Replication Study

Social investment in work reliably predicts change in conscientiousness and agreeableness: A direct replication and extension of Hudson, Roberts, and Lodi-Smith (2012)

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ABSTRACT

The present study was a close replication of Hudson, Roberts, and Lodi-Smith (2012). Participants' personality traits and social investment in work were measured twice over three years. Latent change models were used to examine the associations among the intercepts (levels) and slopes (changes) for these variables. Results revealed that levels of all of the big five traits except openness were generally related to levels of social investment at work. Longitudinally, changes in social investment in work were generally associated with simultaneously co-occurring changes in only conscientiousness and agreeableness. Age did not moderate these correlated changes. Overall, the results directly replicated those of Hudson et al. (2012) and suggest that personality traits develop in concert with job experiences.

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1. Introduction

Many adults commit more than one third of one of their most precious and limited resources—their waking time—to their careers. Moreover, personality psychologists have recently emphasized the notion that individuals' personality traits can be enduringly shaped by the social roles to which they commit (e.g., Lehnart, Neyer, & Eccles, 2010; Lodi-Smith & Roberts, 2007; Roberts & Wood, 2006). This raises an extremely important question: How are people affected by the vast sums of psychological energy that they invest in their jobs?

Previous research suggests that there are individual differences in the extent to which people psychologically commit to their careers (e.g., Kanungo, 1982). Moreover, Hudson, Roberts, and Lodi-Smith (2012) found that growth in social investment (i.e., psychological commitment) in one's work predicted simultaneous gains in conscientiousness over a period of three years. Stated differently, individuals who increased in their commitment to their jobs tended to experience greater co-occurring growth in conscientiousness than did their peers who did not become more psychologically invested in their work. Hudson and colleagues interpreted these findings to mean that people tend to be sculpted

by their careers: investing deeply in a job can lead to lasting gains in conscientiousness.

Given the importance of understanding how people are affected by the vast amounts of time and psychological energy that they invest in their careers, the primary goal of the present research was to closely replicate Hudson et al.'s (2012) findings that changes in social investment in work predict simultaneously co-occurring changes in conscientiousness. Moreover, the present research also improved upon their original study in at least two ways. First, in the present study, we used an employed sample that was nearly three times larger than Hudson and colleagues' previous sample. Second, psychological researchers are divided over whether social investment should more strongly sculpt personality traits among younger or older individuals (e.g., Cornelis, Van Hiel, Roets, & Kossowska, 2009), or whether changes in social investment might continue to predict trait change across the entire lifespan (e.g., Baltes, 1987). Hudson et al. (2012) examined this issue by dividing their sample in half based on age and using multiple groups structural equation models to examine whether the associations between social investment in work and personality trait development differed between the two groups. They found no statistically significant differences across the two age groups. In the present manuscript, we improved upon their analyses by examining whether age, treated as a continuous variable (see Cohen, 1983), moderates the associations between social investment and trait development—including whether it does so in a curvilinear fashion.

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1.1. Social investment and personality trait development

A large body of research suggests that people's personality traits change over time. For example, people tend to become more agreeable, conscientious, and emotionally stable with age (e.g., Lucas & Donnellan, 2011; Roberts, Walton, & Viechtbauer, 2006; Soto, John, Gosling, & Potter, 2011). There are at least two prominent explanations in the empirical literature for why this phenomenon occurs. First, these normative patterns of personality development may reflection biologically predetermined maturation, analogous to the genetically hard-coded physical maturation that humans experience with age (Costa & McCrae, 2006; Roberts & Wood, 2006). Indeed, recent research has found that the ways in which people's personality traits *change* over time are partially heritable (e.g., Bleidorn, 2009; Bleidorn et al., 2010).

A second, non-mutually exclusive explanation for the observed normative patterns of personality trait development is that people's traits are affected by their experiences and social roles (Lodi-Smith & Roberts, 2007; Roberts & Wood, 2006). For example, individuals who smoke marijuana tend to experience less positive growth in conscientiousness, as compared with their non-smoking peers (Roberts & Bogg, 2004). People who enter into enduring romantic relationships tend to experience increases in emotional stability, relative to their single peers (Lehnart et al., 2010). Even factors as seemingly trivial as completing weekly crossword and Sudoku puzzles have been linked to gains in personality traits, such as openness to experience (Jackson, Hill, Payne, Roberts, & Stine-Morrow, 2012).

To the extent that most individuals within a society share common experiences (e.g., commitment to romantic partners and/or careers), they may be shaped in similar ways, producing normative trends (Lodi-Smith & Roberts, 2007; Roberts & Wood, 2006). For example, extrapolating from previous research, the normative increases in emotional stability that occur with age (e.g., Roberts & Mroczek, 2008) may be partly driven by the fact that most people invest in romantic partners during young adulthood, and investing in a romantic partnership is associated with gains in emotional stability (Lehnart et al., 2010). Similarly, the normative age-graded gains in conscientiousness (e.g., Lucas & Donnellan, 2011) might be partially engendered by normative pressures to commit to a career, as committing to a career has been linked to growth in conscientiousness (Hudson et al., 2012).

Theoretically, interpersonal experiences and social roles sculpt people's personality traits by serving as strong, consistent presses to think, feel, and behave in certain ways (Lodi-Smith & Roberts, 2007; Roberts & Wood, 2006). For example, most workplaces presumably reinforce conscientious behaviors (e.g., diligence, organization, and punctuality) and punish non-conscientious ones (e.g., irresponsibility, shoddy workmanship). The end result is that people's personality *states* (i.e., immediate and temporary thoughts, feelings, and behaviors) are molded by their workplaces to be more conscientious. According to the sociogenomic model of personality development (Roberts & Jackson, 2008), changes to personality states that are maintained for a long enough period of time can eventually coalesce into enduring *trait* change—perhaps partially through changes to the epigenome (also see Burke, 2006; Magidson, Roberts, Collado-Rodriguez, & Lejuez, 2012).

Several recent empirical studies have supported this line of reasoning. For example, in one intensive longitudinal experiment, participants who were trained to create small, weekly goals focused on changing their state-level thoughts, feelings, and behaviors experienced much greater growth in their personality traits over the course of four months, as compared with their peers who did not generate weekly goals (Hudson & Fraley, 2015). A different large-scale study found that trait-level changes in self-esteem were mediated by state-level changes (Hutteman, Nestler, Wagner, Egloff, & Back, 2015). In sum, interpersonal experiences that consistently evoke certain state-level patterns of thoughts, feelings, and behaviors may eventually educe corresponding trait changes.

Expanding upon these ideas, several theorists have argued that, among all the different types of interpersonal experiences that individuals can accrue, *social roles* should be particularly powerful in shaping people's personality traits (Lodi-Smith & Roberts, 2007; Roberts & Wood, 2006). Specifically, the neo-socioanalytic model suggests that individuals' social reputations and self-identities influence their patterns of thoughts, feelings, and behaviors—and eventually traits—over time. Thus, if individuals deeply commit to their workplace, for example, shifts to their identity (e.g., "I am a deeply invested employee") may complement situational presses to behave conscientiously, producing more prolific changes to their personality traits over time. Aligning with this prediction, Hudson et al. (2012) found that the individuals who most invested in their careers over a period of three years were the ones who experienced the greatest positive growth in conscientiousness over that same period of time. The primary goal of the present research was to directly replicate this finding, which would bolster the claim that deeply investing in one's workplace can facilitate changes to one's level of conscientiousness over time.

1.2. Is the social investment process moderated by age?

One question that has not been thoroughly resolved in the personality development literature is whether personality traits lose plasticity with age, or whether they remain malleable and responsive to the environment throughout the life course. On the one hand, several studies have found that younger individuals are more changed by their environments than are older persons (e.g., Cornelis et al., 2009). For example, Elder (1979) found that younger children were more likely to suffer negative consequences from the Great Depression, as compared with their older siblings. In contrast, several studies have shown that environmental factors continue to predict personality trait changes into middle-age (e.g., Branje, van Lieshout, & Gerris, 2007; van Aken, Denissen, Branje, Dubas, & Goossens, 2006) or even old-age (e.g., Jackson et al., 2012). Of course, it is possible that both perspectives may be correct—albeit in different circumstances. For example, normative changes in certain traits, such as extraversion or emotional stability, tend to level off with age, whereas other traits, such as conscientiousness, appear to continue to normatively increase across the lifespan (Roberts & Mroczek, 2008). Therefore, it may be the case that certain traits (e.g., emotional stability) are most malleable during young adulthood, whereas other traits (e.g., conscientiousness) retain their plasticity into old age.

Specifically examining the associations between conscientiousness and social investment in work, Hudson et al. (2012) split their sample into half based on age—above and below 40 years old—and found that the associations between changes in social investment in work and changes in conscientiousness did not differ across age groups. In the present manuscript, we sought to improve upon these analyses by examining whether age—when treated as a continuous variable (see Cohen, 1983)—might moderate the associations between social investment in work and changes in conscientiousness. Moreover, given that age frequently has curvilinear associations with trait development (e.g., Roberts & Mroczek, 2008), we examined whether age might moderate the links between social investment in work and trait-change in a nonlinear fashion.

1.3. Review of Hudson et al.'s (2012) findings

In the present research, our primary aim was to closely replicate Hudson et al.'s (2012) findings and improve upon their analyses in several ways. Therefore, it will be fruitful to briefly overview their previous findings. Hudson and colleagues measured participants' big five personality traits and social investment in work twice over the course of three years. They used latent change structural equation models to examine the extent to which *intercepts* (i.e., initial levels) and *slopes* (i.e., changes from Time 1 to Time 2) in social investment in work and personality traits covaried with one another.

Hudson and colleagues operationalized social investment in work as a conglomerate of several existing workplace measures. Specifically, they reasoned that a deeply invested employee would (1) be *involved* in his/her job (Kanungo, 1982), (2) perform *prosocial behaviors* at work (Smith, Organ, & Near, 1983), (3) avoid *anti-social behaviors* (Bennett & Robinson, 2000), and (4) express deep psychological *investment* in/commitment to his/her work (Lodi-Smith & Roberts, 2007). Replicating previous research (e.g., Judge, Heller, & Mount, 2002; Judge, Higgins, Thoresen, & Barrick, 1999; Roberts, Caspi, & Moffitt, 2003) they found that, of all the big five personality traits, *levels* (i.e., intercepts) of conscientiousness were most strongly related to levels of each social investment variable. There were, however, smaller correlations between levels of each big five trait and most of the workplace variables (e.g., more agreeable individuals tended to perform fewer counterproductive workplace behaviors).

Examining longitudinal *changes* (i.e., slopes) over time, Hudson and colleagues found that changes in each of the social investment in work variables predicted simultaneously co-occurring *changes* in conscientiousness. Otherwise, changes in social investment in work were generally unrelated to changes in any of the other big five personality traits. Stated differently, although *levels* all of the big five personality traits tended to be correlated with social investment in work (e.g., extraverted individuals tended to perform greater numbers of organizational citizenship behaviors), *increasing* social investment at work predicted *changes* in only conscientiousness (e.g., individuals who performed fewer counterproductive workplace behaviors over time—indicating *increased* investment at work—tended to experience gains in conscientiousness).

Finally, Hudson and colleagues divided their sample in half based on age—above and below 40 years old—and examined the extent to which the *correlated changes* in social investment at work and personality traits were invariant across the two groups. They found no statistically significant differences in the correlated changes across age groups, suggesting that changes in social investment in work predict concurrent changes in conscientiousness across the entire lifespan.

1.4. Overview of the present study

The present research was designed to be as close to a direct replication of Hudson et al.'s (2012) original study as possible—albeit with a much larger sample size and improved statistical analyses. With the exception of dropping one measure that was included in the original study (organizational citizenship behaviors), the methods were nearly identical. Similar to Hudson et al.'s (2012) study, the current research was a two-wave longitudinal study spanning three years. At each time point, participants provided self-report ratings of their personality traits and social investment at work. We used latent change models to examine the extent to which intercepts and slopes in social investment in work and personality traits were correlated with one another.

Moreover, we examined whether these correlations were moderated by age in a linear and/or curvilinear fashion.

We expected to directly replicate Hudson et al.'s (2012) findings. Specifically, we expected: (1) positive correlations between *levels* of each of the big five personality traits and most (positively keyed) social investment variables;[1] (2) positive correlations between *changes* in social investment at work and *changes* in conscientiousness; and (3) that these associations would not be moderated by age in a linear or curvilinear fashion.

2. Method

2.1. Preregistration

This project, including our purpose, sample, included variables, and planned analyses was preregistered on Open Science Framework (https://osf.io/hyejn/). The relevant, pre-parceled variables from our dataset, and a sample AMOS version 23.00 structural equation model file are also provided on Open Science Framework.

2.2. Participants

Our sample was recruited by Knowledge Networks. An overall Time 1 sample size of 2000 was originally targeted to obtain a representative sample of 1200 individuals who would be willing to provide tissue samples for DNA (for an unrelated project). Participants were compensated for each survey completed in credits from Knowledge Networks, roughly equivalent to $20 USD.

The first wave of surveys was conducted in December 2009. A total of 2136 participants provided Time 1 data. This sample was roughly balanced in terms of men (49%) and women, and ages at Time 1 ranged from 18 to 101 ($M = 50.96$, $SD = 17.08$, *median* = 52). The racial composition of the sample was 79% White, 10% Black, 5% Hispanic, 3% Native American, and 2% Asian. Forty percent ($n = 856$) of the sample was employed full-time, and an additional 14% of the sample ($n = 287$) was employed part-time. On average, participants had worked within their current occupation for 11.76 years ($SD = 11.03$). Twenty-eight percent of the sample ($n = 601$) was retired.

The second wave of data was collected three years later, in December 2012 through February 2013. Of the participants who provided Time 1 data, 1107 (52%) also provided usable data at Time 2. Attrition analyses revealed that numerous demographic and personality variables were related to participants' likelihood of providing data during the second wave. Individuals who were young ($r = -.04$, 95% confidence interval [CI] [$-.09, -.00$]), White ($r = .09$, 95% CI [.05,.13]), employed full-time ($r = .05$, 95% CI [.01,.10]), and not retired ($r = -.05$, 95% CI [$-.09, -.01$]) were more likely to provide Time 2 data. In terms of personality, people tended to provide an additional wave of data if they were lower in extraversion ($r = -.06$, 95% CI [$-.10, -.02$]), more conscientious ($r = .06$, 95% CI [.02,.10]), and higher in openness to experience ($r = .08$, 95% CI [.04,.12]). Finally, those who were more involved ($r = -.08$, 95% CI [$-.13, -.02$]) or invested ($r = -.07$, 95% CI [$-.13, -.01$]) in their jobs were *less* likely to provide data at Time 2. No other study variables, as measured at Time 1, were related to participation in the second data wave. In sum, although numerous variables were related to participants' likelihood of providing Time 2 data, the associations were all relatively small in size (all $|r|s \leqslant .09$), and the distributions of the study variables at Time 2 did not raise cause for concern.

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[1] Thus, we would expect a *negative* correlation between each big five personality trait and counterproductive workplace behaviors.

2.3. Measures

2.3.1. Personality traits

Participants provided self-report ratings of their personality traits using an abbreviated version of the Abridged Big Five-Dimensional Circumplex (AB5C; Goldberg, 1999). Each item in AB5C is a self-description, rated on a scale ranging from *very inaccurate* (1) to *very accurate* (5). For each of the big five personality dimensions, the AB5C contains one unidimensional facet scale (e.g., the *gregariousness* facet taps only extraversion), and eight facets that represent areas of overlap between two dimensions (e.g., the *friendliness* facet taps both extraversion and agreeableness).

For maximum fidelity, we measured conscientiousness (e.g., "I am always prepared") as an aggregate of all nine of its facets (cautiousness, conscientiousness, dutifulness, efficiency, perfectionism, purposefulness, orderliness, organization, and rationality)—a total of 106 items. Items were averaged to form composites for each facet. Subsequently, in our structural equational models (SEMs), conscientiousness was operationalized as a latent variable composed of the common variance across its facets.

As a robustness check, we also replicated all analyses involving conscientiousness using the Chernyshenko Conscientiousness Scale (CCS; Chernyshenko, 2002; Hill & Roberts, 2011). The CCS contains a total of 60 items that measure six facets of conscientiousness (industriousness, order, responsibility, self-control, traditionalism, and virtue). As with the AB5C measure of conscientiousness, items were averaged to form facet composites, and conscientiousness was operationalized in our SEMs as a latent variable capturing the common variance across the six facets.

To reduce the overall length of the survey, extraversion (e.g., "I talk to a lot of different people at parties"), agreeableness (e.g., "I sympathize with others' feelings"), emotional stability (the opposite of neuroticism; e.g., "I am not easily bothered by things"), and openness to experience (e.g., "I enjoy thinking about things") were measured using their 10- or 11-item univariate AB5C facet scales: gregariousness, understanding, stability, and intellect, respectively. In our SEMs, extraversion, agreeableness, stability, and openness were operationalized as latent factors capturing the shared variance across the respective items.

2.3.2. Job involvement

Participants who were employed at least part-time (Time-1 *n* = 1143)[2] rated the extent to which their jobs are an integral part of their lives using 10 items (e.g., "I am very much involved personally in my job;" Kanungo, 1982). All items were rated on a scale ranging from *disagree strongly* (1) to *agree strongly* (5). In our SEMs, job involvement was operationalized as a latent factor capturing the shared variance across the 10 items.

2.3.3. Job investment

Part- or full-time employed individuals (Time-1 *n* = 1143; see footnote 2) used 11 items to rate their social and emotional investment in their jobs (e.g., "I feel a strong sense of obligation toward my work;" "I have put a great deal into my current job that I would lose if I were to change jobs"). All items were rated on a scale ranging from *disagree strongly* (1) to *agree strongly* (5). In our SEMs, job investment was operationalized as a latent factor composed of the common variance in the 11 items. The job investment items were originally adapted from a measure of family investment (see Lodi-Smith & Roberts, 2012).

2.3.4. Counterproductive workplace behaviors

All participants, irrespective of employment status, completed a 28-item self-report measure of counter-productive workplace behaviors (CWB; Bennett & Robinson, 2000). Participants were instructed to rate the frequency with which they performed behaviors such as "Made fun of someone at work," or "Worked on a personal matter instead of work for your employer" on a scale running from *never* (1) to *sometimes* (3) to *very often* (5). In our SEMs, CWB was operationalized as a latent variable capturing the shared variance across the 28 items.

2.3.5. Social investment in work

In addition to the separate analyses of job involvement, job investment, and CWB, we also created an overall index of participants' social investment in work. This was accomplished by averaging together items as appropriate to form three separate composites for job involvement (Time-1 α = .75), job investment (Time-1 α = .83), and CWB (Time-1 α = .95). In models examining the links between overall social investment in work and personality trait development, overall social investment in work was operationalized as a latent factor capturing the common variance in the job involvement, job investment, and CWB composite variables. For clarity, we always refer to this overall composite as *social investment in work*, as opposed to the *job investment* scale, which is one of its components.

Notably, Hudson et al. (2012) also examined organizational citizenship behaviors (OCB). Unfortunately, measures of OCB were not available in the current dataset. This is the only difference in the measures between the two studies.

3. Results

3.1. Analysis strategy

We analyzed our data using latent change structural equation models (SEMs). As can be seen in Fig. 1, each personality and social investment variable at each time point was operationalized as a latent variable, capturing the shared variance across its scale items.[3] To simplify the models and stabilize estimates, we created three parcels for each scale by averaging a third of the scale items together to form each parcel.[4] By using latent variables, we were able to estimate the latent associations among social investment at work and personality traits, modeling and controlling for measurement error (McArdle, 1980).

Higher-order latent variables were used to capture the intercept (i.e., shared variance between Time 1 and Time 2) and slope (i.e., unique variance at Time 2 that was not shared with Time 1) for each personality and social investment variable. Our primary analyses examined the correlations among these intercept and slope variables. As a point of clarification, throughout this manuscript, we use the terms "intercept" and "level" interchangeably; we also treat the terms "changes," "growth," and "slopes" as perfect synonyms.

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[2] Nevertheless, data from *all* participants were included in all structural equation models. Our analyses used full-information maximum likelihood estimation (FIML), which produces less biased parameter estimates than list-wise deletion procedures (Wothke, 2000).

[3] The overall social investment in work composite was operationalized as a latent variable capturing the shared variance in the job involvement, job investment, and CWB composites. That is, the items in the job involvement, job investment, and CWB scales were averaged together to form separate scale composite variables. These three scale composites were treated as parcels and allowed to load on a single latent factor.

[4] Parcel composition was determined by principle axis factoring each scale. The three items with the highest communalities were assigned to separate parcels; the items with the fourth- through sixth-highest communalities were assigned to separate parcels; and so on. For example, for a nine-item scale, the first parcel would be composed of the items with the first-, fourth-, and seventh-highest communalities; the second parcel would contain the items with the second-, fifth, and eighth-highest communalities; and the final parcel would be constructed by averaging together the items with the third-, sixth-, and ninth-highest communalities.
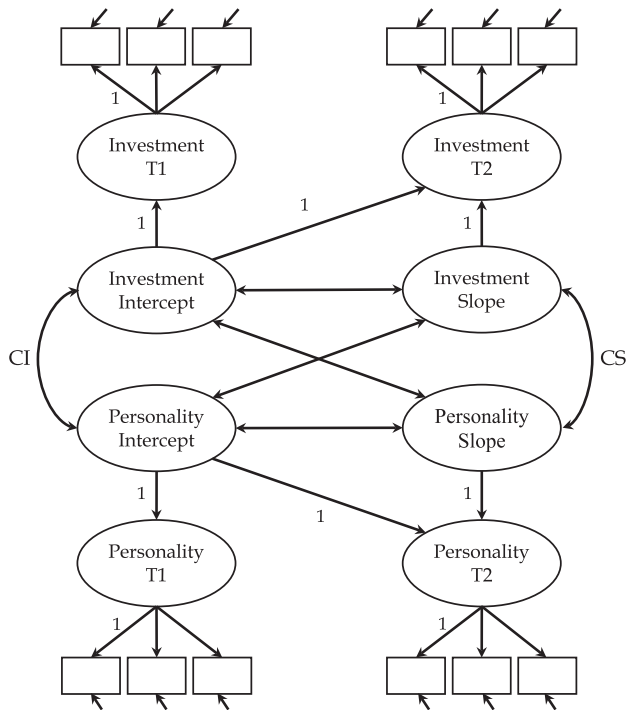
Fig. 1. Latent change structural equation model. Path *CI* represents the correlated intercepts between personality traits and social investment. Path *CS* captures the correlated slopes in personality traits and social investment.

In all of our SEM analyses, we used full-information maximum likelihood (FIML) estimation, which uses all available data, consequently producing less biased parameter estimates, as compared with list-wise deletion or imputation procedures (Hox, 2000; Wothke, 2000).

3.2. Associations between social investment at work and personality traits

The descriptive statistics and intercorrelations for all study variables at Time 1 are presented in Table 1. For our first series of analyses, we examined the extent to which the latent intercepts and slopes for social investment in work and personality traits correlated with one another.

3.2.1. Correlated intercepts

Table 2 contains the estimates of the latent correlation between the *intercepts* for personality traits and social investment in work (i.e., the *CI* path in Fig. 1). Conceptually and empirically, these estimates are extremely similar to the Time-1 correlations between these variables (see Table 1), albeit sans measurement error. Levels of our overall social investment in work composite (i.e., the latent variable capturing shared variance in job involvement, job investment, and CWB) were related to levels of agreeableness ($r = .24$, 95% CI [.16,.31]),[5] conscientiousness ($r s = .30, .44$; 95% CIs [.23,.37], [.36,.53]), and emotional stability ($r = .14$, 95% CI [.07,.21]), but not levels of extraversion ($r = .07$, 95% CI [−.01,.14]) or openness to experience ($r = .05$, 95% CI [−.02,.11]). Thus, the only difference between the present findings and those of Hudson et al.

(2012) is that, in their sample, levels of overall social investment were statistically significantly associated with extraversion ($r = .14$), whereas in our present sample, this association was not statistically significant from zero ($r = .07$, 95% CI [−.01,.14]) (although it was also not statistically significantly different from Hudson and colleagues' parameter estimate).

Follow-up analyses examining the individual social investment variables separately revealed that levels of job involvement were generally uncorrelated with levels of any of the big five personality dimensions, except conscientiousness ($r s = .11$, 95% CIs [.04,.17], [.05,.18]). In contrast, intercepts for job *investment* were positively correlated with levels of all of the big five personality dimensions, parameter estimates ranged from $r = .10$, 95% CI [.03,.17] (extraversion) to $r = .42$, 95% CI [.35,.49] (CCS conscientiousness). Finally, levels of CWB were negatively associated with agreeableness ($r = −.29$, 95% CI [−.33, −.24]), conscientiousness ($r s = −.33, −.45$; 95% CIs [−.37,−.28], [−.50,−.40]), and emotional stability ($r = −.21$, 95% CI [−.26,−.17]), but not extraversion ($r = .03$, 95% CI [−.02,.08]) or openness to experience ($r = −.01$, 95% CI [−.06,.04]). This pattern of results is remarkably consistent with Hudson et al.'s (2012) previous findings. Indeed, although Hudson and colleagues lacked sufficient statistical power to detect the correlations between levels of job involvement and conscientiousness, and the associations between levels of job investment and emotional stability and openness, our estimates of these correlations did not statistically significantly differ from theirs (see Table 2).

3.2.2. Correlated slopes

Table 3 contains the estimates of the latent correlation between *changes* in social investment in work and concurrent *changes* in personality traits (i.e., the *CS* path in Fig. 1). These coefficients capture the extent to which increases in social investment at work predict simultaneously co-occurring increases in personality traits. Notably, our models indicated that there were, on average, no changes in openness to experience over time (slope $M = −0.03$, 95% CI [−0.06, 0.01])—and more importantly, there was no variance in the extent to which participants changed in openness over the course of the study (slope $SD = 0.00$, 95% CI [0.00, 0.14]). Consequently, we were unable to examine the associations between changes in work investment and slope in openness over time (because there was no variance in slope in openness to predict). There was, however, significant variance in slopes for extraversion (slope $M = −0.07$, 95% CI [−0.11, −0.03]; slope $SD = 0.24$), agreeableness (slope $M = 0.00$, 95% CI [−0.03, 0.03]; slope $SD = 0.37$), conscientiousness (slope $M = 0.02$, 95% CI [0.01, 0.04]; slope $SD = 0.13$), and emotional stability (slope $M = 0.04$, 95% CI [0.004, 0.08]; slope $SD = 0.35$).

Directly replicating Hudson et al.'s (2012) previous findings, the slope of our overall social investment composite was associated with changes in conscientiousness—as measured via both the AB5C ($r = .28$, 95% CI [.17,.40]) and the CCS ($r = .40$, 95% CI [.22,.59]). Moreover, the slope of overall social investment was also related to changes in agreeableness over time, $r = .14$, 95% CI [.04,.26]. Notably, although Hudson and colleagues lacked the statistical power to detect this association, our parameter estimate ($r = .14$) was nearly identical to theirs ($r = .15$). Changes in our overall social investment composite were unrelated to slopes for extraversion ($r = −.01$, 95% CI [−.25,.23]) or emotional stability ($r = .09$, 95% CI [−.08,.25]). In terms of effect sizes, as compared with the average effect typically found in personality psychology ($r \sim .21$; Richard, Bond, & Stokes-Zoota, 2003), the associations between changes in social investment in work and changes in conscientiousness were moderate to slightly-above-average. In contrast, the associations between changes in social investment in work and changes in agreeableness were relatively small.

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[5] We used AMOS 23 for all SEM analyses. Standard formulas were used to compute 95% confidence intervals ($cov \pm 1.96 s_{cov}$) and standardize them ($cov_{XY}/s_X s_Y$).

Table 1
Descriptive statistics and intercorrelations at Time 1.

Variable	M	SD	Correlations												
			1	2	3	4	5	6	7	8	9	10	11	12	13
Demographics															
1. Age	50.96	17.08	–												
2. Female	0.51	0.50	.00	–											
3. Employed	0.54	0.50	–.40	–.08	–										
4. Retired	0.28	0.45	.65	.01	–.67	–									
Personality															
5. Extraversion	2.84	0.73	–.05	.04	.06	–.03	–								
6. Agreeableness	4.10	0.58	.16	.23	.01	.08	.14	–							
7. AB5C Conscientiousness	3.77	0.46	.14	.00	.10	.04	.08	.44	–						
8. CCS Conscientiousness	3.05	0.35	.25	.12	–.02	.13	.04	.52	.75	–					
9. Stability	3.32	0.73	.09	–.11	.10	.03	.12	.26	.36	.31	–				
10. Openness	3.58	0.60	–.12	–.02	.16	–.13	.19	.35	.28	.20	.22	–			
Work															
11. Job Involvement[a]	2.89	0.56	.05	–.04	–	–	.03	–.01	.11	.11	.00	–.03	–		
12. Job Investment[a]	3.48	0.64	.11	.04	–	–	.08	.20	.26	.33	.09	.06	.60	–	
13. CWB	1.54	0.50	–.18	–.13	.12	–.11	.03	–.26	–.29	–.41	–.20	–.01	.03	–.13	–

Note. CWB = counterproductive work behaviors.

[a] These variables were measured only for those who were employed (*n* = 1143); thus no correlation can be computed between them and employment/retirement status.

Table 2
SEM estimated correlations between personality trait intercepts and social investment intercepts.

Trait intercepts	Social investment intercepts															
	Social investment				Job involvement				Job investment				CWB			
		95% CI				95% CI				95% CI				95% CI		
	r	LB	UB	HRL	r	LB	UB	HRL	r	LB	UB	HRL	r	LB	UB	HRL
Extraversion	.07	–.01	.14	**.14**	.02	–.04	.09	–.01	**.10**	.03	.17	**.17**	.03	–.02	.08	.02
Agreeableness	**.24**	.16	.31	**.14**	–.04	–.11	.03	–.11	**.26**	.19	.33	**.15**	**–.29**	–.33	–.24	**–.29**
Conscientiousness	**.30**	.23	.37	**.23**	**.11**	.04	.17	.09	**.28**	.22	.35	**.26**	**–.33**	–.37	–.28	**–.43**
CCS	**.44**	.36	.53	–	**.11**	.05	.18	–	**.42**	.35	.49	–	**–.45**	–.50	–.40	–
Stability	**.14**	.07	.21	**.13**	–.01	–.07	.06	–.01	**.14**	.06	.21	.08	**–.21**	–.26	–.17	**–.35**
Openness	.05	–.02	.11	.08	–.04	–.11	.03	–.10	**.11**	.04	.18	.04	–.01	–.06	.04	.10

Note. Conscientiousness = AB5C Conscientiousness; CCS = Chernyshenko Conscientiousness; CWB = counterproductive workplace behaviors; *HRL* = effect estimate from Hudson et al. (2012); CI = confidence interval; LB = lower bound; UB = upper bound. Ninety-five percent CIs for parameter estimates in **boldface** are fully directional.

Table 3
SEM estimated correlations between social investment slopes and personality trait slopes.

Trait slopes	Social investment slopes															
	Social investment				Job involvement				Job investment				CWB			
		95% CI				95% CI				95% CI				95% CI		
	r	LB	UB	HRL	r	LB	UB	HRL	r	LB	UB	HRL	r	LB	UB	HRL
Extraversion	–.01	–.25	.23	.06	.03	–.18	.22	.01	.01	–.20	.22	.06	**–.13**	–.26	–.00	–.09
Agreeableness	**.14**	.04	.26	.15	.00	–.13	.13	.01	**.18**	.05	.30	.25	**–.12**	–.21	–.04	–.08
Conscientiousness	**.28**	.17	.40	**.19**	**.15**	.04	.26	.11	**.24**	.13	.35	**.27**	**–.25**	–.31	–.18	**–.35**
CCS	**.40**	.22	.59	–	**.19**	.03	.36	–	**.40**	.24	.57	–	**–.26**	–.35	–.16	–
Stability	.09	–.08	.25	.00	.05	–.09	.19	–.05	.09	–.05	.24	.03	**–.10**	–.19	–.01	–.11
Openness[a]	–	–	–	.24	–	–	–	.32	–	–	–	.16	–	–	–	–.25

Note. Conscientiousness = AB5C Conscientiousness; CCS = Chernyshenko Conscientiousness; CWB = counterproductive workplace behaviors; *HRL* = effect estimate from Hudson et al. (2012); CI = confidence interval; LB = lower bound; UB = upper bound. Ninety-five percent CIs for parameter estimates in **boldface** are fully directional.

[a] The estimated variance in openness slope was 0.00.

Fig. 2 illustrates the model-predicted associations between changes in overall social investment in work and slope of CCS conscientiousness.[6] On average, participants in our sample did not

[6] Fig. 2 was created by transforming the correlation between *social investment slope* and *personality slope* into a regression path, and allowing the social investment and personality intercept variables to correlate with the error term for personality slope. This trivial modification to the model did not change the association between slope in overall social investment and slope in CCS conscientiousness (*b* = .17, *β* = 0.40; compare to *r* = .40), but allowed us to mathematically compute the model-predicted slope in conscientiousness as a function of changes in overall social investment at work.

change in overall social investment in work over time (*social investment slope M* = 0.02, 95% CI [–0.03, 0.07]; *social investment slope SD* = 0.31). Nevertheless, these average participants were predicted to increase 0.02 original scale units (i.e., on a scale from 1 to 5; 95% CI [0.01, 0.04]; *d* = 0.08) in CCS conscientiousness over the course of three years. This normative level of growth is similar to meta-analytic estimates which suggest that, on average, people increase approximately 0.12 *SD*s in conscientiousness over a period of 6–10 years (which crudely suggests 0.04–0.06 *SD*s per 3 years; Roberts et al., 2006). In contrast, individuals who experienced large positive changes in social investment in work (1 *SD* above the mean;
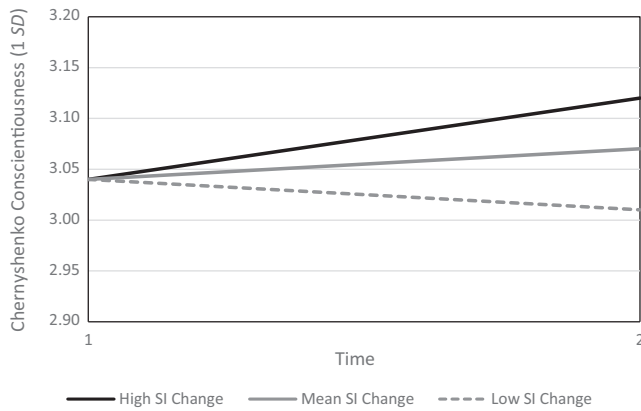
Fig. 2. Model-predicted slope in Chernyshenko Conscientiousness as a function of changes in overall social investment (SI). Mean Change in SI was 0.02 units (SD = 0.31). High SI Change was plotted at 1 SD above the mean (SI Change = 0.33) and Low SI Change was plotted at 1 SD below the mean (SI Change = −0.29). All trajectories were plotted starting at the model-predicted mean latent intercept of conscientiousness (M = 3.04).

social investment slope = 0.33) were predicted to increase 0.08 units (d = 0.26) in conscientiousness over time—which is more than triple the amount of growth experienced by the average participant in our study. Finally, participants who *de*-invested in work (those 1 SD below the mean; social investment slope = −0.29) were predicted to *decrease* 0.03 scale units (d = −0.08) in conscientiousness over three years.

Follow-up analyses examining the individual social investment variables separately revealed that changes in job involvement and job investment were positively associated with changes in conscientiousness (estimates ranged from r = .15, 95% CI [.04,.26] to r = .40, 95% CI [.22,.59]) and growth in CWB was associated with relative *declines* in conscientiousness (rs = −.25, −.26; 95% CIs [−.31,−.18], [−.35,−.16]). Similarly, slope in agreeableness varied as a function of changes in job investment (r = .18, 95% CI [.05,.30]) and CWB (r = −.12, 95% CI [−.21,−.04]). Finally, changes in CWB were also negatively associated with changes in extraversion (r = −.13, 95% CI [−.26,−.00]) and emotional stability (r = −.10, 95% CI [−.19,−.01]).

Collectively, our pattern of results aligns with Hudson et al.'s (2012) findings that changes in social investment predict simultaneous changes in conscientiousness. Moreover, although they lacked statistical power to detect the associations between changes in job investment and growth in agreeableness, as well as the links between changes in CWB and growth in extraversion, agreeableness, and stability, our effect estimates were very similar to theirs. Indeed, *none* of the estimates of the correlated slopes in the present study statistically significantly differed from those found by Hudson et al. (2012). With respect to correlated slopes, the only point of divergence between these two studies is that, in the present study, there was no significant variance in the changes that people experienced in openness over time—whereas Hudson et al.'s (2012) sample *did* vary with respect to change in openness.

3.2.3. Associations between intercepts and slopes

Table 4 contains the latent correlations between social investment *intercepts* and subsequent personality trait *slopes*. These parameters capture the extent to which *levels* of social investment at Time 1 predict *subsequent* changes in personality traits. Initial levels (i.e., the intercepts) of our overall social investment composite as well as each of the individual social investment variables predicted subsequent declines in conscientiousness, parameter estimates ranged from r = −.14, 95% CI [−.23,−.05]

(job involvement intercept predicting changes in AB5C conscientiousness) to r = −.31, 95% CI [−.44,−.21] (overall social investment intercept predicting changes in CCS conscientiousness). The only other association found was that levels of job investment predicted declines in agreeableness (r = −.11, 95% CI [−.21,−.00]). Levels of social investment were unrelated to changes in any other trait.

Finally, Table 5 contains the latent correlations between personality trait *intercepts* and subsequent social investment *slopes*. Levels of conscientiousness (as measured via the AB5C) were negatively related to subsequent changes in overall social investment (r = −.12, 95% CI [−.22,−.00]), as well as job involvement (r = −.12, 95% CI [−.22,−.02]) and job investment (r = −.15, 95% CI [−.24,−.06]). Levels of agreeableness were also related to negative changes in job investment (r = −.11, 95% CI [−.21,−.01]). No other personality trait levels predicted subsequent changes in social investment at work.

Collectively, these associations may reflect regression to the mean. Specifically, levels of conscientiousness at Time 1 were generally positively associated with all social investment variables (see Tables 1 and 2).[7] Thus, it may simply be the case, for example, that those with high levels of social investment and the accompanying high levels of conscientiousness at Time 1 were the least likely to experience positive growth in conscientiousness over time. Stated differently, persons *low* in conscientiousness may be the ones who are most likely to experience positive changes over time—perhaps because they have the most "room" to grow. Such a phenomenon would manifest as a negative, albeit coincidental, correlation between *levels* of social investment and *subsequent changes* in conscientiousness (and, at least for job investment, vice versa).

Notably, the robust negative associations between levels of social investment and subsequent changes in conscientiousness (and vice versa) in our data represent the largest divergence from Hudson et al.'s (2012) prior findings. Specifically, their data did not contain any robust or consistent associations between work investment levels and personality slopes (or vice versa).

3.3. Does age moderate correlated changes in social investment and traits?

For our final series of analyses, we examined the extent to which age predicted (1) *levels* of personality traits and social investment in work, (2) *changes* in personality traits and social investment in work, and (3) the *correlation* between changes in social investment in work and changes in personality traits (i.e., the associations in Table 3). We first directly replicated Hudson et al.'s (2012) analyses by splitting the sample into half based on age (younger and older than 40) and examining whether the estimated correlations were invariant across age groups. Subsequently, we improved upon Hudson et al.'s (2012) analyses by treating age as a continuous variable and examining whether it moderated the associations between social investment and personality trait development in a linear or curvilinear fashion.

3.3.1. Replication of Hudson and colleagues' age-group analyses

We began by directly replicating Hudson et al.'s (2012) analyses by dividing our sample into two age groups: young adults (39 or younger; n = 633) and older-adults (40 or older; n = 1503). We subsequently used multiple-groups SEMs to examine whether constraining all of the longitudinal correlations to be equal across the two age groups significantly worsened the fit of the models. Specifically, we constructed *full models*, in which all parameters were free to vary across the age groups. Following Hudson et al.'s

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[7] Conscientiousness was negatively associated with CWB—however, CWB indicates a *lack* of social investment.

Table 4
SEM estimated correlations between social investment intercepts and personality slopes.

Trait slopes	Social investment intercepts															
	Social investment				Job involvement				Job investment				CWB			
		95% CI				95% CI				95% CI				95% CI		
	r	LB	UB	HRL	r	LB	UB	HRL	r	LB	UB	HRL	r	LB	UB	HRL
Extraversion	−.03	−.21	.15	**−.22**	−.03	−.19	.14	−.08	.01	−.16	.18	**−.19**	.05	−.06	.16	.02
Agreeableness	−.10	−.20	.01	**.17**	−.03	−.13	.08	.15	**−.11**	−.21	−.00	**.18**	.03	−.05	.10	.00
Conscientiousness	**−.19**	−.29	−.10	.05	**−.14**	−.23	−.05	.02	**−.15**	−.23	−.06	.03	**.14**	.08	.20	.02
CCS	**−.31**	−.44	−.21	–	**−.16**	−.29	−.03	–	**−.27**	−.42	−.13	–	**.19**	.10	.28	–
Stability	−.07	−.18	.05	−.07	−.06	−.19	.06	.04	−.04	−.15	.08	−.06	.06	−.03	.15	.09
Openness[a]	–	–	–	.06	–	–	–	.04	–	–	–	.10	–	–	–	−.19

Note. Conscientiousness = AB5C Conscientiousness; CCS = Chernyshenko Conscientiousness; CWB = counterproductive workplace behaviors; *HRL* = effect estimate from Hudson et al. (2012); CI = confidence interval; LB = lower bound; UB = upper bound. Ninety-five percent CIs for parameter estimates in **boldface** are fully directional.
  [a] The estimated variance in openness slope was 0.00.

Table 5
SEM estimated correlations between personality intercepts and social investment slopes.

Trait intercepts	Social investment slopes															
	Social investment				Job involvement				Job investment				CWB			
		95% CI				95% CI				95% CI				95% CI		
	r	LB	UB	HRL	r	LB	UB	HRL	r	LB	UB	HRL	r	LB	UB	HRL
Extraversion	−.02	−.13	.10	−.02	.01	−.09	.11	.07	−.04	−.13	.06	−.04	.00	−.06	.06	−.02
Agreeableness	−.02	−.13	.08	**.24**	.05	−.04	.15	.15	**−.11**	−.21	−.01	**.45**	.02	−.04	.08	−.03
Conscientiousness	**−.12**	−.22	−.00	.05	**−.12**	−.22	−.02	.09	**−.15**	−.24	−.06	**.23**	.05	−.01	.11	.08
CCS	−.10	−.22	.02	–	−.05	−.15	.04	–	**−.21**	−.30	−.12	–	.05	.00	.11	–
Stability	−.06	−.17	.06	.05	−.01	−.11	.09	.08	−.09	−.19	.01	.15	.03	−.03	.09	.02
Openness	−.02	−.14	.10	.12	−.02	−.12	.08	.08	−.06	−.15	.05	.17	−.03	−.09	.03	−.07

Note. Conscientiousness = AB5C Conscientiousness; CCS = Chernyshenko Conscientiousness; CWB = counterproductive workplace behaviors; *HRL* = effect estimate from Hudson et al. (2012); CI = confidence interval; LB = lower bound; UB = upper bound. Ninety-five percent CIs for parameter estimates in **boldface** are fully directional.

(2012) statistical methods, the fit of these full models was compared to that of *restricted models*, in which the following parameters were constrained to be equal across age groups: (1) the correlation between social investment intercept and personality slope, (2) the correlation between personality intercept and social investment slope, and (3) the correlation between personality slope and social investment slope. To the extent that the full models fit the data better than the restricted models, this would suggest that the longitudinal associations in our data differed between young adults and older adults.

For all of the personality dimensions except agreeableness, constraining the three longitudinal parameters in our models to be equal across age groups did not statistically significantly worsen the model fits, all $\chi^2(3)s \leqslant 6.33$, $ps \geqslant .10$. This suggests that there were no differences in the longitudinal associations among social investment in work and personality traits for younger individuals as opposed to older people. In contrast, for agreeableness, constraining the three longitudinal correlations to be equal across age groups did, in fact, statistically significantly worsen the fit of the model, $\chi^2(3) = 33.08$, $p < .01$. Follow-up analyses revealed that this effect was driven by constraining the correlation between social investment intercept and agreeableness slope (and vice versa) to be equal, $\chi^2(2) = 30.68$, $p < .01$. Constraining only the correlated change in social investment at work and agreeableness to be equal across age groups did not significantly worsen the fit of the model, $\chi^2(1) = 0.68$, $p = .41$.

Unfortunately, when the correlation between social investment intercept and agreeableness slope (or vice versa) was constrained to be equal across age groups, the model did not fully converge for the older age group. As a result, we were unable to examine parameter estimates for the older age group and determine whether the correlation between social investment intercept and agreeableness slope (and vice versa) was smaller or larger among

older individuals, as compared with younger people. Notably, Hudson et al. (2012) also found that constraining the intercept-slope associations for social investment at work and agreeableness to be equal across age groups worsed the model fit. In their data, this occurred because the intercept-slope associations were larger for younger individuals, as opposed to older ones.

3.3.2. Continuous age moderation analyses

For our last series of analyses, we sought to improve upon the age-group analyses by examining whether age, when treated as a continuous variable, might moderate the associations among the social investment at work and personality trait variables. Treating age as a continuous variable—as opposed to a two-level group—afforded several major benefits, including increasing our statistical power (see Cohen, 1983) and enabling us to examine curvilinear moderation effects. Because we wished to test up to cubic associations with age, and due to the complexity of modeling linear-, quadratic-, and cubic-latent interaction terms within an SEM framework, we opted to simplify our analyses by (1) imputing latent intercept and slope scores for all personality trait and social investment variables for all participants, and (2) using ordinary least-squares regression (OLS) to examine the extent to which these imputed intercepts and slopes varied as a function of age. We used Bayesian imputation because, of the options available in AMOS 23, the correlations between the resultant Bayesian-imputed intercept and slope scores were most similar to the latent correlation estimates computed by our SEMs (in Tables 2–5).

First, we examined the extent to which age predicted intercepts and slopes for each personality trait and social investment variable. As can be seen in Table 6, older individuals tended to have higher levels of agreeableness (linear $\beta = 0.20$, 95% CI [0.12, 0.29]), conscientiousness (linear $\beta s = .21$, .22; 95% CIs [0.12, 0.29], [0.14, 0.30]), emotional stability (linear $\beta = 0.21$, 95% CI [0.12, 0.29]), overall

Table 6
Associations between age and imputed personality and social investment intercepts and slopes.

Outcome	Predictors								
	Age			Age^2			Age^3		
		95% CI			95% CI			95% CI	
	β	LB	UB	β	LB	UB	β	LB	UB
Personality intercepts									
Extraversion	.02	−.06	.10	.01	−.07	.10	−.09	−.17	.00
Agreeableness	**.20**	.12	.29	**−.05**	−.09	−.01	−.05	−.14	.03
Conscientiousness	**.21**	.12	.29	**−.06**	−.10	−.02	−.04	−.13	.04
CCS	**.22**	.14	.30	**−.05**	−.09	−.01	.01	−.07	.09
Stability	**.21**	.12	.29	.03	−.02	.07	**−.13**	−.21	−.04
Openness	**−.09**	−.17	−.00	**−.05**	−.09	−.01	−.01	−.10	.07
Personality slopes									
Extraversion	.03	−.05	.12	−.01	−.05	.04	−.02	−.11	.06
Agreeableness	−.01	−.09	.08	.02	−.02	.07	−.01	−.10	.07
Conscientiousness	−.07	−.15	.02	.02	−.03	.06	.03	−.06	.11
CCS	−.03	−.11	.05	−.02	−.06	.02	−.03	−.12	.05
Stability	.02	−.06	.11	−.01	−.06	.03	−.01	−.09	.08
Openness[a]	–	–	–	–	–	–	–	–	–
Social investment intercepts									
Social investment	**.09**	.01	.17	−.01	−.05	.04	.07	−.02	.15
Job involvement	.05	−.03	.14	−.01	−.05	.04	.00	−.08	.09
Job investment	**.11**	.02	.20	**−.06**	−.10	−.02	.01	−.07	.10
CWB	**−.24**	−.32	−.15	**−.07**	−.11	−.03	.06	−.02	.15
Social investment slopes									
Social investment	−.07	−.16	.01	−.03	−.07	.02	.00	−.09	.08
Job involvement	.00	−.08	.09	.01	−.03	.06	−.03	−.12	.06
Job investment	−.07	−.16	.01	.03	−.01	−.08	.01	−.08	.09
CWB	.07	−.02	.15	**.09**	.04	.13	−.04	−.12	.05

Note. Conscientiousness = AB5C Conscientiousness; CCS = Chernyshenko Conscientiousness; CWB = counterproductive workplace behaviors; CI = confidence interval; LB = lower bound; UB = upper bound. Ninety-five percent CIs for parameter estimates in **boldface** are fully directional.
[a] The estimated variance in openness slope was 0.00.

social investment at work (linear β = 0.09, 95% CI [0.01, 0.17]), and job investment (linear β = 0.11, 95% CI [0.02, 0.20]). The linear trends were buffered by curvilinear trends for agreeableness (quadratic β = −0.05, 95% CI [−0.09, −0.01]), conscientiousness (quadratic βs = −0.06, −0.05; 95% CIs [−0.10, −0.02], [−0.09, −0.01]), emotional stability (cubic β = −0.13, 95% CI [−0.21, −0.04]), and job investment (quadratic β = −0.06, 95% CI [−0.10, −0.02]) such that the age differences in these traits tended to become less pronounced with age. In contrast, older individuals tended to have *lower* levels of open to experience (linear β = −0.09, 95% CI [−0.17, −0.00], quadratic β = −0.05, 95% CI [−0.09, −0.01]) and they also tended to perform fewer CWBs (linear β = −0.24, 95% CI [−0.32, −0.15]; quadratic β = −0.07, 95% CI [−0.11, −0.03]). Age was unrelated to extraversion or job involvement. As should be expected given the conceptual similarity between the imputed *level* scores and the raw Time-1 scores, these associations were similar in size to the zero-order correlations between age and personality traits and social investment (see Table 1).

Examining *changes* in personality traits and social investment, age was unrelated to the slope of any personality trait or social investment variable. This seems to indicate that, across the lifespan, individuals of all ages experience similar changes in their personality traits over the course of three years. The only exception is that age predicted slope in CWB in a quadratic fashion (linear β = 0.07, 95% CI [−0.02, 0.15]; quadratic β = 0.09, 95% CI [0.04, 0.13]). To the extent that this parameter estimate is accurate (as opposed to an idiosyncrasy due to measurement error)—and given the fact that *levels* of CWB decline with age (linear β = −0.24, 95% CI [−0.32, −0.15])—the association between age and *slope* of CWB indicates that CWB declines most sharply among individuals of approximately the average age in our sample (∼50 years), and that the declines in CWB for younger or older individuals are less steeply negative/more positive.

Finally, we examined the extent to which age might moderate the *correlation* between changes in social investment in work and changes in personality traits (i.e., the associations in Table 3). This was accomplished by regressing the imputed personality slope scores onto (1) the imputed social investment slope scores, (2) linear-, quadratic-, and cubic-age terms, and (3) the linear-, quadratic-, and cubic-interactions between age and the imputed social investment slope scores. All variables were standardized before being entered into the model. The resultant parameter estimates capture (1) the correlation between *changes* in social investment at work and *changes* in personality traits, and (2) the extent to which this correlation is moderated by age (i.e., to extent to which the correlation is different for people of different ages).

As can be seen in Table 7, age did not moderate the correlation between changes in social investment and changes in personality traits. The only exception is that age moderated the correlation between changes in CWB and changes in emotional stability in a quadratic fashion (quadratic β = 0.05, 95% CI [0.00, 0.09]). To the extent that this idiosyncratic parameter estimate is accurate, it would indicate that changes in CWB are most *strongly negatively* related to changes in emotional stability (approximately r = −.18) for averaged-aged persons in our sample (i.e., ∼50-year-olds). For persons younger or older than approximately 50, increases in CWB would be expected to predict relatively smaller decrements in emotional stability. Nevertheless, despite this one exception, age generally did not moderate the association between changes in social investment at work and changes in personality traits. This finding is consistent with the notion that, irrespective of age, people are affected in similar ways by their workplace experiences.

4. Discussion

Hudson et al. (2012) found that *changes* in social investment at work were correlated with simultaneously co-occurring changes in

Table 7
Correlations between imputed personality slopes and social investment slopes, moderated by age.

Correlated slopes	Predictors											
	CS[†]			Age × CS			Age^2 × CS			Age^3 × CS		
		95% CI			95% CI			95% CI			95% CI	
	β	LB	UB	β	LB	UB	β	LB	UB	β	LB	UB
Extraversion												
Social investment	−.01	−.06	.03	.01	−.08	.09	−.05	−.09	.00	.00	−.09	.08
Job involvement	.01	−.04	.05	−.05	−.14	.04	−.01	−.06	.03	.02	−.07	.11
Job investment	.01	−.04	.05	.03	−.06	.12	−.01	−.05	.04	−.03	−.12	.06
CWB	−**.16**	−.20	−.11	.00	−.09	.10	.02	−.03	.06	−.02	−.12	.07
Agreeableness												
Social investment	**.22**	.18	.26	.02	−.07	.11	.02	−.02	.06	−.05	−.14	.04
Job involvement	−.01	−.05	.04	.05	−.04	.14	.00	−.04	.05	−.06	−.16	.03
Job investment	**.20**	.15	.24	−.03	−.11	.06	.02	−.02	.06	−.02	−.11	.07
CWB	−**.09**	−.13	−.04	−.02	−.11	.08	.03	−.02	.08	.03	−.06	.12
AB5C Conscientiousness												
Social investment	**.29**	.25	.33	−.07	−.15	.01	.00	−.04	.05	.02	−.06	.11
Job involvement	**.22**	.18	.26	−.04	−.12	.05	−.04	−.09	.00	.05	−.04	.13
Job investment	**.26**	.22	.30	.01	−.09	.10	.02	−.02	.07	.01	−.08	.11
CWB	−**.27**	−.31	−.23	.02	−.07	.11	.03	−.01	.08	−.01	−.10	.08
CCS Conscientiousness												
Social investment	**.48**	.46	.52	.01	−.06	.09	.01	−.03	.05	−.01	−.09	.06
Job involvement	**.22**	.18	.26	.02	−.06	.11	−.04	−.08	.01	−.02	−.11	.06
Job investment	**.41**	.37	.45	−.05	−.13	.03	.00	−.04	.04	.01	−.07	.10
CWB	−**.28**	−.32	−.23	−.02	−.11	.07	−.01	−.05	.04	.03	−.06	.12
Stability												
Social investment	**.09**	.05	.13	.06	−.03	.15	.00	−.04	.05	−.03	−.13	.06
Job involvement	**.13**	.09	.17	−.03	−.12	.06	.07	.03	.12	.01	−.08	.10
Job investment	**.08**	.03	.12	.02	−.07	.10	−.01	−.05	.04	−.02	−.11	.06
CWB	−**.18**	−.22	−.13	.03	−.06	.12	**.05**	.00	.09	−.02	−.12	.07

Note. CS = correlated slopes; CWB = counterproductive workplace behaviors; CI = confidence interval; LB = lower bound; UB = upper bound. Ninety-five percent CIs for parameter estimates in **boldface** are fully directional. All variables were standardized before being entered into the model. Openness was not included because the estimated variance in its slope was 0.00.
[†] This represents the *simple association* between personality slope and investment slope at the average age in the sample, 51 years.

conscientiousness—and that the magnitude of this correlated change was invariant across age groups. The purpose of the present study was to closely replicate their findings with a larger sample, and also to improve upon their statistical analyses in several ways. To that end, our results revealed that Hudson et al.'s (2012) key findings are robust. In the present sample, changes in social investment at work were positively correlated with changes in conscientiousness: the people who most increased their commitment to their jobs were the ones who experienced the largest increases in conscientiousness over time. Moreover, this association was not moderated by age in a linear or curvilinear fashion. We elaborate upon these findings and their implications in greater depth below.

4.1. Associations between social investment at work and personality trait development

We used latent growth structural equation models to examine the extent to which levels/intercepts and changes/slopes for social investment in work and personality traits were associated with one another. On a cross-sectional level, our results indicated that levels of each of the big five personality traits were related to levels of job investment. Moreover, agreeableness, conscientiousness, and emotional stability were predictive of counterproductive workplace behaviors. Replicating previous research (e.g., Judge et al., 1999, 2002), these associations were strongest for conscientiousness.

In contrast, on a longitudinal level, *changes* in social investment at work were generally predictive of changes in only conscientiousness and agreeableness. For instance, people who tended to increase in social investment at work (i.e., perform fewer

counterproductive behaviors, and express greater involvement and investment in their careers) tended to experience more than triple the amount of growth in conscientiousness over a period of three years, as compared with their peers who did not increase in social investment in work over time.

With respect to correlated changes between social investment at work and agreeableness, Hudson et al.'s (2012) previous study appears to have lacked sufficient statistical power to detect these associations. Indeed, the point-estimates of the correlated change between social investment in work and agreeableness were nearly identical across the present study and Hudson and colleagues' previous study. However, the fact that our employed sample was nearly three times larger than theirs allowed us to more reliably detect this effect. Thus, taken together, these two studies seem to suggest that people who become increasingly invested in their work not only experience gains in conscientiousness—they also tend to increase in agreeableness over time. These findings may reflect that workplaces—and adopting an identity as a deeply invested employee—serve as consistent presses to behave not only conscientiously, but also in a prosocial, agreeable manner.

Finally, we found that initial levels of conscientiousness predicted subsequent declines in social investment at work. The reverse was also true: higher initial levels of social investment at work were associated with subsequent declines in conscientiousness. Notably, these associations between personality intercepts and social investment slopes (and vice versa) were the largest area of divergence between the present study and that of Hudson et al. (2012). Specifically, Hudson et al. (2012) found little evidence of any robust links between initial levels of personality traits and subsequent changes in social investment at work (or vice versa).

Consequently, the negative associations between levels of conscientiousness and changes in social investment at work (and vice versa) may not be replicable, and/or may be the result of sampling error.

Collectively, our correlated change findings were remarkably consistent with those of Hudson et al. (2012). Together with the original study, this replication should bolster confidence that personality traits do, in fact, reliably develop in concert with fluctuations in life circumstances (e.g., Hudson et al., 2012; Jackson et al., 2012; Lehnart et al., 2010). That said, as this project was a relatively straightforward replication of Hudson et al.'s (2012) research, it suffers from the same limitations and interpretational difficulties. Specifically, even given the longitudinal nature of our data, it is difficult to rule out alternative explanations, such as reverse causality. For example, it remains possible that individual differences in biological maturation drive changes in conscientiousness and agreeableness, which are accompanied by co-occurring increases in social investment at work (e.g., Costa & McCrae, 2006). Similarly, it is possible that unspecified third variables might be catalyzing increases in both personality traits and social investment at work, producing a spurious association between the two.

Nevertheless, we believe that our findings should be interpreted within the framework of other large-scale longitudinal surveys (e.g., Hutteman et al., 2015) and intensive longitudinal randomized experiments (e.g., Hudson & Fraley, 2015) which suggest that small state-level changes to thoughts, feelings, and behaviors can eventually coalesce into enduring trait-level changes (Roberts & Jackson, 2008). Taken collectively, the literature seems to suggest that it is reasonable that one's workplace and identity as a deeply invested employee can serve as consistent presses to think, feel, and behave in more conscientious and agreeable state-level manners, which may eventually educe trait-level changes in conscientiousness and agreeableness.

4.2. Social investment and personality trait development across the life course

Finally, we examined the extent to which age predicted both levels (i.e., intercepts) and change (i.e., slopes) in social investment at work and personality traits over time. Replicating large bodies of previous research (e.g., Lucas & Donnellan, 2011; Roberts et al., 2006; Soto et al., 2011), we found that older individuals tended to be more agreeable, conscientious, and emotionally stable, as compared with younger persons. Moreover, these normative age-graded gains tended to plateau in middle-to-old age. Curiously, however, we found that age was unrelated—in a linear or curvilinear fashion—to *changes* in people's personality traits over the course of three years. That is, irrespective of age, people tended to experience changes to their personality traits of a similar magnitude.

The fact that *levels* of some traits (e.g., conscientiousness) tend to plateau with age, yet *growth* in those traits remains constant across the lifespan represents a somewhat interesting discontinuity in our data. There are at least two explanations for why such a phenomenon might have occurred. First, although the parameter estimates were not statistically significant, we found age trended toward predicting diminished slopes in conscientiousness over time. Therefore, it may be the case that older individuals *do* experience lesser gains in some traits (e.g., conscientiousness) over time, but our study was not sufficiently statistically powered to detect these relatively small differences.

An alternative explanation for the apparent disconnect between our cross-sectional patterns (e.g., age predicts growing then plateauing levels of conscientiousness) and longitudinal findings (e.g., age is unrelated to rate of *growth* in conscientiousness) is that repeatedly assessing personality traits may influence participants' responses to the measures, or non-random attrition may alter or obscure estimates of change over time (e.g., Lucas & Donnellan, 2011).

Irrespective, we generally found that age did not moderate the *correlation* between *changes* in social investment in work and *changes* in personality traits. This finding suggests that environmental factors—including one's level of commitment to one's job—predict changes in personality traits across the entire lifespan. Indeed, our findings seem to complement theory (e.g., Baltes, 1987) and research (e.g., Jackson et al., 2012) which suggest that personality remains an open system throughout the life course.

4.3. Limitations and future directions

Given that our study is a straightforward, close replication of Hudson et al.'s (2012), its limitations remain largely identical to theirs. One limitation of both studies was relatively high attrition between waves (approximately 50%). Although using full information maximum likelihood estimation helps to mitigate some of the limitations of missing data (e.g., Newman, 2014), we cannot soundly rule out the possibility that our pattern of results may be partially attributable to nonrandom attrition.[8]

A second limitation of these studies is that we measured social investment in work in a subjective fashion. Future research would benefit from collecting more objective—or at the very least non-self-rated—reports of participants' social investment in work (e.g., Paulhus & Vazire, 2007). Moreover, future research would benefit from employing designs with a finer temporal resolution (i.e., more frequent measurement occasions) in order to better tease apart the causal processes linking social investment at work and personality trait development.

Finally, our studies suggest that social investment in work is related to changes in personality traits across the lifespan. Consequently, it may be the case that the normative *declines* that occur in some traits during old age (e.g., conscientiousness, Lucas & Donnellan, 2011; or openness Roberts & Mroczek, 2008) are the result of *de-investment* processes: becoming *less* invested at work may facilitate *reductions* in some personality traits. To evaluate this idea, future research would benefit from collecting larger samples of individuals transitioning from employment to retirement.

4.4. Conclusion

Work consumes more than a third of many adults' waking hours. Our research replicates that of Hudson et al. (2012) and suggests that experiences at work—namely becoming increasingly socially invested in one's work—predict enduring gains in personality traits over time. Combined with previous research, the present study bolsters confidence in the claim that personality traits change in tandem with developmental experiences.

Acknowledgment

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[8] We attempted to partially address this issue through simulation. We simulated a dataset with two waves in which conscientiousness and social investment were correlated at Time 1 ($r = .30$) and were relatively stable over time ($r = .70$). We then estimated the correlated *change* in conscientiousness and social investment in two conditions: (1) no attrition, and (2) 50% attrition that was a function of Time 1 conscientiousness ($\beta = .06$) and social investment ($\beta = -.07$). One thousand samples were generated for each condition. There were no mean differences in the distributions of *correlated change* across these simulated conditions. This simulation may suggest that attrition *per se* should not produce illusory correlated changes, assuming that attrition is wholly a function of Time 1 variables. Of course, to the extent that attrition is also a function of Time 2 variables or within-person changes from Time 1 to Time 2, it is absolutely possible that nonrandom attrition could create illusory correlated changes.

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