Personality Traits and Income Attainment of Self-Employed People—Accounting for Model Uncertainty

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Abstract: We examine the robustness of the relationship between income attainment and personality traits from Tellegen's three-factor model that map into constructs of positive emotionality (well-being, social potency, achievement, and social closeness), negative emotionality (stress reaction, alienation, and aggression), and constraint (control, harm avoidance, and traditionalism). We do so by estimating the sampling distribution of 32,768 models in a sample of self-employed people from the Midlife in the United States (MIDUS) study to account for model uncertainty. We find that only social potency and aggression are robust and positively correlated with income attainment among the self-employed. In contrast, income attainment for organizational employees is positively influenced by social potency and achievement and negatively influenced by traits such as alienation, impulsivity, traditionalism, and control. We find similar results when we examine a sub-group of self-employed people who employ and supervise others. Implications for future research are discussed.

Keywords: personality traits, self-employment, model uncertainty, income attainment, aggression, social potency, social closeness

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1. Introduction

Personality traits play a central role in classical economic models of entrepreneurship (e.g., see for a recent review, Kerr, Kerr, & Xu, 2018) and have long been recognized as powerful predictors of economic outcomes (e.g., Borghans, Duckworth, Heckman, & Weel, 2008). More specifically, personality traits are at the core of occupational theories of entrepreneurship (e.g., Kihlstrom & Laffont, 1979; Shaver & Scott, 1991; Parker, 2009; McGrath & MacMillan, 2000) where the self-employed individual is the primary focus (Shepherd, 2003).[1] As a result, personality traits are considered to be critical to one's propensity to start and successfully run new business ventures, as well as to perform various entrepreneurial tasks, including creativity, problem-solving, and opportunity evaluation (e.g., Rauch & Frese, 2007; Delgado-García, Rodríguez-Escudero, & Martín-Cruz, 2012; Frese & Gielnik, 2014).

Despite the valuable insights of prior work, current empirical literature has produced rather inconsistent findings (e.g., Frank, Lueger, & Korunka, 2007; Kerr et al., 2018). That is, entrepreneurship researchers have yet to converge on a consensus when it comes to a standard (or even a minimalist) set of trait-related variables that need to be included in empirical estimations. This is important because different personality traits can be potentially omitted variables that are likely to bias empirical estimations, especially that different traits are often highly correlated with each other yet often studied independently (Kerr et al., 2018).

In this paper, we evaluate the robustness of ten personality traits drawn from Tellegen's three factor model that map broadly into three constructs—positive emotionality (well-being, social potency, achievement, and social closeness), negative emotionality (stress reaction, alienation, and aggression), and constraint (control, harm avoidance, and traditionalism)—with respect to one objective measure of entrepreneurial success—income

[1] In this paper, we focus on self-employed people and further examine a sub-sample of individuals who are also owners and managers (i.e., supervise and employ others). We also acknowledge that while self-employed individuals are not the type of entrepreneurs often highlighted in the media, their collective impact on the economy is too large to be ignored, even if they don't come up with breakthrough innovations (Parker, 2009).

attainment. Some of these traits have received significant attention in the literature (e.g., achievement, stress-reactivity, and well-being) while others have rarely been studied (e.g., social potency, aggression, and harm avoidance). We focus on income attainment because classical models of entrepreneurship and economics suggest that self-employed entrepreneurs are largely motivated by the pursuit of profit and because successful entrepreneurs are often socially recognized for their high net worth and earnings (e.g., Baumol & Strom, 2007; Knight, 1921; Parker, 2009).[2] In addition, the economic success of individuals who start their own business ventures is of primary interest to policy makers (Parker, 2009). To this end, we compare how different personality traits affect the economic success for both self-employed and organizational-employees, a question that has rarely been addressed in the literature up to this point (e.g., Kerr et al., 2018).

2. Model Uncertainty

Model uncertainty—or uncertainty with respect to the choice of control variables that are used in statistical models—is one of the most challenging issues in the social sciences. In the course of statistical analysis, researchers often estimate a large number of models, but often report only a small fraction of non-random empirical estimations. This is because statistically significant findings that support the main hypotheses in a study are more likely to be published and therefore researchers have perverse incentives to avoid reporting alternative specifications that yield insignificant results, the so called "file-drawer problem" (e.g., Rosenthal, 1979; Young & Holsteen, 2015).[3] This is problematic because classical statistical tests assume that only one true model is applied to a sample of data and thus account only for the uncertainty associated with the sampling distribution. If researchers, however, are uncertain which is the true model (e.g., what variables need to be included in their model as controls), then the range of uncertainty increases (i.e., researcher's choice

[2] Here, we acknowledge that many entrepreneurs are driven by multiple motives other than money such as independence, mastery, or social generativity (e.g., see Parker, 2009).

[3] Young and Holsteen (2015), for example, review replication results reported in two major sociological journals and find that out of 164 cases, not a single one reported statistical results that failed to support the main findings.

of a model). This suggests that standard errors and confidence intervals of the estimated coefficients will be significantly larger. In this respect, previous studies suggest that 89 percent of the total variance in estimates is due to model uncertainty while only 11 percent is associated with the uncertainty of the sample (see Pinello, 1999).

Choosing a set of control variables, however, is "difficult, fraught with ethical and methodological dilemmas, and not covered in any serious way in classical statistical texts" (Ho, Imai, King, & Stuart, 2007, p., 232). This is because extant theory often does not provide enough direction to select the true empirical model (Heckman, 2005; Leamer, 1983; Raftery, 1995). More importantly, the same theory can be tested with a large number of models, and since empirical findings depend on both the data and the choice of model (Heckman, 2005), different models applied to the same set of data can lead to completely different conclusions (Leamer, 1983; Young & Holsteen, 2015).

This dynamic is clearly evident in the recent replicability crisis in the social sciences. For example, more than 140 variables have been theoretically identified and found to be significantly correlated with economic growth (Moral-Benito, 2012). Yet, in a set of classical robustness tests, Sala-i-Martin (1997), and Sala-i-Martin, Doppelhofer, and Miller, (2004) found that the majority of these variables were consistently weak or non-significant, with many coefficients showing significance in only 1 out of 1,000 regression models. Similar patterns are also well documented in fields such as medicine (Loannidis, 2005) and psychology (Simmons, Nelson, & Simonsohn, 2011), where the majority of published studies have been found to produce false positives instead of robust correlations. Recent research has also pointed out to a parallel credibility concern in strategic management (Bergh, Sharp, Aguinis, & Li, 2017) and cross-country entrepreneurship research (Nikolaev, Boudreaux, & Palich, 2018). Such empirical heterogeneity emphasizes the need for more robustness analyses that account for model uncertainty with respect to the choice of control variables in a study in order to make empirical findings more compelling and less prone to non-robust, trivial, and false-positive results (Durlauf, Kourtellos, & Tan, 2012; Young, 2009; Young & Holsteen, 2015). This is important because elements that are

not part of the model may help reconcile existing disagreements or contradictions in the entrepreneurship literature on the performance consequences of multiple personality traits.

3. Personality Traits and Entrepreneurship

The entrepreneurship literature has identified a large number of personality traits that can influence startup activity and business success. For example, a recent meta-analysis by Rauch and Frese, (2007) identified 51 traits—ranging from innovativeness and Type A behavior to achievement motivation and conformity—that previous studies have found to be significantly correlated with various entrepreneurship outcomes. Other meta-analytical studies (e.g., Brandstätter, 2011) and reviews (e.g., Kerr et al., 2018) of the literature have also identified a large number of potentially relevant personality variables as significant drivers of entrepreneurial engagement and success such as proactive personality, self-efficacy, stress tolerance, need for autonomy, internal locus of control, need for achievement, and risk tolerance (Stewart Jr & Roth, 2001; Zhao and Seibert, 2006; Zhao, Seibert, and Lumpkin, 2010).

The relationship between personality traits and firm performance, however, has been "woefully understudied" (Kerr et al., 2018, p.1), with only a handful of studies focusing on the link between income attainment and personality traits among entrepreneurs, despite the practical appeal of the topic and its relevance to public policy (Parker, 2009). Results from previous studies imply that traits associated with positive emotionality (such as dispositional positive affect, achievement motivation, and social potency) can increase effort and persistence on work-related tasks, improve creativity and problem-solving, decrease work withdrawal, reduce interpersonal conflict, and increase satisfaction from work (e.g., Baron, 2008; Delgado-García et al., 2012; Lyubomirsky et al., 2005; Stephan, 2018; Kerr et al., 2018); which, in turn, can lead to higher levels of personal income. For example, entrepreneurs are often viewed as having higher need for achievement (McClelland, 1965) and several studies have demonstrated that entrepreneurs who have such tendencies are more likely to achieve business success (e.g., Rauch and Frese, 2007). This relationship,

however, is rather weak and empirical findings have been mixed, especially in the context of business success (e.g., Frank et al., 2007).

Traits associated with negative emotionality (such as stress reactivity, aggression, and alienation) can have both positive and negative effect on income. For example, previous studies show that more neurotic and irritable people, those that have high levels of stress reactivity, earn significantly less than those with low levels of stress (Heineck, 2011). Other studies, however, suggest that the effect is positive (Hamilton, Papageorge, and Pande, 2018), despite being small and insignificant. Further, more aggressive individuals may earn more as they seek to keep more business profits at the expense of others (Ben-Ner, Putterman, Kong, & Magan, 2004). On the contrary, several studies have found that more agreeable people experience a wage penalty (Nyhus and Pons, 2005; Heineck, 2011; Hamilton et al., 2018). However, in a more recent study Viinikainen et al., (2017) show that more aggressive behavior (during adolescence) does not significantly predict business engagement and sales in later life because more hostile behavior creates interpersonal conflict and leads to frustration.

Finally, while recent studies suggest that impulsive behavior may have various benefits for entrepreneurs (Wiklund et al., 2017; Wiklund, Patzelt, & Dimov, 2016), a parallel literature also suggests that individuals who strive to have greater control over their life are more adept to deal with pressure at work, more satisfied with their jobs, and better capable of dealing with adversity, which can lead to greater reservation wages (Lefcourt, 2014). Entrepreneurs are also often considered to be innovative individuals who are less likely to follow established practices and norms, and such traditional values may be antagonistic to starting and running successfully new business ventures (Rauch & Frese, 2007). Overall, while previous studies suggest that personality matters for business success and income attainment, the effects have been generally moderate and empirical findings rather mixed.

4. Data

Data for the current analysis were extracted from Wave 2 and Wave 3 of the Midlife in the United States (MIDUS),[4] an American National longitudinal survey including 7,108 English-speaking individuals aged 25 to 74. The initial purpose of MIDUS was to learn more about the psychology and sociology behind the health of Americans, including both mental and physical health. Wave 1 (n = 7,108) was collected from 1995 to 1996; Wave 2 (n = 4,936) from 2004 to 2006; and Wave 3 (n = 3,294) from 2013 to 2014. Data were collected with a 30-min phone interview followed by two self-reported questionnaires. Around 70% rate of retention was observed from Wave 1 to Wave 2 and 66% of the participants remained in Wave 3. Monetary compensation was offered in all the Waves of the study, ranging from $20 to $60 American dollars. The average age of participants was 55.21 ($SD = 12.42$) in Wave 2, and 63.64 years ($SD = 11.35$) in Wave 3. Across all waves, around 90% of the sample were white individuals; while the distribution of gender was evenly weighted, with 70% of the participants reporting having a spouse. On average, participants reported having some technical studies or at least 2 years of college and the mean income attainment ranged from $55,000 to $75,000 between waves (cf. Radler, & Ryff, 2010).

4.1 Measures

Personality traits were assessed with Tellegen's (1985) three-factor model, which is composed of 10 primary scales that map into three higher-order dimensions of personality—(1) positive emotionality (PEM) (well-being, social potency, achievement, and social closeness); (2) negative emotionality (NEM) (stress reaction, alienation, and aggression); and (3) constraint or reverse impulsivity (CON) (control, harm avoidance, and traditionalism). These primary scales are measured with a shortened version of the Multidimensional Personality Questionnaire (MPQ), which has been extensively validated (Patrick, Curtin, & Tellegen, 2002) and linked to underlying biological systems that drive various psychobiological processes (Tellegen et al., 1988). Previous studies have also linked the Tellegen's three factor model to the Big Five personality traits (Church, 1994). The PEM and NEM

[4] We use only wave 2 and 3 of the dataset because wave 1 does not provide information on the Multidimensional Personality Questionnaire (MQP) needed for the scope of this study.

dimensions are explicitly temperamental in nature and reflect dispositions towards positive and negative moods. The CON dimension reflects traits are related to reversed impulsivity and behavioral restraint. Table 1 provides a summary of the items used to measure each personality trait. All scales were constructed by calculating the sum of the values of the items. All items, except those marked with (R), were reverse-coded, so that high scores reflect higher standing in each dimension. All personality variables had acceptable psychometric properties. While information on the Big Five personality factors is also available in MIDUS, we focus on Tellegen's three-factor model because it more closely maps to personality traits that are most often discussed in the entrepreneurship literature such as achievement motivation, control, impulsivity, or well-being.

Self-employment was measured with a dummy variable (i.e., if the respondent reported her/his work status as self-employed = 1; and if they reported being employed = 0). In additional analyses, we further examined a sub-sample of self-employed people who also reported supervising and employing others (manager owners). This allowed us to focus on a sub-sample of self-employed people who are job creators and have significantly higher economic impact (Parker, 2009). Personal income was self-reported as pre-tax income. Consistent with previous studies in the literature, additional controls for age, age squared, gender, education, marital status (dummies for married, separated, divorced, widowed, and never married), number of children, and optimism were used for the analysis; these controls are commonly included in regressions that estimate the drivers of personal income such as the returns from higher education (Dickson & Harmon, 2011; Mincer, 1974). Table 2 presents summary statistics for all variables used in the study. Overall, after eliminating missing observations,[5] the sample consisted of 730 individual-level observations of self-employed people (330 manager owners) and 5,331 observations of organizational workers.

6. Results

[5] We only used individuals for whom we had information on all relevant variables (i.e., no missing information on key variables) and we did not impute any data.

Table 3 presents the most complete model in which all variables (from Table 2) are included in the estimation. All models are estimated with a random-effects estimator with robust standard errors clustered at the individual level (reported in parentheses next to the coefficient estimates). Overall, the results in Table 3 suggest that only social potency, aggression, and harm avoidance have a significant and positive effect on the income attainment of self-employed people while harm avoidance was only marginally significant. The effect of these personality traits is non-trivial. For example, increase of one standard deviation in social potency (2.36) is associated with $8,249 higher income, holding other socio-economic variables in the model constant. Similarly, the difference in income attainment between the least and most aggressive entrepreneurs is $57,000, on average, which is equivalent to the average household income in the US in 2017 adjusted for inflation (US Census Bureau, 2018). To further provide easier interpretation of these findings, Figure 1 shows marginal effects plots with 95 percent confidence intervals, holding all variables at their sample means.

As expected, the results also suggest that education is strongly and positively correlated with higher income attainment and this relationship is stronger for the self-employed; women earn significantly less than men, with self-employed women experiencing a greater wage penalty than their employed counterparts; income increases with age in a curvilinear fashion for the employed, but age has no effect on the income attainment of the self-employed; married people earn a wage a premium; surprisingly, optimism matters only for the wage-employed when it comes to income attainment.

The left panel of Table 3 shows the results for the sub-sample of employed people. The notable result here is that the type of personality traits that significantly correlate to personal income for self-employed individuals are not always the same for organizational workers. For example, while aggression benefits the self-employed in terms of income attainment, it has no effect for organizational employees. Instead, the traits that seem to correlate with higher income attainment for the employed are achievement, social potency, lack of alienation, and higher impulsivity (low level of control and traditionalism), traits

that previous studies have found to be critical for starting and running successfully new business ventures (e.g., Kerr et al., 2018).

To test the robustness of these results with respect to model uncertainty, we next use the novel computational framework developed by Young and Holsteen (2015). Specifically, we report a number of statitstics associated with the distribution of the estimated coefficients from 32,768 possible models (all possible combination of models based on the control variables from our most complete model in Table 3). This allows us to account not only for the uncertainty associated with the sampling distribution, but also with respect to the choice of model—i.e., check whether the results reported in Table 3 hinge on the set of possible control variables in our model space or if they are robust regardless of the theoretical assumptions made in regard to the true model.

Specifically, following Young and Holsteen's (2015), we report a robustness ratio,[6] which is analogous to a T-statistic, but accounts for the uncertainty of the modelling distribution, and interpret values greater than two to reflect strong robustness. In addition, we report core summary statistics such as *sign stability* (the share of estimates that have the same sign) and *significance rate* (the share of models that report statistically significant coefficients) to further evalute robustness. Here, we follow the advice of Raftery (1995), so that a significance rate of 50 percent sets a lower bound for "weak" robustness while a rate of 95 percent or higher indicates "strong" robustness.

Table 4 presents a summary of the robustness analysis with respect to all ten personality traits for the self-employed sub-sample. The findings in this table suggest that only social potency and aggression are robust predictors of income attainment among the ten personality traits. None of the other eight personality traits are robust once accounting for model uncertainty across the 32,768 estimated models. For example, the estimated coefficient on achievement, a personality trait that has been found to be key to entrepreneurial success in previous meta-analysis (e.g., Rauch & Frese, 2007), is positive in 65

[6] For a technical derivation of this statistic and discussion of model uncertainty, see Young and Holsteen (2015).

percent of the cases and negative in the remaining 35. It is also significant in less than 5 percent of the models. Similar patterns emerge for the other personality traits as well.

Because self-employment is highly heterogenous, we next replicate our results from Table 4 with respect to a sub-sample of self-employed people who employ and supervise others (i.e., job creator supervisors). This allows to focus on a group of self-employed people (n=330) who are more likely to be growth oriented, opportunity driven, and have significantly higher economic impact (Parker, 2009). Overall, our results are highly consistent in both sub-samples of self-employed people, although there are some notable differences. For example, we find that social potency is still the most robust predictor of personal income for the self-employed job creators and the effect is slightly stronger ($13,778) compared to the overall sample of self-employed people. At the same time, aggression becomes non-robust predictor once we look at this sub-sample of self-employed people while more socially closed people tend to do worse in terms of personal income. Finally, the remaining seven personality traits, just like before, are non-robust predictors of personal income.

In a follow-up analysis (Table 6) we also estimate the extent to which including four control variables in the model (age, gender, education, and optimism) influence the marginal effect—the percent change from the mean (β)—of the ten personality traits on personal income. For example, when gender enters the regression, the effect of social potency on personal income decreases by $195 (or 3.5%), on average (across all 32,768 estimations). Table 6 provides some preliminary evidence that future scholars may use to examine possible interactive relationships between the ten personality traits and demographic variables such as age, gender, and education.

Finally, we replicated our model uncertainty analysis with respect to the Big Five personality traits—neuroticism, extraversion, openness, conscientiousness, and agreeableness (see Table 7). Overall, we found that conscientiousness and agreeableness are weakly robust predictors of income attainment among the sample of self-employed people while the other three traits—neuroticism, extraversion, and openness—were not robustly

predictors of entrepreneurs' income. For example, even though openness to new experiences is often considered to be essential trait of entrepreneurs, we found that only 7 percent of the models in our sample yielded a significant coefficient, with a rather weak sign stability. Our findings also implied that the effect size of conscientiousness and agreeableness on income attainment was substantial. For example, the most conscientious people earn $51,200 more compared to their least conscientious counterparts, and the least agreeable people earn $61,600 more compared to the least agreeable ones. This is consistent with our results based on Tellegen's personality measures which show that more aggressive people (a trait that maps negatively into agreeableness) are more likely to achieve higher earnings. These findings further provide support for previous studies which find that less agreeable people are more likely to have an income premium (Ben-Ner et al., 2004).

7. Conclusion

Model uncertainty is one of the most pervasive challenges in the social sciences. In this paper, we evaluate the robustness of ten personality traits from the Tellegen's three-factor model that map into positive emotionality (well-being, social potency, achievement, and social closeness), negative emotionality (stress reactivity, aggression and alienation), and constraint (control, traditionalism, and harm avoidance) with respect to one objective measure of entrepreneurial success—income attainment. Accounting for model uncertainty--the choice of control variables in the model--we find that only social potency and aggression are robustly and positively correlated with the income attainment of self-employed people. The magnitude of these effects is substantial—one standard deviation increase in aggression and social potency is associated with $8,160 and $11,394 raise in personal income, all else constant. Even though aggression benefits self-employed people, it is uncorrelated with success for organizational employees. Rather, the traits that seem to pay off for organizational workers are associated with achievement motivation, social potency, lack of alienation, and higher impulsivity. Finally, social potency is also the most

robust personality trait that predicts income attainment when we examine a sub-sample of self-employed people who also employ and supervise others.

There are several limitations to the study. One drawback is that of reverse causality. Because personality traits from the Tellegen's model are considered to be deeply embedded dispositions in individuals' genetic profiles (Tellegen et al., 1988; Patrick et al., 2002), it is not likely that reverse causality and endogeneity are serious problems. However, because we rely on comparative and archival data, like most model uncertainty studies, our results should be treated as suggestive and not causal. In addition, it is possible that alternative model specifications (e.g., non-linear models) may provide better fit for some of the variables in the model (Rauch et al., 2007). After running several robustness tests,[7] we did not find any evidence for quadratic relationship in any of the personality trait variables. And yet, it is also possible that some of the personality variables work through moderating or mediating channels that can affect income attainment. In this respect, our additional analysis in Table 6 suggests some possible avenues for future research by showing how four control variables--age, gender, education, and optimism--influence the marginal effect on income attainment of the ten personality traits tested in the current study. Another limitation is that we focus on one measure of success–income attainment. Entrepreneurs, however, are heterogeneous when it comes to their motivations. It is likely that at least some of them pursue and view other intrinsically valuable goals such as independence, mastery, and/or well-being as relevant outcomes to their success and are willing to trade-off some of their income to achieve such outcomes (e.g., Hamilton, 2000; Manish & Sutter, 2015; Parker, 2018). More importantly, like most previous studies on the topic, our data do not allow us to test how personality traits affect income attainment along the venture creation process. In this respect, many early stage entrepreneurs, especially those who have or wish to have VC backing, derive very little income from their venture. In many cases, a VC will explicitly expect the founder not to derive income from the venture, with

[7] Such analyses are available upon request.

the payoff being related to an exit event or eventually derived from a CEO salary once the venture has grown substantially.

However, our results have several implications for entrepreneurship research on personality traits. First, previous meta-analyses suggest that traits such as achievement, control, and well-being are important for entrepreneurial success (e.g., Rauch & Frese, 2007; Kerr et al., 2018; Delgado-Garcia et al., 2015). The findings in this study, however, suggest that, at least by one key measure of success (income attainment), the positive role of these traits is likely to be sensitive to model uncertainty—i.e., significantly influenced by researcher's discretion to the choice of control variables in the model. In many cases, personality traits (e.g., achievement motivation) were significant in only a small fraction of the estimated models (less than 5 percent) and randomly changed signs. This could very well explain the heterogeneity of mixed empirical findings in the previous literature.

Of course, many of these personality traits have been previously studied in the stage of starting a new business rather than in the growth stage—e.g., achieving business success. As Kerr et al. (2018) note "the very sparse number of studies that connect firm performance outcomes to the personality traits of entrepreneurs are a significant limitation to our capacity to describe the quality margin of entrepreneurial ideas." Thus, it could very well be the case that these personality traits are relevant during certain stages of the entrepreneurial process when compared to others. This is a major limitation of the literature on personality traits and we encourage future researchers to focus on longitudinal datasets that can allow them to explore these effects at different stages of the evolution of the venture creation process.

Second, while some personality traits such as achievement motivation, well-being, and self-control have received significant attention in the literature, others such as aggression, social closeness, and social potency have been rarely studied (e.g., see Kerr et al., 2018). The evidence presented in the current analysis suggests that once accounting for model uncertainty, the most robust predictors of income attainment are precisely the type of personality traits that have received the least attention in previous analyses. Therefore,

future research can examine the effect of these traits at different stages of the entrepreneurial process and with respect to other measures of success (e.g., business venture growth).

Future studies may also want to study the heterogeneity of this effect with respect to other variables and groups of entrepreneurs. For example, in additional sensitivity tests, we found that the sign on aggression is significantly influenced by the inclusion of the gender variable while social potency is strongly influenced by one's educational level, implying that aggression may be a trait that benefits men far more than women while social potency benefits significantly more those who are highly educated. Finally, the current findings suggest that the type of personality traits that drive success among self-employed individuals are likely to be different from the traits that lead to success among the employed. A notable finding in our study was that achievement, well-being, and impulsivity—variables that have been found to be critical drivers of entrepreneurial action (Rauch and Frese, 2007; Kerr et al., 2018)—are far more important for organizational workers than the self-employed individuals, at least when it comes to their income attainment. Future studies will have to provide more nuanced understanding on the "why" and "under what circumstances" personality traits such as achievement motivation are more relevant for self-employed people compared to their employed counterparts.

8. References

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Appendix

Table 1: Multidimensional Personality Questionnaire (MPQ)

Measures	Items
Positive Emotionality	
Well-being (3 items)	"I usually find ways to liven up my day." "For me life is a great adventure." "I always seem to have something pleasant to look forward to."
Social Potency (4 items)	"On most social occasions I like to have someone else take the lead." (R) "I am quite effective at talking people into things." "I am very good at influencing people." "When it is time to make decisions, others usually turn to me."
Achievement (4 items)	"I often go on working on a problem long after others would have given up." "I like to try difficult things." "I like hard work." "I set very high standards for myself in my work."
Social Closeness (4 items)	"I usually like to spend my leisure time with friends rather than alone." "When I am unhappy about something, I tend to seek the company of a friend rather than remaining alone." "I am a warm person rather than cool and detached." "I often prefer not to have people around me." (R)
Negative Emotionality	
Stress Reactivity (3 items)	"My mood often goes up and down. "I sometimes get myself into a state of tension and turmoil as I think of the day's events." "Minor setbacks sometimes irritate me too much."
Aggression (4 items)	"When I get angry I am often ready to hit someone." "Sometimes I seem to enjoy hurting someone by saying something mean." "When people insult me, I try to get even." "Sometimes I just like to hit someone."
Alienation (3 items)	"People often try to take advantage of me." "I would be more successful if people did not make things difficult for me." "People often say mean things about me."
Constraint	

Control (3 items)	"When faced with a decision, I usually take time to consider and weigh all options." "I like to stop and think things over before I do them." "I am a cautious person."
Traditionalism (3 items)	"I am opposed to more censorship of books and movies because it would go against free speech." (R) "People should observe moral laws more strictly than they do." "I don't like to see religious authority overturned by so-called progress and logical reasoning."
Harm Avoidance (4 items)	"It might be fun and exciting to experience an earthquake." (R) "It might be fun learning to walk a tightrope." (R) "Of these two situations, I would dislike more: - Situation 1: Riding a long stretch of rapids in a canoe. - Situation 2: Waiting for someone who's late…" "Of these two situations, I would dislike more: - Situation 1: Being at the circus when two lions suddenly get loose down in the ring - Situation 2: Bringing my whole family to the circus and then not being able to get in because a clerk sold me tickets for the wrong night."

Note: Measures were extracted from wave 2 and 3 of the Midlife in the United States Study (MIDUS). Personality variables are based on MQP validated scales (Tellegen, 1985).

Table 2: Summary Statistics

	Self-Employed					Wage-Employed				
Variable	N	Mean	Std. Dev.	Min	Max	N	Mean	Std. Dev.	Min	Max
Income	730	65556.51	65186.79	0	300000	5,331	45713.00	45961.08	0	300000
Positive Emotionality										
Well-being	730	9.30	1.68	3	12	5,331	8.96	1.81	3	12
Social Potency	730	10.91	2.36	4	16	5,331	10.11	2.41	4	16
Achievement	730	12.73	2.11	6	16	5,331	12.17	2.22	4	16
Social Closeness	730	11.65	2.40	4	16	5,331	11.69	2.45	4	16
Negative Emotionality										
Stress Reactivity	730	5.91	2.15	3	12	5,331	6.09	2.23	3	12
Aggression	730	5.40	1.73	4	16	5,331	5.36	1.74	4	16
Alienation	730	4.92	1.77	3	12	5,331	5.06	1.80	3	12
Constraint (Reversed Impulsivity)										
Control	730	9.66	1.54	4	12	5,331	9.74	1.50	3	12
Traditionalism	730	7.93	2.35	3	12	5,331	8.27	2.18	3	12
Harm Avoidance	730	11.57	2.81	4	16	5,331	12.18	2.83	4	16
Age	730	56.81	10.58	30	87	5,331	59.29	12.63	33	92
Age Squared/100	730	3338.83	1218.94	900	7569	5,331	3674.36	1523.01	1089	8464
Gender	730	1.39	0.49	1	2	5,331	1.56	0.50	1	2
Education	730	7.92	2.51	1	12	5,331	7.39	2.51	1	12
Marital Status (base = married)										
Separated	730	0.01	0.11	0	1	5,331	0.01	0.12	0	1
Divorced	730	0.11	0.31	0	1	5,331	0.13	0.34	0	1
Widowed	730	0.02	0.14	0	1	5,331	0.09	0.29	0	1
Never Married	730	0.06	0.23	0	1	5,331	0.08	0.26	0	1
N Children	730	2.47	1.57	0	9	5,331	2.50	1.77	0	22
Optimism	730	24.36	4.37	8	30	5,331	23.14	4.71	6	30

Notes: Based on Wave 2 and 3 of the Midlife in the United States Study (MIDUS).

Table 3: Personality Traits and Personal Income

Variables	(1) Self-Employed		(2) Employed	
Positive Emotionality				
Well-being	521.63	(1,708.59)	-321.20	(385.25)
Social Potency	3,495.32***	(1,188.82)	946.75***	(283.90)
Achievement	-873.02	(1,404.66)	1,218.43***	(318.72)
Social Closeness	-276.23	(924.36)	-426.10*	(258.60)
Negative Emotionality				
Stress Reactivity	-1,072.72	(1,409.49)	461.26	(308.84)
Aggression	4,752.59***	(1,621.18)	299.00	(352.13)
Alienation	-574.65	(1,567.02)	-733.90**	(351.77)
Constraint (Rev Impulsivity)				
Control	360.72	(1,488.09)	-1,730.27***	(412.03)
Traditionalism	-1,196.36	(984.49)	-1,988.71***	(296.81)
Harm Avoidance	1,642.89*	(881.01)	109.26	(218.63)
Controls				
Age	107.50	(1,564.98)	2,170.20***	(354.44)
Age Squared	1.41	(13.79)	-19.53***	(3.01)
Gender	-36,989.62***	(4,783.16)	-23,019.98***	(1,385.06)
Education	6,211.61***	(1,012.87)	4,491.55***	(278.39)
Marital Status (base = married)				
Separated	-37,129.80***	(11,477.15)	-7,158.57*	(4,244.00)
Divorced	-11,279.50	(6,889.05)	-2,184.51	(1,804.45)
Widowed	2,423.86	(14,541.16)	2,941.59	(2,062.15)
Never Married	-11,187.92	(11,242.99)	-6,761.48***	(2,281.54)
N Children	408.57	(1,631.64)	-856.27***	(330.64)
Optimism	988.74	(739.58)	738.09***	(148.65)
R Squared	0.24		0.24	
Observations	730		5,331	

Notes: All models are estimated with random-effects estimator. Robust standard errors clustered at the individual level are shown in parentheses (below coefficient estimates). Data were extracted from Wave 2 and 3 of the Midlife in the United States Study (MIDUS).
*** p¡0.01, ** p¡0.05, * p¡0.1

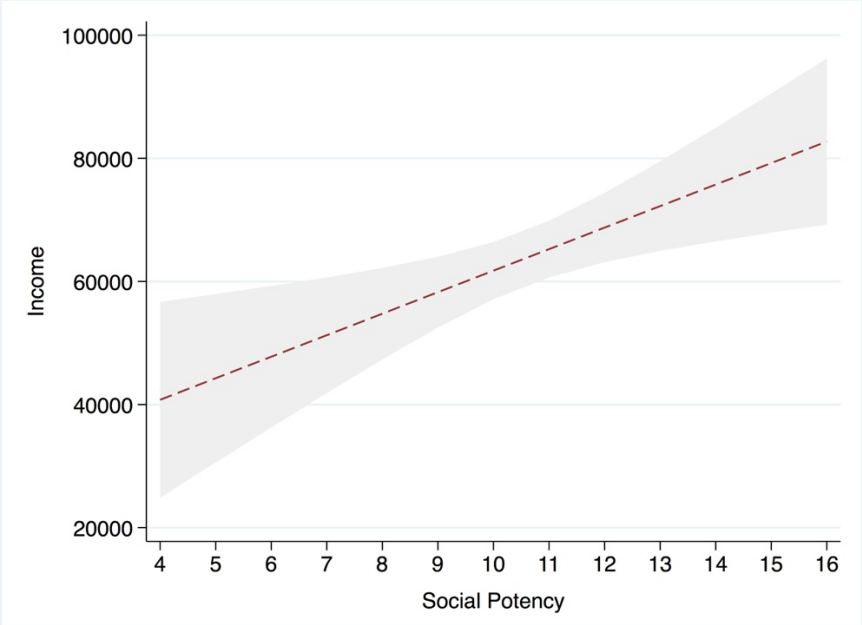
Table 4: Model Uncertainty (Self-Employed, Whole Sample)

Variable	(β)	R Ratio	Sign Stability	Significance Rate	+	+ & sig	-	- & sig	N	Overall
				Positive Emotionality						
Well-being	$569	0.27	60	8	60	8	40	0	732	not robust
Social Potency	$4828	3.38	100	100	100	100	0	0	732	strongly robust
Achievement	$629	0.38	69	5	69	5	31	0	732	not robust
Social Closeness	$0	-0.87	95	10	5	0	95	10	732	not robust
				Negative Emotionality						
Stress Reactivity	$0	-0.93	96	17	4	0	96	17	732	not robust
Aggression	$4,717	2.18	100	85	100	85	0	0	732	robust
Alienation	$0	-1.21	100	34	0	0	100	34	732	not robust
				Constraint (Reversed Impulsivity)						
Control	$370	0.22	66	0	66	0	34	0	732	not robust
Traditionalism	$0	-1.34	100	50	0	0	100	50	732	not robust
Harm Avoidance	$624	0.51	70	11	70	11	30	0	732	not robust

Notes: We follow the methodology outlined by Young and Holsteen (2015). Results show a summary of the modelling distribution for the ten personality measures based on 32,768 unique combinations of the 16 control variables used for our main estimations in Table 3. Since the procedure is computationally very intensive, we treat age and marital dummies as a vector of variables that enter each estimation together.

(β) = the average β coefficient across all 32,768 estimations.
R Ratio = Robustness Ratio. If higher than 2, it suggests robustness (Young and Holsteen, 2015).
+ = % of models in which the variable enters with a positive sign.
+ & sig = % of models in which the variable enters with a positive & significant sign.
- = % of models in which the variable enters with a negative sign.
- & sig = % of models in which the variable enters with a negative & significant sign.
Sign stability = sign stability indicating the percentage of models that have the same sign.
Significance rate = significance rate indicating the percentage of models that report statistically significant coefficient. A significance rate of 95% or higher indicates "strong" robustness while a significance rate of 50% sets a lower bound for "weak" robustness (Raftery, 1995).
N = number of observations

Figure 1: Marginal Effects with 95 % Confidence Intervals (Table 3)



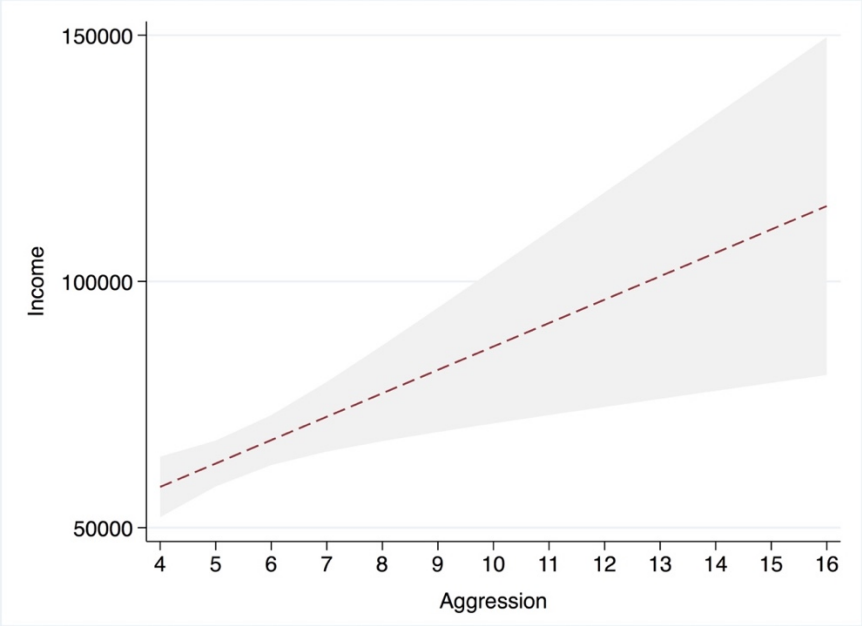


Table 5: Model Uncertainty (Self-Employed, Sub-Sample Employer Supervisors)

Variable	(β)	R Ratio	Sign Stability	Significance Rate	+	+ & sig	-	- & sig	N	Overall
				Positive Emotionality						
Well-being	$1204	0.34	69	3	69	3	31	0	330	not robust
Social Potency	$5838	2.68	100	100	100	100	0	0	330	strongly robust
Achievement	-$1670	-0.55	81	1	19	0	81	1	330	not robust
Social Closeness	-$3710	-1.98	100	69	0	0	100	69	330	weakly robust
				Negative Emotionality						
Stress Reactivity	-$2280	-0.99	100	8	0	0	100	8	330	not robust
Aggression	$2339	0.71	85	12	85	12	15	0	330	not robust
Alienation	-$2260	-0.79	98	5	2	0	98	5	330	not robust
				Constraint (Reversed Impulsivity)						
Control	$1021	0.35	85	0	86	0	14	0	330	not robust
Traditionalism	$598	0.26	54	1	54	1	46	0	330	not robust
Harm Avoidance	$355	0.20	64	0	64	0	36	0	330	not robust

Notes: We follow the methodology outlined by Young and Holsteen (2015). Results show a summary of the modelling distribution for the ten personality measures based on 32,768 unique combinations of the 16 control variables used for our main estimations in Table 3. Since the procedure is computationally very intensive, we treat age and marital dummies as a vector of variables that enter each estimation together.

(β) = the average β coefficient across all 32,768 estimations.
R Ratio = Robustness Ratio. If higher than 2, it suggests robustness (Young and Holsteen, 2015).
+ = % of models in which the variable enters with a positive sign.
+ & sig = % of models in which the variable enters with a positive & significant sign.
- = % of models in which the variable enters with a negative sign.
- & sig = % of models in which the variable enters with a negative & significant sign.
Sign stability = sign stability indicating the percentage of models that have the same sign.
Significance rate = significance rate indicating the percentage of models that report statistically significant coefficient. A significance rate of 95% or higher indicates "strong" robustness while a significance rate of 50% sets a lower bound for "weak" robustness (Raftery, 1995).
N = number of observations

Table 6: Marginal Effects of Control Variable Inclusion

	Control Variables			
	Age	Gender	Education	Optimism
Personality Traits				
Well-being	-$438 (-36.4%)	+ $1327 (110%)	+ $934 (77.6%)	- $1280 (-106.3%)
Social Potency	+ $185 (+3.2%)	- $195 (-3.3%)	- $1560 (-25.6%)	- $360 (-6.2%)
Achievement	+ $324 (-19.4%)	- $650 (38.9%)	- $916 (54.8%)	- $1030 (61.7%)
Social Closeness	+ $82 (-2.2%)	+ $538 (-14.5%)	+ $824 (-22.2%)	- $421 (+ 11.4%)
Stress Reactivity	+ $656 (-28.8%)	+ $741 (-32.6%)	+ $1117 (-49.1%)	+ $791 (-34.8%)
Aggression	+ $99 (+4.3%)	- $2350 (-100.5%)	+ $2684 (+114%)	+ $494 (+21.1%)
Alienation	- $88 (+3.9%)	+ $659 (-29.3%)	+ $1928 (-85.5%)	+ $1028 (-45.6%)
Control	- $493 (-48.3%)	- $1370 (-134%)	+ $280 (+27.8%)	+ $4 (0.4%)
Traditionalism	+ $412 (69%)	- $158 (-26.5%)	+ $2943 (+492%)	- $39 (-6.6%)
Harm Avoidance	- $153 (-26.5%)	+ $1468 (413%)	+ $856 (+241%)	+$117 (+33.2%)

Notes: The results show model influence in terms of marginal effect change (percent change from mean (β) in Table 5) of the ten personality traits on personal income due to inclusion of the control variables age, gender, education and optimism. For example, controlling for gender decreases the effect of social potency on personal income by $1560, on average.

Table 7: Model Uncertainty, Big Five Personality Traits (Self-Employed Sample)

Variable	(β)	R Ratio	Sign Stability	Significance Rate	+	+ & sig	-	- & sig	N	Overall
Big Five Personality Traits										
Neuroticism	$542	0.09	53	5	53	0	47	5	727	not robust
Extraversion	$8738	1.29	94	46	94	46	6	0	727	not robust
Openness	-$505	-0.07	54	7	46	4	54	3	727	not robust
Conscientiousness	$12,800	1.93	100	59	100	59	0	0	727	weakly robust
Agreeableness	-$15,400	-1.97	100	85	0	0	100	85	727	weakly robust

Notes: We follow the methodology outlined by Young and Holsteen (2015). Results show a summary of the modelling distribution for the Big Five personality traits based on 1,024 unique combinations of the 10 control variables used for our main estimations in Table 3. Note that we use the Big Five instead of the Tellegen's personality measures for these estimations. Since the procedure is computationally very intensive, we treat age and marital dummies as a vector of variables that enter each estimation together.

(β) = the average β coefficient across all 1,024 estimations.
R Ratio = Robustness Ratio. If higher than 2, it suggests robustness (Young and Holsteen, 2015).
+ = % of models in which the variable enters with a positive sign.
+ & sig = % of models in which the variable enters with a positive & significant sign.
- = % of models in which the variable enters with a negative sign.
- & sig = % of models in which the variable enters with a negative & significant sign.
Sign stability = sign stability indicating the percentage of models that have the same sign.
Significance rate = significance rate indicating the percentage of models that report statistically significant coefficient. A significance rate of 95% or higher indicates "strong" robustness while a significance rate of 50% sets a lower bound for "weak" robustness (Raftery, 1995).
N = number of observations