCS	(7) Δ Bodily Pain	(8) Δ General Health	(9) Δ Role Physical	(10) Δ Physical Functioning
Treatment	**1.025** **	**0.628**	**1.855*** **	**0.732**	**0.885***	**0.624***	**1.033** **	**0.453**	**0.420**	**0.971*** **
	(0.493)	**(0.540)**	**(0.487)**	**(0.478)**	**(0.464)**	**(0.366)**	**(0.465)**	**(0.471)**	**(0.462)**	**(0.348)**
Δlog Household income	1.200	0.735	0.134	1.679***	1.183	0.402	0.207	1.339*	0.750	0.218
	(0.818)	(1.006)	(0.612)	(0.648)	(0.759)	(0.533)	(0.531)	(0.779)	(0.528)	(0.473)
Δlog Household asset inc.	0.116	0.167*	-0.007	0.079	0.064	0.033	0.192	0.028	0.160	-0.046
	(0.097)	(0.094)	(0.111)	(0.091)	(0.102)	(0.092)	(0.120)	(0.097)	(0.104)	(0.082)
ΔWeekly work hours	-0.049	-0.081**	0.049	-0.050	-0.020	0.015	0.026	-0.007	-0.033	-0.027
	(0.038)	(0.037)	(0.032)	(0.036)	(0.033)	(0.022)	(0.034)	(0.028)	(0.025)	(0.020)
ΔAutonomy	0.297	-0.107	0.184	0.523*	0.482*	0.256	0.284	0.268	0.811***	-0.243
	(0.318)	(0.353)	(0.325)	(0.289)	(0.274)	(0.269)	(0.322)	(0.334)	(0.288)	(0.251)
ΔFirm size	0.262	0.384	0.145	-0.065	0.253	-0.019	0.135	0.099	0.110	-0.010
	(0.251)	(0.259)	(0.260)	(0.241)	(0.224)	(0.157)	(0.241)	(0.201)	(0.218)	(0.171)
Pre-treatment covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	21,479	21,479	21,479	21,479	21,479	21,479	21,479	21,479	21,479	21,479
R^2	0.324	0.378	0.353	0.361	0.354	0.345	0.372	0.311	0.387	0.297

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

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. Δ MCS = change in the Mental Component Scale, Δ PCS = change in the Physical Component Scale. See Table 1A for detailed definitions.